IMPACT OF AGRICULTURAL INPUT SUBSIDY PROGRAMS ON THE FOOD SECURITY OF POOR HOUSEHOLDS RESIDING IN MERU COUNTY, KENYA

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I have read, and I understood the plagiarism provisions in the General Regulations of the University Calendar for the current year.

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I declare that this document and the research that it describes are my original work and that they have not been presented in any other university for academic work.

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ABSTRACT

Food security has emerged as a top challenge that affects millions of Kenyans. Statistics from the National Drought Management Authority estimate the population in Kenya suffering from food insecurity as 4.1 million individuals in 2021. Food security challenge in Kenya is greatly reliant on poor conceptualization and implementation of robust programs like Agricultural Input Subsidy Program. Despite the efforts made by the government including the implementation of Agricultural Input Subsidy Program, food shortage has remained an unresolved challenge in Kenya and especially in Meru County. The purpose of this study was to establish the effect of government agricultural input subsidy programs on the food security among poor households residing in Meru County, Kenya. The study sought to establish the following objectives: determine the social-economic effects of the Agricultural Input Subsidy Program on food security among poor households residing in Meru County, Kenya; assess the effect of fertilizer subsidies on food security among poor households residing in Meru County, Kenya and determine how training of farmers on the use of agricultural input subsidy program subsidies affects food security among poor households residing in Meru County, Kenya. Available literature was reviewed to inform conceptualization and instrumentation in this study. This study adopted positivism paradigm followed by mixed research designs covering cross-sectional descriptive survey and explanatory designs. Structured questionnaire with close-ended questions was used to gather information from respondents. The study targeted 100,345 poor households from Meru County out of which 398 respondents were sampled through stratified random technique. The analysis was conducted through Statistical Package for Social Sciences guided by means and standard deviations, correlation, and regression. The study established that fertilizer subsidies (β=0.629) had greatest effect on food security of Kenya's poor households residing in Meru County followed by training of farmers (β=0.397) and lastly social-economic effects (β=0.186) respectively. The study concludes that government agricultural input subsidy programs are significant predictors of food security.

TABLE OF CONTENTS

DECLARATION **ii**

ACKNOWLEDGEMENT iii

ABSTRACT **iv**

TABLE OF CONTENTS **v-vii**

LIST OF TABLES **x**

LIST OF FIGURES **ix**

ABBREVIATIONS **x**

INTRODUCTION AND OBJECTIVES **1**

Study Background 1

Problem Statement 3

Purpose of the Study 4

Objectives 4

Main Objective 4

Specific Objectives 5

Research Questions 5

Justification and Significance of Study 5

CRITICAL LITERATURE REVIEW **7**

Introduction to Literature Review 7

Theoretical Review 7

Sustainable livelihood theory in the context of food security 7

Transaction Cost Theory 9

Empirical Review 10

Food Security 11

Social-economic effects of the agricultural input subsidy program on food security 14

Fertilizer Subsidies and Food Security 16

Training of Farmers on Use of Agricultural Input Subsidy Program and Food Security 20

Research Gap 22

Conceptual Framework 24

RESEARCH METHODOLOGY AND METHODS **26**
Research Paradigm and Overall Approach 26
Research Strategy and Methods 27
Research design 27
Quantitative data collection techniques 27
Inclusion and Exclusion Criteria for the Study 28
Inclusion criteria 28
Exclusion criteria 28
Sampling technique 28
Data analysis 30
Model Specification 30
Diagnostic Tests 32
Research Quality 33
Ethical consideration 34
Potential Outcome of your research 34
PRESENTATION AND ANALYSIS OF FINDINGS **35**
Introduction 35
Response Rate 36
Characteristics of the Respondents 36
Gender Distribution of Respondents 36
Education Qualifications 37
Length of Residence in Meru County 38
Source of Income 38
Presentation and Interpretation of Research Analysis and Findings 39
Diagnostic Tests 40
Social-Economic effects of the Agricultural Input Subsidy Program and Food Security 43
Fertilizer Subsidies and Food Security 46
Training of Farmers on the Use of Agricultural Input Subsidy Program Subsidies and Food Security 50
Joint Effect of agricultural input subsidy programs on the food security 53
Discussion 55

CONCLUSIONS AND RECOMMENDATIONS **59**
Introduction 59
Conclusions 60
Recommendations 60
Limitations of the Study 61
Unique Contribution of the Study 61
Contribution of the Study to body of Knowledge 61
Theoretical Contribution of the Study 62
Personal Reflection 62
Areas of Further Research 63
REFERENCES **64**
APPENDICES **74**
Appendices 1: Questionnaire 75
Appendices 2: Introduction letter 75

LIST OF TABLES

Table 2.1: Knowledge Gap Matrix Summary 23

Table 4.2: Multicollinearity Test 41

Table 4.3: Normality Test 41

Table 4.4: Heteroscedasticity Test 42

Table 4.5: Social-Economic effects of the Agricultural Input Subsidy Program 44

Table 4.6: Linear Regression Results Linking Social-Economic effects of the Agricultural Input 46

Table 4.7: Fertilizer Subsidies 47

Table 4.8: Linear Regression Results Linking Fertilizer Subsidies and Food Security 49

Table 4.9: Training of Farmers on the Use of Agricultural Input Subsidy Program 50

Table 4.10: Linear Regression Analysis on Training of Farmers on the Use of Agricultural Input Subsidy Program and Food Security 52

Table 4.11: Correlation Results 53

Table 4.12: Beta Coefficients and Significance 54

LIST OF FIGURES

Figure 2.1: Sustainable livelihood framework 8

Figure 2.2: The conceptual framework. 25

Figure 4.1: Response Rate 36

Figure 4.2: Gender Distribution of Respondents 37

Figure 4.3: Education Qualifications 37

Figure 4.4: Length of Residence in Meru County 38

Figure 4.5: Source of Income 39

Figure 4. 6: Scatter Plot 43

ABBREVIATIONS

SPSS Statistical Package for Social Sciences

SSA Sub-Saharan Africa

AISPs Agricultural Input Subsidy Programs

NDMA National Drought Management Authority

INTRODUCTION AND OBJECTIVES

Study Background

This section provides a summary of the impact of agricultural input subsidies on the food security of Kenya's poor households residing in Meru County. The objective, research question, the justification, and the conceptual framework of the study is also considered.

Food security has remained a global issue that has attracted significant attention among scholars. According to UNICEF (2021), food insecurity remains a challenge among millions of people around the globe. Cook and Frank (2008) noted that food insecurity was one of the most prevalent risks as far as health, growth and cognition at individual levels were concerned. Gani and Chand-Prasad (2007) indicated that availability of food, supply of proteins and calories have direct implication on development at human point of view. On the other hand, accessibility to food represented by vulnerability and prices has inverse implication on human development (Gani & Chand-Prasad, 2007).

Jenkins and Scanlan (2001) shared that pressure at population level coupled with a rise in age dependency interfered with the ability of population to access food. Beyene (2023) documented that prices of staple foods like milk and maize among others had been on a rise and this has diminished the ability of individuals from poor backgrounds to access food hence food insecurity in Kenya. Although food security is a multifaceted concept, literature provides a number of measures of this construct. Thus, the present study adopted these measures as proxies of food security.

The agricultural sector plays a vital role in promoting a diverse and vibrant social economic pillar in growth and development of a nation (Walls *et al.*, 2018). Most of the agricultural subsidies provided by the government are meant to improve agricultural activities with the ultimate goal of ensuring that there is sustainable food security. Food security exists when there is easy access to safe and sufficient nutritious food not just physically but also economically (Dorward & Chirwa, 2011). Globally, there has been a rise in the provision of agricultural subsidies to ensure a sustainable food supply to feed the ever-growing population (Adjognon, Liverpool-Tasie & Reardon, 2017).

According to Matita, Chiwaula, Chirwa, Mazalale and Walls (2022), majority of countries in Subsaharan Africa (SSA) region are working out to implement agricultural input subsidy programs (AISPs) to ensure there is food security. As observed by Kato and Greeley (2016), most of the AISPs in SSA have resulted into an increase in the yield of maize while contributing towards reduction of poverty. Ghins, Mas Aparisi and Balié (2017) indicated that in SSA, the input subsidies tend to crowd out other expenditure categories that have potential to support long term objectives of agriculture development. In Tanzania, Kato (2016) observed that existence of AISPs have contributed to overall national food security.

Agriculture is the cornerstone of the Kenyan economy, yet small scale farmers are often caught in low yields and low-income vicious cycles resulting in poverty and food insecurity (Nyairo 2011). Kenya is among the sub-Saharan African nations implementing agricultural input subsidy programs. For instance, in 2007, the 'Kilimo Plus' initiative offered fifty-kilogram bags of basal and top-dressing fertilizer along with ten kilograms of improved maize seed to poor household farmers. However, the nation continues to contend with severe food shortages, with 1.3 million people facing hunger in 2017. The role of agricultural subsidies cannot be ignored, as agriculture

remains to be the key contributor to the country's economic growth and development. In Kenya, for instance, 45 % of the government revenue is obtained from the agricultural sector. Despite the existence of agricultural subsidies in Kenya, the issue of food insecurity remains rampant in a majority of Kenyan households, therefore this study aimed to assess the impact of agricultural subsidies on the food security of Kenya's poor households.

Problem Statement

Food security has remained unresolved global, regional and local challenge both in developing and developed countries (Mbow, Rosenzweig, Barioni, Benton, Herrero, Krishnapillai, Liwenga, Pradhan, Rivera-Ferre, Sapkota & Tubiello, 2019). Statistics from the United Nations Report (2022) indicate that there was a rise in people affected by hunger to 828 million individuals in 2021 from 46 million in 2020. The report further observed that about 2.3 billion individuals representing 29.3 percent of the global population who were severely or moderately food insecure in the year 2021 (UN, 2022). In Africa, the Global Report on Food Crisis (2022) indicates that about 140 million individuals are encountering acute food insecurity. This situation is particularly persistent in the SSA and the Horn of Africa regions. The consequences of this persistent problem of food security include an increase in malnutrition cases that were estimated at 5.7% of the world population in 2020 (Brazier, 2023). Despite the various efforts that have been adopted by countries including implementation of AISPs, food insecurity has remained a global challenge.

Just like other countries in the world, food security has emerged as a top challenge that has affected millions of Kenyans. Statistics from the National Drought Management Authority (NDMA) (2022) estimate the population in Kenya suffering the problem food insecurity as 4.1 million individuals in 2021. As noted by Kaguara (2014), the food security challenge in Kenya is greatly reliant on poor conceptualization and implementation of robust programs like AISPs. According to Isaac,

Mwenda and Wachira (2019), despite the efforts made by the government including the implementation of AISPs, food shortage has remained unresolved challenge especially in arid and semi-arid areas like Baringo. This has contributed to unresolved debate on the effectiveness of such programs towards solving food security in Kenya.

The promulgation of the 2010 Constitution in Kenya gave rise to a devolved system of government comprising of national and 47 County Governments, Meru being one of the counties (Wanyande & Mboya, 2013). The county has been facing numerous challenges. Food insecurity being one of the key challenges. According to Muia (2022), an estimated 200,000 people in this county are currently facing massive starvation. The situation is particularly evident among the poor households who cannot afford to purchase food or farm inputs like fertilizer that they can use to supporting small scale farming activities. It is therefore hoped that efforts to enhance the government agricultural input subsidy programs to poor households would enhance their food security situation. Against this background, the study sought to establish the effect of government agricultural input subsidy programs on the food security among poor households residing in Meru County, Kenya.

Purpose of the Study

This study aimed at revealing the dynamic impact of government agricultural input subsidy programs on the food security among poor households residing in Meru County, Kenya.

Objectives

Main Objective

The main objective of the study was to analyze the effect of agricultural input subsidy programs on the food security of Kenya's poor households residing in Meru County.

Specific Objectives

The specific objective of the study are follows:

1. To determine the social-economic effects of the agricultural input subsidy program on food security among poor households residing in Meru County, Kenya.
1. To assess the effect of fertilizer subsidies on food security among poor households residing in Meru County, Kenya.
2. To determine how training of farmers on the use of agricultural input subsidy program affect food security among poor households residing in Meru County, Kenya.

Research Questions

The study sought for answers to the following research questions:

1. What are the social-economic effects of the agricultural input subsidy program on food security among poor households residing in Meru County, Kenya?
2. How do fertilizer subsidies affect food security among poor households residing in Meru County, Kenya?
3. Does training of farmers on the use of agricultural input subsidy program affect food security among poor households residing in Meru County, Kenya?

Justification and Significance of Study

The findings from the study would provide real-time data and information on effect of government agricultural subsidies by farmers from poor households which would inform the government, policymakers, and other stakeholders of the effect of this agricultural subsidy program. The findings from this study would provide valuable information to farmers, like the potential economic benefits of incorporating technology and modern farming methods. The study would also offer policymakers and donors accurate and up-to-date estimates of the impact of farm input

subsidies on crucial indicators of household food security and sustainability. Additionally, the Ministry of Agriculture, County as well as National Governments in Kenya need such data to design profitable and sustainable policies. Moreover, this study is in line with the Kenya big four agenda which calls for a sustainable food security system through an agricultural subsidy model. This study is also in line with SDG goal number two [SDG-2] which calls for sustainable food security through the provision of agricultural subsidies with the aim of achieving zero hunger.

This study would help the Government to achieve Vision 2030 of transforming Kenya into a 24-hour industrial economy. Conventional wisdom dictates that productivity at individual level is strongly influenced by food intake. It was believed that by carrying out this study on food security, recommendations would be shared with the Government of Kenya so that it makes necessary improvement towards the agricultural input subsidy programs that are already in place. An improvement of these programs has the potential of increasing food security and thus the possibility of achieving the aforesaid noble Vision.

CRITICAL LITERATURE REVIEW

Introduction to Literature Review

This chapter explores relevant studies on agricultural subsidy programs and changes in household income under the following sub-headings: type of subsidy, fertilizer subsidies, susceptibility, time factor, and training. Government subsidy programs are attractive on various grounds and are hard to resist. Firstly, they are politically attractive and look easy to implement. Secondly, the challenges they intend to solve are compelling nationally and internationally (Crawford et al., 2008). Subsidy programs offer ready solutions to seemingly tricky challenges of input markets and attributable financial services to poor small farmers; however, this assertion is debatable. Whilst other strategies for overcoming the problems are complex, subsidies look straightforward to implement with broader political, social and economic aims. However, whether or not these government-initiated subsidy programmes have met the desired outcomes is contentious.

Theoretical Review

The sustainable livelihood approach theory and the transaction cost theory were used to guide this study. The main theory of the study was the sustainable livelihood approach theory since the study is about ensuring there is sustainable access to food hence food security. The transaction cost theory was used to provide an illustration of how proving agriculture subsidies result into reduction in transaction costs incurred by farmers to access food inputs. With the increased uptake of farm inputs as a result of agriculture subsidies, investment in farm inputs is likely to increase among farmers. The ripple effect of this would be an improvement in food security in the country.

Sustainable livelihood theory in the context of food security

The sustainable livelihood approach theory looks into various platforms utilized by people to produce and maintain their livelihood through enhanced and improved well-being and that of the

future generation in short and long-term phases. This approach was formulated by Chambers and Conway (1992). Utilization of the sustainable livelihood approach has it's shortcomings when it comes to poverty reduction among poor households this includes defining who the poor are and the social content revolving around poverty (Kagin, Taylor, Pellerano, Daidone, Juergens, Pace & Knowles, 2019). However, sustainable livelihood approach has it's own strengths which include revealing a number of activities that are carried out aiming to eradicate poverty among poor households.

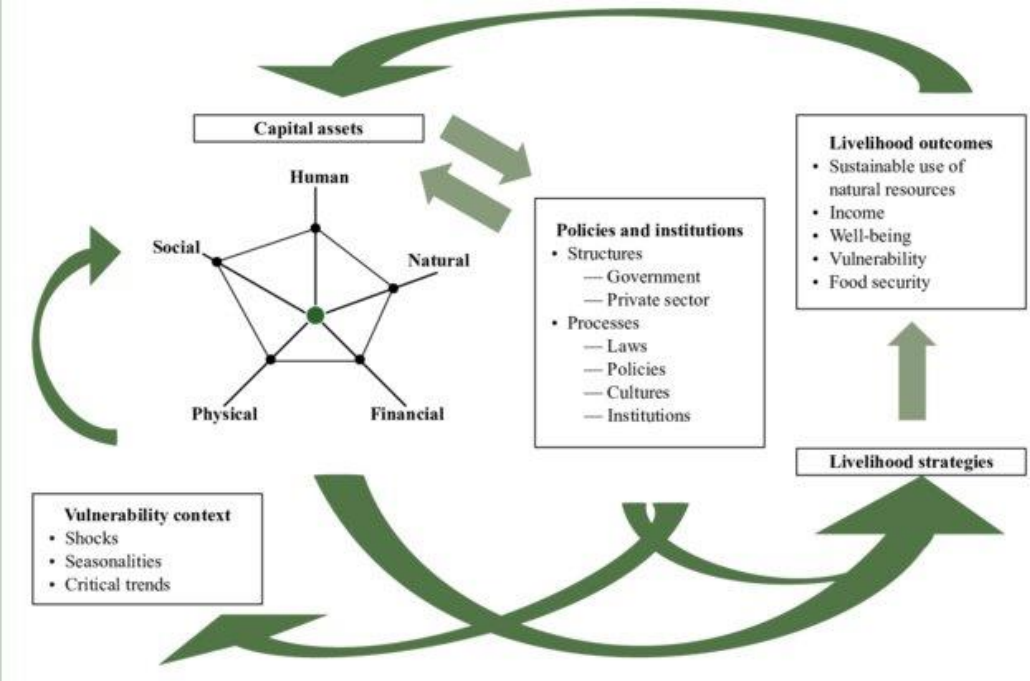


Figure 2.1: Sustainable livelihood framework

Source: (Tambe, 2022)

This study adopted the Sl framework (Scoones, 1998) to assess how agricultural subsidy programs, training of farmers concerning this subsidies program, access to information regarding this program, and provision of farm inputs such as fertilizer have an impact on food security among poor households farmers.

Transaction Cost Theory

This theory was developed by Coase (1937) and it argues that failures in markets by themselves should not lead to interventions by the Government if such imperfections can be internalized at an individual level. The term transaction costs have been defined by different scholars. For instance, Cuypers, Hennart, Silverman and Ertug (2021) referred to transaction costs as the costs that are incurred when an economic system is being run. Transaction costs according to Bel and Sebő (2021) refer to collective expenses that are incurred during negotiation in a contract. In carrying out market transaction, engaging in negotiations is paramount. Firms and individuals exist as institutions that are established to counter these transaction costs. Government regulation is an alternative to an enterprise which can shape how production factors are utilized (DeMiguel, Martin-Utrera, Nogales & Uppal, 2020).

There exist differences at firm and government level in that governments have ability of avoiding competitive and market forces altogether, a responsibility that cannot be done at firm and individual level (Schneiberg & Hollingsworth, 2019). At the same time, the government has some huge powers that can allow it to lower the costs of products like fertilizers through imposition of subsidies which privately established entities cannot. According to Kano and Verbeke (2019), transaction costs are linked with the manner in which resources are allocated covering the markets. Market failure is said to be evident when there are high transaction costs that the market cannot sustain. The two key sources of transaction costs are exclusion costs and the expenses incurred when communicating and sharing of information. In case of a public good, exclusion costs are usually very high. The existence of the costs incurred to communicate and share information arises when prices of products do not have adequate information that is required for carrying out a specific transaction like purchase of fertilizers in the markets (Coase, 1960).

The rationale for existence of transaction costs according to Altinay and Taheri (2019) includes asset specificity and opportunism. In this theory, the agents have strong attributes of opportunism with high self-interested behavior. The implication of this behavior is that even in presence of clear rules of the game; these agents will simply break the same resulting into problems of moral hazard and adverse selection. This is particularly more pronounced in presence of information asymmetry. Relating these assertions to the current study, although the government may have in subsidies of fertilizers, opportunistic agents involved in distribution of this commodity guided by their self-interested behavior may create a situation where the fertilizer do not reach the targeted beneficiaries (Rindfleisch, 2020).

Transaction costs that arise from opportunism result into circumstances of market failures. Coase (1937) observed that the major reason why firms and individuals exist is to ensure transaction costs linked with the use of the market are minimized. Provided the fact that the State has power to ensure that these transaction costs are economized, provision of subsidies on commodities like fertilizer can go a long way to achieving the same (Coase, 1937). The present study sought to establish the influence of the government agricultural input subsidy programs on the food security among poor households residing in Meru County, Kenya. It is predicted from this theory that providing agricultural input subsidy is one way of reducing the transaction costs that farmers incur when purchasing fertilizer and is expected to increase the quantity of fertilizer purchased which may lead to increased productivity and thus food security.

Empirical Review

The subsequent sections provide empirical review of past studies based on the objectives that guided the study.

Food Security

Literature provides different measures of food security but synthesis of the same results into indicators as availability and accessibility to food as well as optimal uptake of nourishment (UNICEF, 2021). The study conducted by UNICEF (2021) was an analysis of the situation of food security and nutrition across the globe taking the period of 2020. The report points out that the key drivers of food security across the globe include economic downturns and persistent conflicts as well as variability in climatic conditions. The report further indicates that food insecurity has remained as a challenge among millions of people around the globe. Within the context of China, He, Zhao, Wang, Jiang and Zhu (2019) did a study with focus on challenges linked with food security. The time horizon that was of focus by this study was 1981 all through to 2016. Information was obtained from different sources. It emerged after analysis that variability in food habits led to a rise in water for irrigation in the period covered.

Naylor and Falcon (2010) did an examination of food security in the context of economic volatility. The focus of this study was on providing an analysis of movement in commodity prices around the globe, policies revolving around food in regard to fluctuation in prices and examining the implication of food security on individuals drawn from low income categories. The study documents that there exists long-lasting implication of the increase in prices on food and food policies around the globe. It further emerged that government commitment in stabilization of prices has often contributed to an increase in food insecurity among individuals drawn from poor households.

In United State, Cook and Frank (2008) did a study with emphasis on food security and its contribution toward development at an individual level. The study provides a summary of the data child and household food insecurity and the link with health and development of children. The

paper notes that food insecurity is one of the most prevalent risks as far as health, growth and cognition at individual level are concerned. Gani and Chand-Prasad (2007) did an analysis of food security and development at human point of view. The context of the study was on low income nations. The analysis indicated that availability of food, supply of proteins and calories have direct implication on development at human point of view. On the other hand, accessibility to food represented by vulnerability and prices of food have inverse implication on human development. Based on this study, two key important measures of food security are availability and accessibility to food.

In a study conducted by Barrett (2002), the main focus was on food security and assistance programs. It was observed that malnutrition and hunger has remained a global challenge even after an increase in per capital food availability. The study recommends the need for food assistance programs in response to this concern of food insecurity around the globe. Jenkins and Scanlan (2001) covered less developed countries to appraise their food security situation. The time period covered by this study was 1970 all the way to 1990 and it was a lagged panel analysis. The analysis indicated that the supply of food is structurally based in processes of development that include investments at domestic level and penetration of foreign capital. It also emerged that pressure at population level coupled with a rise in age dependency interfered with the ability of population to access food.

The main focus of the study conducted by Godfray, Beddington, Crute, Haddad, Lawrence, Muir, Pretty, Robinson, Thomas and Toulmin (2010) was on food security and its associated challenges. The paper hypothesizes that the surge in global population and growth in consumption would imply there would be an increase in global demand for food. An increase in competition for land, energy as well as water is also predicted to have potential implication on how food is produced.

To solve these concerns, the study suggests the need for a linked and multifaceted global strategy to enhance sustainability and equitability of food security.

The study done by Beyene (2023) focused on food security and its implication on outcomes linked with health with specific focus on countries in sub-Saharan Africa. The paper observed that human health is adversely affected by food insecurity. The study conducted in Kenya by Emongor (2014) was an examination of crisis of food prices and concerns about food insecurity. The study was an analysis of information in its auxiliary sources. It was observed from the review that there has been a persistent rise in prices of food in Kenya since 2006 to the time the study was conducted. It documented that prices of staple foods like milk and maize among others had been on a rise and this has diminished the ability of individuals from poor backgrounds to access food hence food insecurity. The key causes of food insecurity in Kenya documented by this study include supply and demand related issues. It was summed up that food price crisis and food insecurity are evident in Kenyan context.

However, all the reviewed studies create gaps. For instance, the study by Beyene (2023) focused on the larger Sub-Saharan region. The study by Emongor (2014) focused on food security issues in Kenya since 2006 but failed to link the same with agriculture subsidy program provided by the government. Against this background, it was imperative that an analysis is conducted to provide the link between agricultural input subsidy programs and the food security of Kenya's and specifically among the poor households residing in Meru County. The main reason for focusing on the poor households is because of their variability to economic shocks as well as low purchasing power.

Social-economic effects of the agricultural input subsidy program on food security

The new advances in farming technologies have directly impacted poor farmers by raising household farm revenues and indirectly by raising laborers' wage rates besides lower food prices (Winters et al., 1998). A study in Malawi found that small-scale farmers got less fertilizer from the subsidy programs than reported, besides many not getting what they had anticipated (Lunduka et al.,2013). The main objective of the subsidy program in Malawi was to provide to the farmers who cannot purchase them on their own to encourage conservation farming and diversification. However, the subsidy package never reached the supposed beneficiaries in part. Further, during the 2005/06 season, farmers only got fertilizer and maize seeds, contrary to the objective of crop diversification. The researcher finds these results critical as they coalesce with the proposal's objectives.

A study conducted in Bhutan aiming to assess the social-economic impact of agricultural subsidies among farmers revealed that farmers who were beneficiaries of agricultural subsidies such as poultry and seed products led to an improved income level which resulted in a reduction of poverty magnitude (Wang et al., 2019). In their study, Wang et al., (2019), found that the provision of jersey cows not only led to an improved livelihood but also led to an increased production of biogas which was made more available among poor households. Farmers who benefited from farm products such as seedlings not only led an improved income level but also increased utilization of available land, improved irrigation practices, and interest to grow as a result this led to the development of a secondary market to sell their farm produce .

Solaymani, Aghamohammadi, Falahati, Sharafi and Kari (2019) conducted an analysis of food security and its implication on socio-economic issues of agriculture subsidies. Food security was

represented by access and availability of food. The context of the study was in Malaysia and the analysis showed that policies to remove agriculture subsidies by the government had negative socio-economic implication on the growth of Malaysia as a country. On the other, policies to expand agriculture subsidies had direct implication on the growth of the country at large. The removal of agriculture subsidies was linked with a drop in access and availability of food and this in turn translated to poverty at national and household level.

Wang, Manjur, Kim and Lee (2019) did an assessment of socio-economic implications of agricultural related subsidies taking a case of Bhutan. Information was gathered with aid of semi-structured interviews where participants were household heads. The study noted that above nighty per cent of the studied households got at least one kind of subsidy except from piglets, and machineries. The study further noted that population from non-poor families had more access to subsidies as compared to those from poor backgrounds.

Although significant progress has been made to review relevant empirical studies on social-economic effects of the agricultural input subsidy program on food security, the existing literature create gaps that the present study sought to fill. For instance, the study by Wang, Manjur, Kim and Lee (2019) and was done within the content of Bhutan and not in Kenya. Solaymani, Aghamohammadi, Falahati, Sharafi and Kari (2019 focused on Malaysia and not in Kenya. This means that there is scanty of literature on social-economic effects of the agricultural input subsidy program in developing countries like Kenya. Against this background, it was important that an analysis of the effect of agricultural input subsidy programs on food security of Kenya's and specifically among the poor households residing in Meru County is conducted hence the justification of the present study.

Fertilizer Subsidies and Food Security

Several World Bank reports submit that the economic reforms between the 1980s and 1990s led to significant reductions in fertilizer usage, thus increasing food insecurity amongst remote communities (Morris et al., 2007). Therefore, these reforms needed to be better considered and affected household income and nutrition. Several debates are ongoing about the desirability of fertilizer subsidies to attain economic and welfare objectives, with some economics linking these subsidies to political convenience. Regrettably, some African nations use fertilizer subsidies as vehicles for political wins (Morris et al., 2007). Agreeably, the political objectives in these contexts vary with the intended aims of income, food security and nutrition, which could be the reasons for the failure of such programs.

Ariga et al. (2006) observed that of the four nations using approximately 25 kilograms of fertilizer per hectare, three had an economic growth of less than 30% between 1990 and 2003, that is, Swaziland, Malawi and Zimbabwe, while Kenya reported high usage and high growth. As earlier highlighted, Sub-Saharan Africa's fertilizer applications are the poorest globally, with only13kg/ha compared to 94/ha in other developing nations in 2008 (Minot and Benson,2009). The law of demand and supply can highlight potential reasons for low fertilizer applications. From the demand point of view, the perceived profitability and payment ability may lead to poor usage, besides a lack of training on fertilizer use. Consistently, the researcher shall explore the role of training in the study area to verify the claims. The inability to purchase farm inputs reflects low social and economic status and credit inaccessibility in rural jurisdictions. On the other side, Kherallah et al. (2002) argue that fertilizer costs are higher in Africa than elsewhere globally due to infrastructural transportation barriers. They further submit that lack of irrigation infrastructure prohibit plants' nutrient uptake promptly. These demand and supply reasons are anchored on structural

determinants requiring public sector interventions. Morris et al. (2007) submitted fertilizer applications to be unprofitable in several African regions due to huge costs, including transportation. Despite similar agronomic response to fertilizer in Africa and elsewhere globally, the fertilizer cost-to-output ratio is enormous, making agriculture amongst the least profitable ventures in the region (Yanggen et al., 1998). Therefore, fertilizer price is integral to its profitability and potential application.

There are divergent opinions in literature regarding sustainability of fertilizer subsidies as a growth strategy (Harrigan, 2008), with some pointing out the logistical achievement of making fertilizer subsidies available to farmers in Malawi and its impact on maize productivity (Dorward & Chirwa, 2011). Experimental evidence in Kenya shows that providing small, time-limited fertilizer subsidies at harvest increases fertilizer usage in the following season (Kremer and Robinson, 2009). The researcher identifies a primary research issue in these arguments as to whether or not receiving subsidized fertilizer is enduring and examines the contentious issue as the main objective of the study.

Popoola (2022) did a study with focus on fertilizer subsidy and its implication on food security at household level in Nigeria. Sampling of participants was achieved through two-stage process starting with purposive sampling with a total of 539 participants being targeted. Information in its primary nature was gathered with of semi-structured questionnaires. Fertilizer subsidy was operationalized into access to fertilizer that has been subsidized, distance of residence to the market having subsidized input as well as extension services. It was shown much of the population in Nigeria had food insecurity challenges estimated at above fifty per cent. Food insecurity at household level was attributed to age of the head of the household, their levels of education and accessibility to extension services.

Wiredu (2015) conducted an investigation in Ghana with focus on fertilizer subsidy and its implication on productivity at firm level and food security. The focus of the study was among farmers involved in cultivation of rice. The study was exploratory in nature and 330 farmers on a small scale level were targeted. The study noted that there is need to regularly train farmers on the need to increase the adoption of fertilizers. Mkwara and Marsh (2011) did an analysis of subsidies to maize farmers and the implication on food security in Malawi. It was noted from analysis that food security has direct implication on fertilizer subsidies. The concern raised by the study was the need for maize farmers in Malawi to diversify into different crops so as to generate more income and increase their purchasing power. Javdani (2009) did an investigation on fertilizer subsidy and the role it plays as far as food security is concerned in Malawi. The study hypothesized that Malawian government has received praise for having made good progress to eliminate hunger by leveraging subsidy programs that have increased availability of chemical fertilizers to farmers.

In Kenya, Robert and Nie (2015) conducted an investigation on fertilizer subsidy program and its implication on vulnerable population. The data adopted in this study was cross sectional in nature covering time horizon from 2009 all through to 2010. The results were that provision of fertilizer subsidies improved income of the vulnerable population. Mulupi, Sibiko and Mose (2021) conducted an analysis of fertilizer subsidy program as a strategy that can be embraced to counter low productivity of maize in Kakamega in Kenya. Data was in cross sectional nature and it was gathered from 300 participants that were selected through multistage method. Information in its primary nature was obtained from participants guided by questionnaire. It emerged from analysis that productivity of maize was significantly shaped by the level of participation in subsidy program that was estimated at five per cent.

Although this chapter was dedicated to reviewing relevant literature on Fertilizer Subsidies and Food Security, some of the reviewed studies create gaps that the present study sought to fill. For instance, although the focus of the study Mulupi, Sibiko and Mose (2021) was in Kenya, it was done in Kakamega County and not Meru County. This study also used maize productivity and not food security as the dependent variable. Based on these gaps, the present study was an examination of agricultural input subsidy programs and its effect on food security of Kenya's and specifically among the poor households residing in Meru County.

Susceptibility of Subsidies

Subsidies should be directed to poor farmers without buying the ability to minimize the risks of displacing commercial inputs sales and enhance pro-poor growth. Therefore, the efficiency of subsidy programmes depends on errors of inclusion and exclusion in the selection of beneficiaries. Inclusions errors happen when unintended households are included in the subsidy programmes, while exclusion errors occur when intended homesteads are not included. A Zettabyte File System Pool (ZFSP) beneficiary survey shows that half of the recipients of the subsidized input bought input from private shops before getting the subsidy assistance, thus generating a higher probability of displacement. The same survey showed that 43% of recipients complemented their subsidy package through purchases from private suppliers. In Malawi, field officers allocated subsidies to the farmers they thought would make good use of the input instead of those who could not afford the retail prices (Dorward & Chirwa, 2011). In this regard, the objectives of the subsidy program should be stipulated as to whether the emphasis is on promoting agricultural growth or food security. Another study revealed 20-40% displacement of commercial fertilizer in the 2006/07 programme because able households were erroneously allocated subsidies (Mathenge, 2012). Studies examining the allocation of fertilizer subsidies concur that subsidy programs have

difficulty targeting poor beneficiaries. In Malawi, subsidized fertilizer is allocated to richer homesteads with better community connections (Chibwana et al., 2010)

The time factor

Among the factors limiting the impact of the fertilizer subsidy program in Malawi is late delivery. For instance, in the 2007/08 season, 69% of the farmers never received their inputs until the rain started (World Bank, 2010). A further examination of the 2000-2001 input programs in the same country shows that the production effects of the subsidy program were insignificant due to the late delivery of inputs for the primary farming season (Van Donge et al., 2001). Dhital et al. (1997) noted that planting dates impacted yield and yield components in a study of grain legumes. Crops planted early produced high seed yields (1.6t/ha), while planting late led to low yields (0.28t/ha). Against this backdrop, the researcher sets out to examine and verify the extent to which the time of allocating subsidies impacts yields and household income in Kenya.

Training of Farmers on Use of Agricultural Input Subsidy Program and Food Security

Farmers ought to receive observational, experimental, analytical, and communication training to enhance sustainable farming. Participation of non-governmental organizations in providing information to farmers via outreach programmes and extension services significantly increases the adoption of sustainable agricultural practices (Lee, 2005). However, the training content must be consistent with the setting familiar to farmers (Kilpatrick & Rosenblatt, 1998). Therefore, farmers must be allowed to choose the training that aligns with their interests

Kenya witnessed a significant decline in extension services, from 58% in 1992 to 30% in 2002 for maize growers. To fix public extension, the World Bank in Africa supported the training and visit model of extension services from 1975 to 1995. The project helped reach many farmers, including

adopting maize technologies (Anderson & Feder, 2004). However, rigorous evaluation of the influence of the training and visit approach in Kenya shows discouraging results. This failure could be due to the employment of a rigid top-down model disregarding heterogeneous production conditions and farmers' circumstances. Examination of extension experiments is limited to date (Anderson & Feder, 2004). However, the performance of extension systems can be improved.

The focus of the study conducted by Leuveld, Nillesen, Pieters, Ross, Voors and Sonne (2016) was on provision of agriculture extension and input subsidies as far as knowledge is concerned within the context of Democratic Republic of Congo (DRC). The study was a field experiment in nature and design. It was shown that extension and knowledge of farmers are directly connected with each other. In Malawi, Ragasa and Mazunda (2018) did an examination of extension services and how they affect productivity and food security. The specific focus of the study was on maize farmers. Leveraging information from auxiliary sources, the study noted that provision of overall outreach is not adequate, there is need to increase effectiveness of the advice that is provided to farmers. The study noted that the method used to communicate information to farmers is a key predictor of farming outcomes.

Dirisa (2023) did a study on sensitivity of food security to agriculture input subsidies within the context of Uganda. The aim of the study was on examining the implication of food security to farmers on small holder basis and how it is sensitivity to subsidies. The findings indicate that agriculture subsidy programs in Uganda have had less contribution to the targeted beneficiaries. The recommendation raised by the study was the need to increase training of farmers on the subsidy program.

From the reviewed studies, some like Dirisa (2023) focused on Uganda and not in Kenya. Ragasa and Mazunda (2018) did a study in Malawi which is a different context from Kenya. Thus, against

this background, the present study sought to establish the effect of agricultural input subsidy programs on food security of Kenya's and specifically among the poor households residing in Meru County.

Research Gap

Several studies have been conducted on subsidized farm input, but scarce studies examine whether subsidy programs last one season or are enduring. The study conducted by He et al. (2019) focused on China and not in Kenya. The study by Cook and Frank (2008) was done in USA and not in Kenya. Gani and Chand-Prasad (2007) focused on human development as the dependent variable while food security will be used in the proposed study. The main focus of the study conducted by Godfray et al (2010) focused on food security as an independent and not dependent variable. The study done by Beyene (2023) used health as the dependent variable and not food security. Emongor (2014) focused on food price crisis as the independent variable while agriculture subsidy programs were covered in the present study.

Solaymani et al (2019) used socio-economic issues as the dependent variable while the same was one of the independent variables in the current study. Wang et al (2019) was done in Bhutan and not in Kenya. Popoola (2022) did a study in Nigeria and not in Kenya. Wiredu (2015) conducted an investigation in Ghana and not in Kenya. Javdani (2009) did an investigation ion Malawi and not in Kenya. Mulupi et al (2021) focused on productivity of maize farming that is conceptually different from food security. The focus of the study conducted by Leuveld et al (2016) was on knowledge as the dependent variable while food security was covered in the present study. Ragasa and Mazunda (2018) did an examination in Malawi and not in Kenya. Dirisa (2023) focused on food security as an independent variable while the same was covered as a dependent variable in the present study. Table 2.1 is a summary of the gaps above:

Table 2.1: Knowledge Gap Matrix Summary

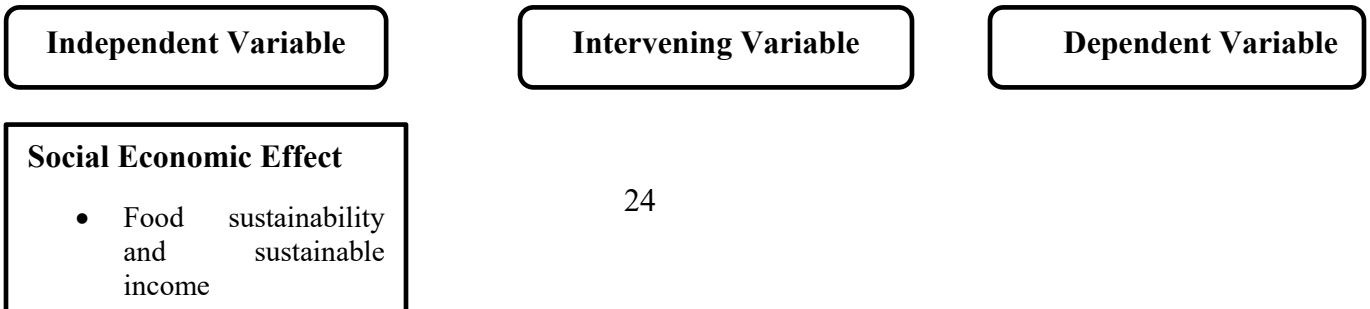
Author	Study	Key Findings	Knowledge Gaps	Focus of present study
Beyene (2023)	Provision of agriculture extension and input subsidies as far as knowledge is concerned within the context of Democratic Republic of Congo (DRC). .	The paper observed that human health is adversely affected by food insecurity.	used health as the dependent variable	food security among poor households residing in Meru County, Kenya was the dependent variable
Dirisa (2023)	Did a study on sensitivity of food security to agriculture input subsidies within the context of Uganda	The findings indicate that agriculture subsidy programs in Uganda have had less contribution to the targeted beneficiaries. The recommendation raised by the study was the need to increase training of farmers on the subsidy program.	focused on food security as an independent variable	food security among poor households residing in Meru County, Kenya was the dependent variable
Mulupi et al (2021)	conducted an analysis of fertilizer subsidy program as a strategy that can be embraced to counter low productivity of maize in Kakamega in Kenya	It emerged from analysis that productivity of maize was significantly shaped by the level of participation in subsidy program that was estimated at five per cent.	focused on productivity of maize farming	food security among poor households residing in Meru County, Kenya was the dependent variable
He et al. (Fma2019)	did a study with focus on challenges linked with food security	It emerged after analysis that variability in food habits led a rise in water for irrigation in the period covered.	focused on China	It was done among poor households residing in Meru County, Kenya
Solaymani et al (2019)	conducted an analysis of food security and its implication on socio-economic issues of agriculture subsidies	Food security was represented by access and availability of food. The context of the study was in Malaysia and the analysis showed that policies to remove agriculture subsidies by the government had negative socio-economic implication on the growth of Malaysia as a country.	used socio-economic issues as the dependent variable	food security among poor households residing in Meru County, Kenya was the dependent variable

Ragasa and Mazunda (2018)	Did an examination of extension services and how they affect productivity and food security.	Leveraging information from auxiliary sources, the study noted that provision of overall outreach is not adequate, there is need to increase effectiveness of the advice that is provided to farmers. The study noted that the method used to communicate information to farmers is a key predictor of farming outcomes	did an examination in Malawi	It was done among poor households residing in Meru County, Kenya
Emongor (2014)		The key causes of food insecurity in Kenya documented by this study include supply and demand related issues. It was summed up that food price crisis and food insecurity are evident in Kenyan context.	focused on food price crisis as the independent variable	food security among poor households residing in Meru County, Kenya was the dependent variable

Conceptual Framework

This study was guided by the sustainable livelihood theory by focusing on the benefits of government agricultural subsidies on improved food security and reduction of poverty (Chambers and Conway, 1992). After reviewing the literature by Lunduka et al. (2013), the researcher notes type of subsidy could impact household food security status; hence the study will examine whether this variability affects food security in the study area shown. The independent variables for this research is the social-economic effect of agricultural subsidies which shall include (whether the beneficiary of this household had an improved livelihood, food security status, and improved stable income), the second independent variable is the fertilizer subsidies. Food security is the dependent variable. Below is a graphical representation of the fundamental structure and components the researcher shall use to examine the influence of subsidized inputs, time, training, and selection of beneficiaries on household income. Government policy was the intervening variable.

Conceptual Framework



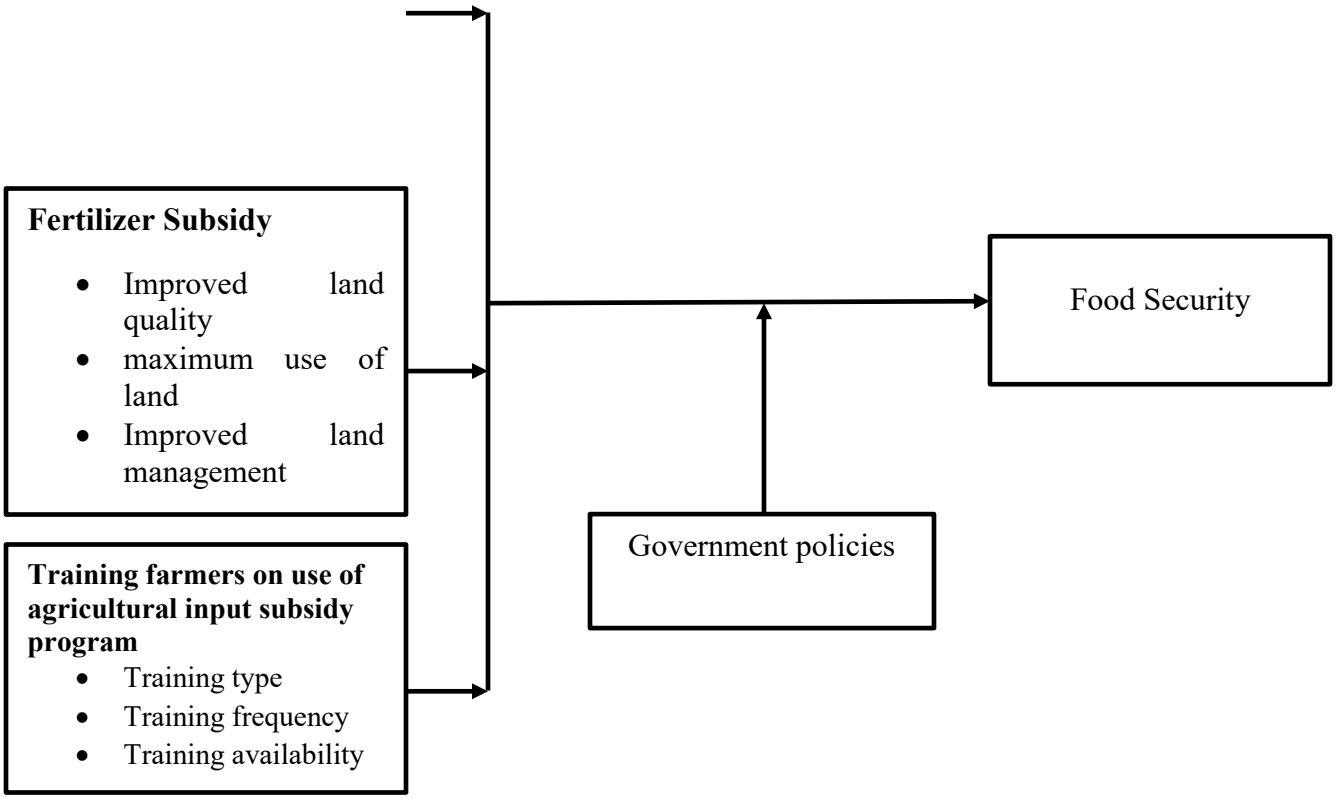


Figure 2.2: The conceptual framework

From Figure 2.2, it is anticipated that existence of food sustainability and sustainable income would allow farmers to adopt latest technologies include mechanization to carry out farming activities. This is expected to contribute to food security in the country. Sustainable income allows farmers to pay for farming expenses including planting and harvesting of crops to achieve security. Accessing agriculture input subsidy programs by the government is assumed that it would increase and improve the livelihoods of farmers. This in turn is expected to have some positive effect on overall purchasing power of farmers. With increased purchasing power, such farmers would be in position to access food in the market hence food security. It is believed that agriculture subsidy programs by the government are likely to bring about a long term food security. In other words, this is a program that can help governments to have long term solution to issues of food insecurity.

Because of access to fertilizer subsidies by the government, the quality of land of farmers is likely to improve. This improve in quality of land is reflected in the increase in nutritional contents. Providing fertilizer subsidies is likely to provide a strong incentive among farmers to ensure there is maximum utilization of their land. This is also expected to contribute towards an improvement in the way farmers manage their land. All these are likely solve food insecurity challenges. It is imperative to provide training among farmers on how to use the government agriculture subsidy programs. The type of training; whether formal and information can an implication on how farmers master the content. The frequency at which training is conducted also determines the learning outcomes. To ensure maximum mastery of the contents being taught in the training, such sessions should always be available to farmers.

RESEARCH METHODOLOGY AND METHODS

Research Paradigm and Overall Approach

A research paradigm is a patter or method that a researcher selects ion executing the proposed study. It is a collection of beliefs and ideas that guide the functioning of practices and theories (Donkers, 2014). There are two broad categories of research paradigms: interpretivism and positivism. This study adopted positivism paradigm. According to Donkers (2014), positivism paradigm has a belief in one reality that is easy to measure and understand. The design heavily relies on quantitative approaches to ensure that reality is quantified. In this paradigm, rigorous

approaches are employed so that data sources are systematically analyzed. This is a more objective approach of studying a given phenomenon. Thus, through this positivism paradigm, the study was able to gather and analyze quantitative data on agricultural input subsidy programs and food security of Kenya's poor households residing in Meru County.

Research Strategy and Methods

Research design

The study adopted mixed research designs covering cross-sectional descriptive survey and explanatory designs. The rationale of choosing on cross-sectional descriptive survey design was because data was obtained at a single point in time and that the analysis entailed the use of descriptive statistics. Descriptive survey design provides an account of things in their original state without manipulation. Thus, the study leveraged this design to provide a correct account and current state of agricultural input subsidy programs and food security of Kenya's poor households residing in Meru County. On the other hand, explanatory research design was ideal in carrying out inferential analysis with the use of regression analysis so as to draw informed inferences and deduction. The study involved an analysis of the effect of agricultural input subsidy programs and food security of Kenya's poor households residing in Meru County which could best be achieved through inferential statistics that require the use of explanatory research design.

Quantitative data collection techniques

A researcher-administered close-ended questionnaire was used in the collection of quantitative data. The questionnaire captured data from three sections. Section A captured data on the social-economic impact (food sustainability, sustainable income, improved livelihood, and long-term food security) of agricultural subsidies on food security), and section B captured data on the influence of fertilizer subsidies on food security (improved land quality, maximum use of land,

and improved land management), and the last section, section C captured data on the effect of training farmers'(training type, training frequency, training availability) influence on the use of agricultural subsidies. The lead researcher hired and trained 18 research assistants on objectives and ethical concerns before being deployed to the field to gather data. The whole data collection exercise took a period of one week.

Inclusion and Exclusion Criteria for the Study

Inclusion criteria

The study included all farmers from poor households residing in Meru County. The study also considered including farmers from poor households who were the beneficiaries of the government agricultural subsidies such as fertilizer, farm inputs and training on good farming practices.

Exclusion criteria

The study excluded farmers who did not consent to participate in the study. Farmers who were mentally impaired and unable to express themselves fully were excluded from the study. Framers with cognitive impairments and psychiatric/psychological disabilities were also excluded. Farmers who were not residents of Meru County for a period of six months were also excluded from the study and lastly, farmers who were well off in terms of a good household income were excluded from the study as the research focused on farmers from poor households.

Sampling technique

Statistics from the Kenya Bureu of Statistics (KNBS) (2019) indicate that Meru County has a total of 244,669 households. From these households, KNBS categories 100,345 as those living in poor conditions and these were the population of the proposed study. These poor households are stratified as per their respective sub counties.

Table 1: Population

Sub county	Population of poor households
South Imenti	10,345
North Imenti	12,333
Tigania East	11,546
Tigania West	13,765
Igembe South	10,673
Buuri	10,897
Central Imenti	9,764
Igembe Central	10,869
Igembe North	10,153
Total	**100,345**

Source: KNS (2019)

The sample size of the study was determined scientifically using the below formula by Yamane (1967):

$$\mathbf{n = N / (1 + Ne^2)}$$

n = is the desired sample size

N = is the target population

e = is the acceptable margin of error estimated at 0.05 (at 95% confidence interval)

Therefore, sample size (n) =100,345÷ (1+100,345 (0.0025))

= 100,345÷ (1+250.8625)

= 100,345÷251.8625

n= 398 respondents

Thus, from 100,345 poor households in Meru County, 398 respondents were selected through simple and stratified random sampling technique as shown in Table 3.2.

Table 2: Sampling Technique

Subcounty	Population of poor households	Sample proportion	Sample size
South Imenti	10,345	10,345/100,345=10.3 %	10.3%*398=41
North Imenti	12,333	12,333/100,345=12.3 %	12.3%*398=49
Tigania East	11,546	11,546/100,345=11.5 %	11.5%*398=46

Tigania West	13,765	13,765/100,345=13.7 %	13.7%*398=55
Igembe South	10,673	10,673/100,345=10.6 %	10.6%*398=42
Buuri	10,897	10,897/100,345=10.9 %	10.9%*398=43
Central Imenti	9,764	9,764/100,345=9.7%	9.7%*398=39
Igembe Central	10,869	10,869/100,345=10.8 %	10.8%*398=43
Igembe North	10,153	10,153/100,345=10.1 %	10.1%*398=40
Total	**100,345**		**398**

Source: KNS (2019)

Data analysis

Primary quantitative data collected was entered into excels for data cleaning purposes. This was important since missing variables were identified and appropriate action was taken. Outliers and inconsistency of data was addressed at this stage. The final excel sheet with the cleaned data was imported into SPSS version 26 for data analysis. Variables that were numerical were summarized by the use of means and standard deviations while variables that were categorical were summarized employing percentages and frequencies. In order to draw relevant inferences on the implication of agricultural input subsidy programs and food security of Kenya's poor households residing in Meru County, the following regression model was adopted:

Model Specification

The following four regression models were adopted during analysis of the findings is as specified below

$$\mathbf{Y= \beta_0+ \beta_1 X_1 +\varepsilon \ldots\ldots (i)}$$

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_1, β_2, and β_3 are Coefficients

ε = error term

X_1= social-economic effects

$Y= \beta_0 + \beta_2 X_2 + \varepsilon$…… (ii)

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_2 is Coefficient

ε = error term

X_2= fertilizer subsidies

$Y= \beta_0 + \beta_3 X_3 + \varepsilon$…… (iii)

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_3 is a Coefficient

ε = error term

X_3= training of farmers on the use of agricultural input subsidy program subsidies

$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$…… (iv)

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_1, β_2, and β_3 are Coefficients

ε = error term

X_1= social-economic effects

X_2= fertilizer subsidies

X_3= training of farmers on the use of agricultural input subsidy program subsidies

Model 1 is linear regression analysis used to determine the effect of social-economic effects on food security. Model 2 is used to provide the implication of fertilizer subsidies on food security while model 3 was used to provide the implication of training of farmers on the use of agricultural input subsidy program subsidies on food security. Model 4 is the overall multiple regression analysis that was used to establish joint effect of social-economic effects, fertilizer subsidies and training of farmers on the use of agricultural input subsidy program subsidies on food security.

Diagnostic Tests

In order to validate the assumptions of regression analysis, it was imperative to conduct diagnostic tests. In this regard, the study conducted normality, multicolinearity and Heteroscedasticity Test. A discussion of these tests is set out in the subsequent sections.

Multicollinearity Test

A data is said to exhibit multicolinearity when at least one of its independent variable is highly related with another variable (Strijker, Bosworth & Bouter, 2020). This situation is not desirable and it would not be possible to proceed with regression analysis when the assumption is evident in the sampler data. Whenever this condition has been detected, efforts should be made to treat the sample data through log transformation and dropping of the highly correlated independent variables (Dźwigoł, 2019). Although there exists several methods and techniques that can be adopted to detect this condition, the use of Variance of Inflation Factors (VIF) remains the widely adopted and documented methods. In this regard therefore, the values of VIF were computed through SPSS version 24. As indicated by Eden and Nielsen (2020), such VIF values within range if 1-10 provide an indication of absence of this assumption.

Normality Test

Regression analysis is only performed on a sample data that has attributes of a normal distribution. Violation of this assumption makes it hard for regression analysis to proceed and there would be need to treat that sample data first (Kara, 2020). As earlier pointed out, the best way to treat sample data that has violated any of these assumptions of regression include log transformation or rearranging of the transformed variables (Fellows & Liu, 2021). In this study, a normality test was done through the use of values of Skewness and Kurtosis. The interpretation of the resultant values of Skewness and Kurtosis was done taking into account the range of +/-3as proposed by Thanem and Knights (2019).

Heteroscedasticity Test

There are some incidences when there is either equal or unequal variance which describes either presence of Heteroscedasticity or Homoscedasticity in the sample data. When a test has been conducted and presence of Heteroscedasticity identified, it would not be ethical to proceed with regression analysis unless the situation has been rectified (Ghauri, Grønhaug & Strange, 2020). While Heteroscedasticity is undesirable condition, its opposite which is desirable is Homoscedasticity. Heteroscedasticity Test was determined through Levene test and the use of Scatter Plots. When interpreting Levene test results, consideration and attention is paid on p-values. In this regard, p values less than 0.05 point out absence of this assumption (Rose, McKinley & Baffoe-Djan, 2019). For scatter plot, a keen eye is needed to determine where any observable pattern in the distribution of the data point is. If this is observed, presence of Heteroscedasticity in the sample data would be infered (McKinley & Rose, 2019).

Research Quality

The quality of the research was determined through a pilot study. The pilot study was conducted among 10 respondents from Tharaka-Nithi County who were purposively sampled. The

justification of selecting upon Tharaka-Nithi County was because of its close proximity to Meru County. The responses from the pilot study were used to determine values of Cronbach Alpha Coefficients that were interpreted at 0.7. For validity, two experts working in the Ministry of Agriculture were issued with the questionnaire for review so that they shared their views.

Ethical consideration

Authorization to conduct the research was sought from the Griffith College Research Ethics and Review Committee. Authorization to carry out the study in Kenya was sought from the National Commission for Science Technology & Innovation (NACOSTI). Further legal documents were obtained from the county government of Meru and were sought from the department of agriculture, department of education, and ministry of interior and coordination for security purposes. Participation in this research was purely voluntary where the researcher sought for an informed consent from the study respondent before data collection. Privacy and confidentiality of the study respondents were highly observed by the use of unique numbers instead of their real names. Study respondents who agreed to participate in the study were provided with a consent form where the aim, risk, purpose and benefits of the study were explained to them in a language they understood. Study respondents were guaranteed that the original data collection tools questionnaires will be kept confidential under lock and key and will be destroyed after five years from the day of primary data collection. The content and the literature used in this study was well paraphrased whereas other authors' work has been well cited and referenced by the use of Harvard referencing style as mandated by the Griffith Style-Harvard Citation and Referencing system.

Potential Outcome of your research

The role of the agricultural subsidies program cannot be ignored in matters related to food security among farmers from poor households. Agricultural subsidies ensure farm inputs such as farm

equipment, seeds and fertilizers are available to farmers at all times without any difficulty. Appropriate utilization of agricultural subsidies by farmers improves the overall food productivity of a nation at any given time. The presence of adequate foods ensures the nation is free from disasters such as climate change and hunger which have been termed as public health concerns. Furthermore, excess farm produce can be sold to improve farmers' livelihood and general well-being due to improved income levels. This study produced a clear picture of the recently implemented strategy for the provision of agricultural subsidies to curb food insecurity in Kenya. The study informed the government whether the strategy has been effective and the necessary measures that need to be taken to promote food security in Kenya. This study informed the government on the need to provide adequate training which would aid to empower farmers' skills and knowledge on good agricultural practices which would ultimately result in a sustainable food security nation.

PRESENTATION AND ANALYSIS OF FINDINGS

Introduction

This chapter focuses on providing the analysis and interpretation of the findings from the information that was obtained from respondents in the field. It covers the response rate, analysis of the attributes of respondents, descriptive statistics guided by means and standard deviations. Results from correlation and regression analysis are also presented besides a discussion of the findings. Key observations were that while there were slight social-economic effects that were associated with agricultural input subsidy program, fertilizer subsidies and raining conducted among poor households residing in Meru County on the use of agricultural input subsidy program subsidies were all in place and they significantly affected food security.

Response Rate

The researcher administered 398 questionnaires to respondents out of which 291 were filled up and collected for analysis. This represented a response rate of 73% as shown in Figure 4.1.

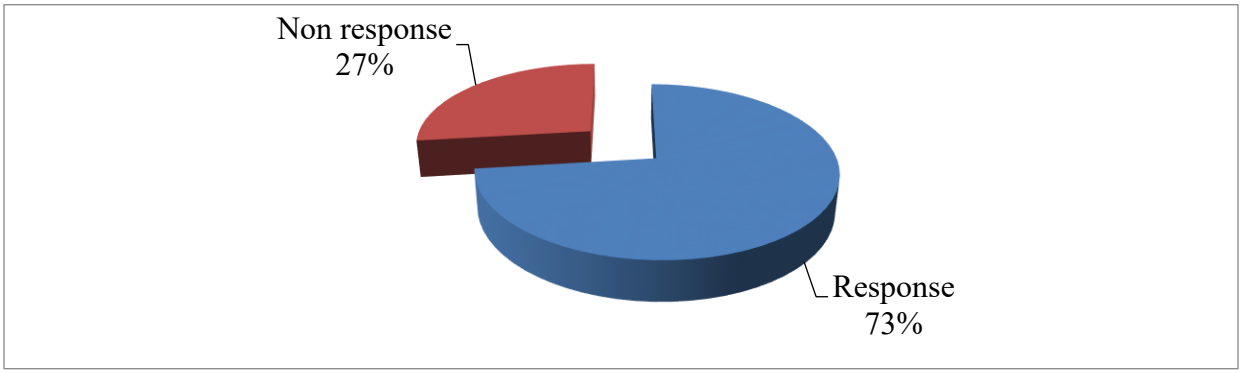


Figure 4.1: Response Rate

The response rate in Figure 4.1 agrees with Bougie and Sekaran (2019) who noted that a 70% and above response is good for supporting analysis in a survey.

Characteristics of the Respondents

To have a clear understanding of the respondents and their characteristics, the researcher has analyzed the feedback received in the subsequent sections. The factors of consideration based on the respondents Gender, Level of education, Length of residence in Meru County and Sources of Income.

Gender Distribution of Respondents

Figure 4.2 is a summary of distribution of respondents based on their gender categories.

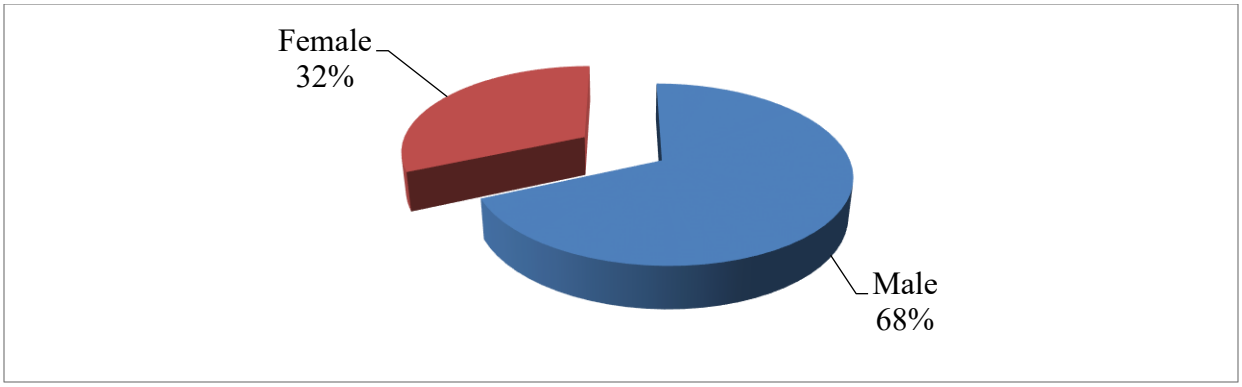


Figure 4.2: Gender Distribution of Respondents

From Figure 4.2, while 68% of respondents were males while 32% were female. This means that there was gender inclusivity in the study implying that representative information was sought from respondents on dynamic impact of the government agricultural input subsidy programs and food security.

Education Qualifications

Figure 4.3 is a breakdown of findings on education qualifications of the respondents.

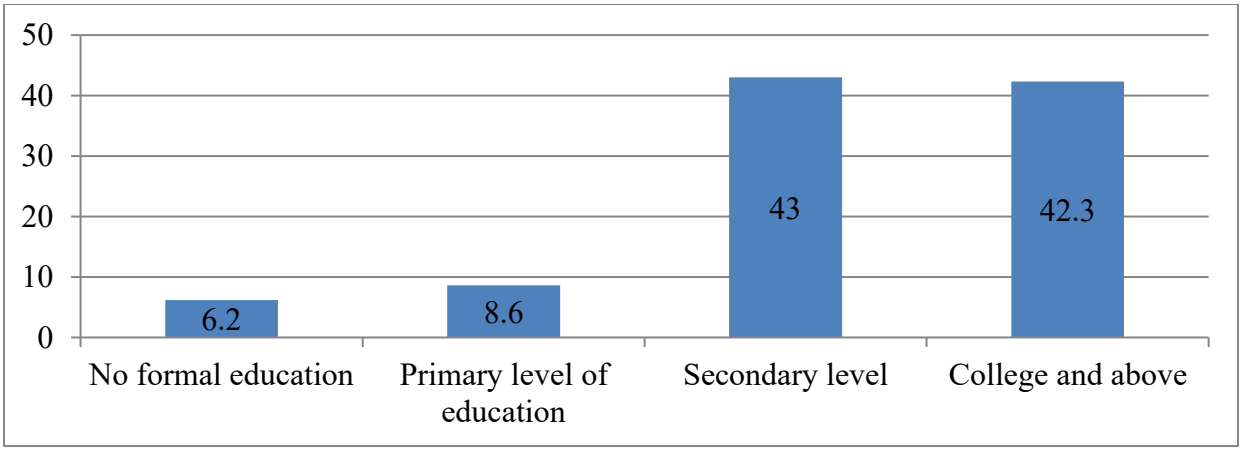


Figure 4.3: Education Qualifications

Figure 4.3 show that while 43% of respondents had attained a secondary level education, 6.2% had no formal education. This finding was anticipated given the rural contextual setting that the study was conducted. It however provides a strong indication that participants could read and

interpret the questionnaire on the government agricultural input subsidy programs and food security that were central themes in the present study.

Length of Residence in Meru County

Figure 4.4 is a breakdown of the results on length of residence in Meru County by the respondents.

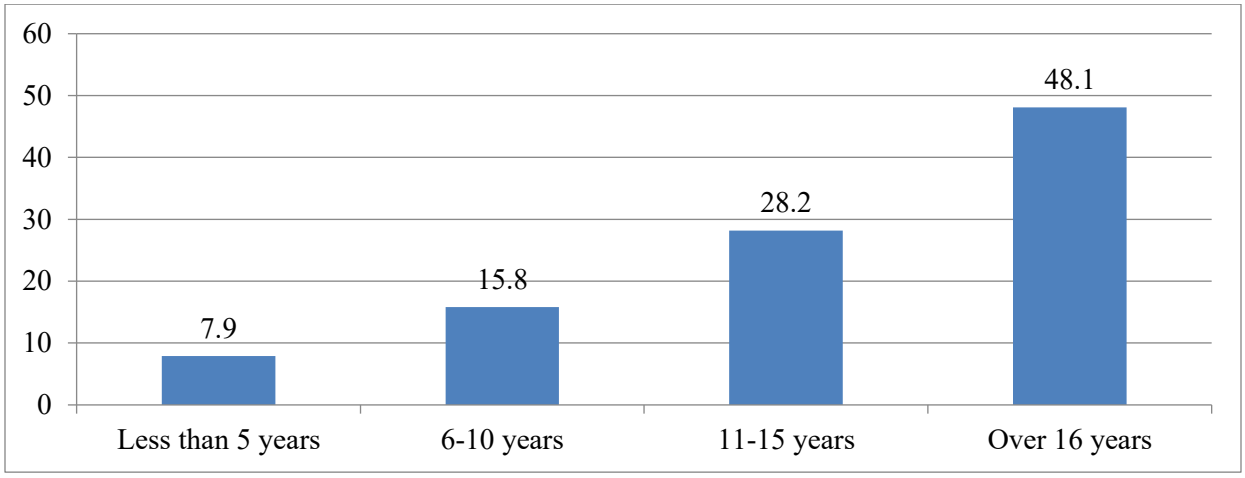


Figure 4.4: Length of Residence in Meru County

While 48.1% of participants in the study had stayed in Meru County for over 16 years, 7.8% had lived there for less than 5 years. This infers that respondents who took part had resided in the contextual County for long period and thus they were expected to possess critical information on government agricultural input subsidy programs and food security that the present study sought to establish.

Source of Income

The findings on sources of income of the respondents were determined and summarized as shown in Figure 4.5.

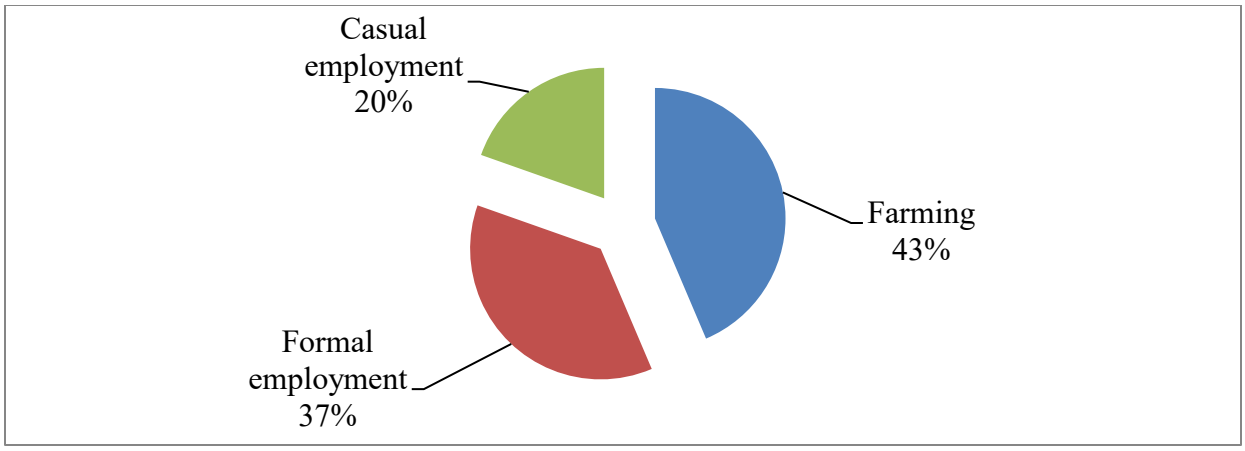


Figure 4.5: Source of Income

Figure 4.5 shows that while 43% of the respondents' source of income is farming, 20% depended on casual employment. Given that the majority of the respondents derived their livelihoods from farming, it was imperative to have an evaluation of the effect of government agricultural input subsidy programs on their farming activities as covered by the present study.

Presentation and Interpretation of Research Analysis and Findings

In this section, the focus is on presenting the analysis with interpretations based on mean and standard deviation, correlation, and regression analysis. The key findings in this section is that while, there were slight social-economic effects that were associated with the agricultural input subsidy program among poor households residing in Meru County, Kenya (M=3.52, SD=0.798)), fertilizer subsidies (M=3.77, SD=0.824) and training of farmers on the use of agricultural input subsidy program subsidies were all in place among poor households residing in Meru County (M=3.66, SD=0.777). Diagnostic tests provided an indication that the data did not violate assumptions of regression analysis. Linear regression results showed that all the variables were significant

Diagnostic Tests

In order to validate the assumptions of regression analysis, it was imperative to conduct diagnostic tests. In this regard, the study conducted normality, multicolinearity and Heteroscedasticity Test. A discussion of these tests is set out in the subsequent sections.

Multicollinearity Test

A data is said to exhibit multicolinearity when at least one of its independent variable is highly related with another variable (Strijker, Bosworth & Bouter, 2020). This situation is not desirable and it would not be possible to proceed with regression analysis when the assumption is evident in the sampler data. Whenever this condition has been detected, efforts should be made to treat the sample data through log transformation and dropping of the highly correlated independent variables (Dźwigoł, 2019). Although there exists several methods and techniques that can be adopted to detect this condition, the use of Variance of Inflation Factors (VIF) remains the widely adopted and documented methods. In this regard therefore, the values of VIF were computed through SPSS version 24. As indicated by Eden and Nielsen (2020), such VIF values within range if 1-10 provide an indication of absence of this assumption. Table 4.1 is a breakdown of the findings.

Table 4.1: Multicollinearity Test

	Collinearity Statistics	
	Tolerance	**VIF**
Social-Economic effects	.744	1.345
Fertilizer Subsidies	.633	1.579
Training of Farmers	.499	2.003
Mean VIF	**.625**	**1.642**

Table 4.1 gives the mean VIF value as 1.642. This value fits within the range of 1-10 as required by Eden and Nielsen (2020), providing an indication of absence of multicolinearity condiction in the sample data that was gathered and analyzed in this study.

Normality Test

Regression analysis is only performed on a sample data that has attributes of a normal distribution. Violation of this assumption makes it hard for regression analysis to proceed and there would be need to treat that sample data first (Kara, 2020). As earlier pointed out, the best way to treat sample data that has violated any of these assumptions of regression include log transformation or rearranging of the transformed variables (Fellows & Liu, 2021). In this study, a normality test was done through the use of values of Skewness and Kurtosis. The interpretation of the resultant values of Skewness and Kurtosis was done taking into account the range of +/-3 as proposed by Thanem and Knights (2019). Table 4.3 is a breakdown of the findings.

Table 4.2: Normality Test

	n	Skewness		Kurtosis	
	Statistic	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**
Social-Economic effects	63	-1.089	.302	.555	.595
Fertilizer Subsidies	63	-.161	.302	2.593	.595
Training of Farmers	63	.579	.302	.370	.595
Food security	63	-.835	.302	.674	.595
Average	**63**	**-0.377**	**0.302**	**1.048**	**0.595**

Table 4.2 gives average values of Skewness and Kurtosis was -0.377 and 1.048 respectively. These values fit within the established threshold of +/-3 as recommended by Thanem and Knights (2019), implying that the sample data used in this was normally distributed.

Heteroscedasticity Test

There are some incidences when there is either equal or unequal variance which describes either presence of Heteroscedasticity or Homoscedasticity in the sample data. When a test has been conducted and presence of Heteroscedasticity identified, it would not be ethical to proceed with regression analysis unless the situation has been rectified (Ghauri, Grønhaug & Strange, 2020). While Heteroscedasticity is undesirable condition, its opposite which is desirable is Homoscedasticity. Heteroscedasticity Test was determined through Levene test and the use of Scatter Plots. When interpreting Levene test results, consideration and attention is paid on p-values. In this regard, p values less than 0.05 point out absence of this assumption (Rose, McKinley & Baffoe-Djan, 2019). For scatter plot, a keen eye is needed to determine where any observable pattern in the distribution of the data point is. If this is observed, presence of Heteroscedasticity in the sample data would be inferred (McKinley & Rose, 2019). Table 4.3 is an overview of the findings.

Table 4.3: Heteroscedasticity Test

	Levene Statistic	df1	df2	Sig.
Social-Economic effects	12.069	6	56	.345
Fertilizer Subsidies	15.154	6	56	.543
Training of Farmers	18.141	6	56	.332
Average	**15.121**	**6**	**56**	**0.407**

The findings in Table 4.3 gives an average p-value as 0.407, which is greater than 0.05. This concurs with Rose, McKinley and Baffoe-Djan (2019) who argued that such p-values under this

test above 0.05 lead to assumption of presence of Homoscedasticity which is desirable. The findings in Table 4.3 are further summarized in the scatter plot below in Figure 4.6 below.

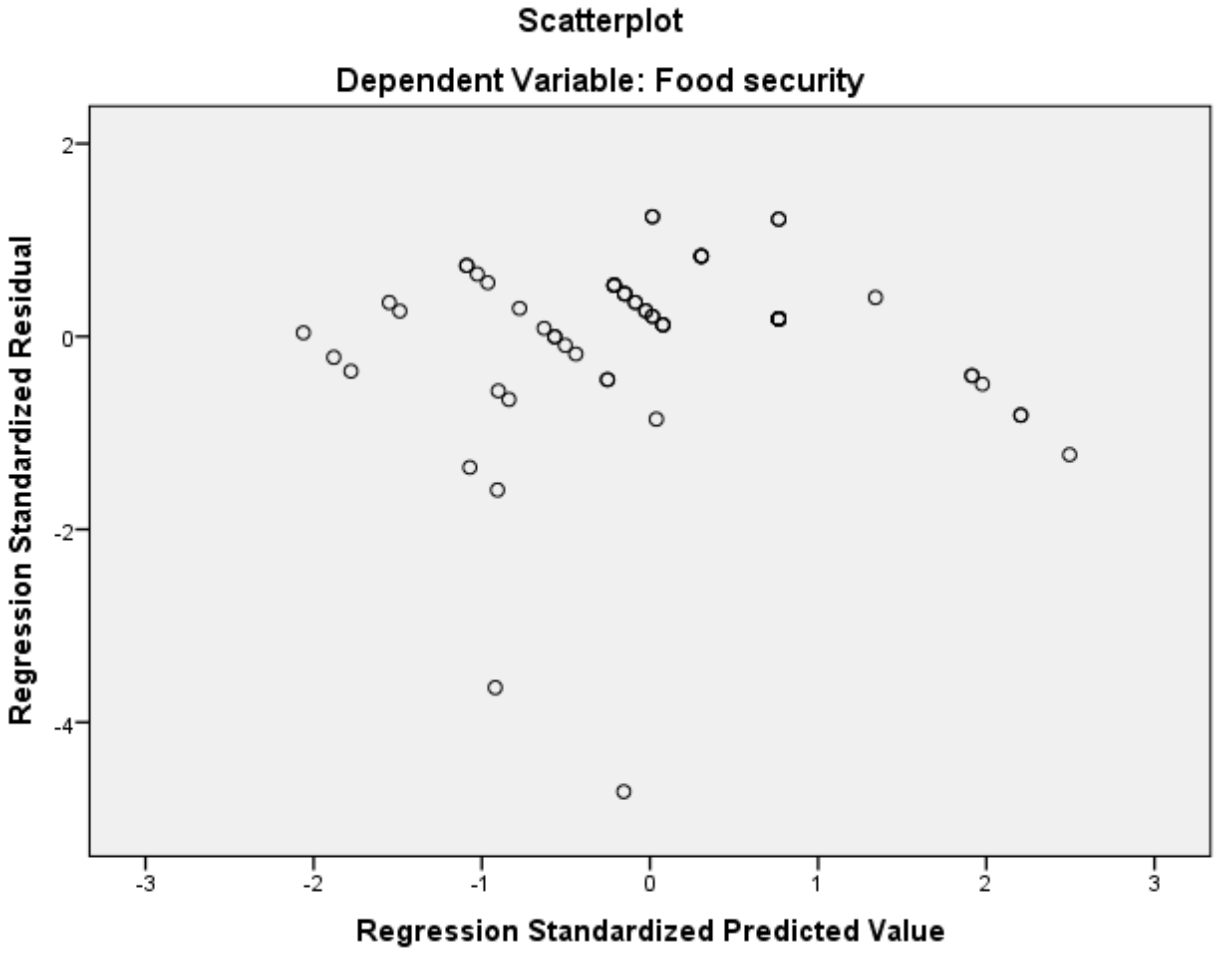


Figure 4. 6: Scatter Plot

With no clearly established pattern in Figure 4.6 and as recommended by McKinley and Rose (2019), presence of normality in the data used in this study was inferred.

Social-Economic effects of the Agricultural Input Subsidy Program and Food Security

The first objective of the study was on establishing the effect of social-economic effects of the agricultural input subsidy program and food security. In achieving this objective, it was imperative to compute values of means and standard deviations as well as linear regression analysis. A

presentation and interpretation of the outputs from the aforementioned statistics is set out in the subsequent sections.

Descriptive Statistics on Social-Economic effects of the Agricultural Input Subsidy Program

Means and standard deviations were generated on the objective variables of the study and presented as indicated in the subsequent sections. Table 4.4 is a summary of the descriptive statistics on social-economic effects of the agricultural input subsidy program.

Table 4.4: Social-Economic effects of the Agricultural Input Subsidy Program

Statements on social economic impact	Mean	Std. Dev
The agricultural input subsidy program has resulted into sustainable food among poor households residing in Meru County	3.39	0.727
I generate sustainable income from farming activities after rolling out the agricultural input subsidy program	3.62	0.754
The agricultural input subsidy program has improved my livelihood	3.51	0.815
There is long term food security after rolling out the agricultural input subsidy program	3.57	0.897
Average	**3.52**	**0.798**

Table 4.4 gives the overall statistic as (M=3.52, SD=0.798), this means that there were slight social-economic effects that were associated with the agricultural input subsidy program among poor households residing in Meru County, Kenya. It then follows that there was limited socio-economic spillover effect arising from agricultural input subsidy program as far as the poor households in Kenya were concerned. This creates the need for the government to ensure that the program is carefully reviewed so that it is able to meet the socio-economic needs of the beneficiaries.

Respondents were in agreement that the agricultural input subsidy program allowed farmers to generate sustainable income from their farming activities (M=3.62, SD=0.754). This means that the program contributed towards improved livelihood of farmers who were the most beneficiaries.

Sustainable income is an important construct that is well aligned with the global efforts of realization of sustainable development goals (SDGs). By sustainable income, it represents an inflow that has a long term orientation implying that it is not easy to get depleted. This in turn contributed to the general wellbeing of most of the farmers who benefited from the agricultural input subsidy program in Kenya and more specifically in Meru County.

The study observed that the agricultural input subsidy program ensured long term food security (M=3.57, SD=0.897) as well as improved livelihoods of farmers (M=3.51, SD=0.815). Given the fact that these two items were averagely rated, it implies that the agricultural input subsidy program has not done much to contribute towards food security and in as much it led to generation of stable income among farmers. Depending on cost of living and general financial literacy of an individual, generating stable income may not necessary lead to improved livelihood and this could be the possible explanation of why these items were lowly rated by respondents compared to the earlier one of generation of sustainable incomes from farming activities due to the agricultural input subsidy program.

Linear Regression Results Linking Social-Economic effects of the Agricultural Input

Drawing of inferences on how social-economic effects of the agricultural input subsidy program affected food security were not possible without incorporating linear regression analysis. Table 4.5 is a breakdown of the findings of linear regression analysis linking social-economic effects of the agricultural input subsidy program and food security.

Table 4.5: Linear Regression Results Linking Social-Economic effects of the Agricultural Input

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	7.581	1.785		4.248	.000
Social-Economic effects	.324	.124	.225	2.613	.016
R=.225	R^2=.051	Adj. R^2=.035			

The following is the predicted model:

Y=7.581**+0.**324**X_1+ε……. (i)**

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_1 is Coefficient

ε = error term

X_1= social-economic effects

The findings in Table 4.5 indicate that 5.1% change in food security among poor households in Meru County in Kenya is as a result of variation in social-economic impacts. At 5%, social economic effects had p-value as 0.016 which is lower than 0.05 hence the variable was significant. The finding agree with Wang, Manjur, Kim and Lee (2019) who did an assessment of socio-economic implications of agriculture related subsidies taking a case of Bhutan. The study noted that above nighty per cent of the studied households got at least one kind of subsidy except from piglets, and machineries that contributed towards an increase in food security.

Fertilizer Subsidies and Food Security

The second objective that guided the study was establishing the effect of fertilizer subsidies and food security. Achieving this objective was done through use of means and standard deviation as descriptive and linear regression analysis and the summary presented in subsequent sections.

Descriptive Statistics on Fertilizer Subsidies

The findings on fertilizer subsidies were established and summarized as shown in Table 4.6.

Table 4.6: Fertilizer Subsidies

Statements on fertilizer subsidy	Mean	Std. Dev
The fertilizer subsidy I receive has improved the quality of my land	3.76	0.709
Improvement in quality of land after fertilizer subsidy has increase the quantity of yields, I harvest	3.65	0.843
The fertilizer subsidy has motivated me to maximize the use of land	3.76	0.903
There has been an improvement in management of land my land in order to receive more fertilizer subsidies	3.89	0.841
Average	**3.77**	**0.824**

The value of average from Table 4.6 is (M=3.77, SD=0.824), this implies that fertilizer subsidies were in place among poor households residing in Meru County, Kenya. This therefore implies that fertilizer subsidy is a component of agricultural input subsidy program that poor households residing in Meru County were enjoying. This shows that the National Government of Kenya in collaboration with the County Government of Meru provided fertilizer subsidies. Leveraging this observation, the inferential statistics were adopted covering regression analysis to establish how these fertilizer subsidies affected food security taking a case of Meru County. Subsidizing fertilizers make them affordable to farmers which may increase their uptake in their farming undertakings.

It was shown that these fertilizer subsidies contributed towards an improvement in management of land (M=3.89, SD=0.841). Effective management of land is an important practice that contributes to overall productivity and yield of food. Fertilizer improves the nutritional content of land and this could be the possible explanation of why it led to improved management of land by farmers who benefited from the fertilizer subsidies. Overall yields from farming activities is strongly influenced by the amount and varieties of fertilizers used. When subsidies are provided

on fertilizers, farmers may find it affordable to use various types of fertilizer at relevant intervals to maximize the yield from their farming activities.

The findings were that farmers were motivated for maximize utilization of their land (M=3.76, SD=0.903). Maximum utilization of land entails cultivation of different crops at a single point. This motivation is influenced by the fact that such farmers could now afford fertilizer to support their farming operations and activities. Depending on rainfall patterns, there are two major planting seasons in most parts in Kenya, around April and around August every year. Maximum utilization of land in consideration of the two aforementioned planting and in light of fertilizer subsidy implies that farmers would find it easy to carry out farming activities across the two seasons since they can afford the prices of fertilizers.

It was shown that there was an improvement in quality of land (M=3.76, SD=0.709). Quality of land reflects the nutritional content in terms of nitrogen, potassium and calcium among other important fertility components. It reflects the fertility status of land. Fertile land is said to be one with high level of quality and it is strongly associated with high yields. Infertile lands are associated with poor yields and it could be the reason for food insecurity. Thus, food security improves with an improvement in the quality of land which in turn is influenced by the amount of fertilizer used. This means that provision of fertilizer subsidy has an influence on food security through improved land quality that in turn increases the amount of yields by farmers.

The study noted that there was an improvement in quantity of harvest (M=3.65, SD=0.843). This observation was expected given the fact that quantity of harvest by farmers is strongly influenced by the amount of fertilizer used by farmers. On the other hand, the price of fertilizer influenced the quantity that farmers can afford. Thus, when subsidies are provided on fertilizer, the price

drops and this becomes affordable among farmers. This increase the purchasing power of farmers leading to an increased uptake which contribute to increased quantity of harvest as established in this study. The increased quantity of harvest in turn contributes towards food security and overall improvement in livelihood of farmers. This improvement in food security in turn contributes towards overall productivity of farmers since they have something to eat to get energy for national development and growth.

Linear Regression Results Linking Fertilizer Subsidies and Food Security

The findings of linear regression analysis on fertilizer subsidies and food security were determined and summarized as shown in Table 4.7.

Table 4.7: Linear Regression Results Linking Fertilizer Subsidies and Food Security

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	2.877	1.487		1.935	.058
Fertilizer Subsidies	.907	.098	.763	9.222	.000
R=.763	**R^2=.582**	**Adj. R^2=.575**			

The predicted model from Table 4.7 becomes:

$Y=2.877+0.907X_2+\varepsilon$……. (ii)

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_2 is Coefficient

ε = error term

X_2= fertilizer subsidies

The findings in Table 4.7 show that 58.2% change in food security is due to variation in fertilizer subsidies. At 5%, fertilizer subsidies had p-value as 0.000 that is $p<0.05$ hence it had significant

effect on food security. This finding agree with The finding further agrees with Mkwara and Marsh (2011) who did an analysis of subsidies to maize farmers and the implication on food security in Malawi and noted from analysis that food security has direct implication on fertilizer subsidies. Similarly, Mulupi et al. (2021) conducted an analysis of fertilizer subsidy program as a strategy that can be embraced to counter low productivity of maize in Kakamega in Kenya where it emerged from analysis that productivity of maize was significantly shaped by the level of participation in subsidy program that was estimated at five per cent.

Training of Farmers on the Use of Agricultural Input Subsidy Program Subsidies and Food Security

The last objective aimed to determining the effect of training of farmers on the use of agricultural input subsidy program subsidies. This section details the findings on descriptive statistics and linear regression analysis.

Descriptive Statistics on Training of Farmers on the Use of Agricultural Input Subsidy Program Subsidies

Table 4.8 provides an overview of results of descriptive statistics on training of farmers on the use of agricultural input subsidy program subsidies.

Table 4.8: Training of Farmers on the Use of Agricultural Input Subsidy Program

Statements on training farmers on subsidy use	Mean	Std. Dev
I receive formal training on use of the agriculture subsidies	3.99	0.605
I receive online training on use of the agriculture subsidies	3.04	1.093
I receive training subsidy use two times per year	3.97	0.735
Training on subsidy use is always available to me	3.63	0.674
Average	**3.66**	**0.777**

Table 4.8 gives an average value as (M=3.66, SD=0.777), this means that training was being conducted among poor households residing in Meru County on use of agricultural input subsidy

program. Training farmers on use of agricultural input subsidy program is an important undertaking that generally contributes to their knowledge and skills as well as improving their attitude towards such programs. Overtime, this contributes towards increased uptake of the program.

Respondents shared that they received formal training on use of Agricultural Input Subsidy Program (M=3.99, SD=0.605). Formalization of training of farmers plays an important step in mastery of the key concepts being delivered by the trainers to trainees. Forma training implies that the same is well structured with clear logistical arrangements. This improves the learning experiences of farmers who attended such trainings on the use of Agricultural Input Subsidy Program.

The findings showed that training was provided to farmers two times per year (M=3.97, SD=0.735) and that the same was always available (M=3.63, SD=0.674). However, further considerations should be made by concerned stakeholders to increase the frequency of training on use of Agricultural Input Subsidy Program that is provided to farmers in Meru. Twice in a year is not enough and this is an important area that requires improvement.

Linear Regression Analysis on Training of Farmers on the Use of Agricultural Input Subsidy Program Subsidies and Food Security

The findings on linear regression analysis on training of farmers on the use of agricultural input subsidy program subsidies and food security were determined and summarized as shown in Table 4.9.

Table 4.9: Linear Regression Analysis on Training of Farmers on the Use of Agricultural Input Subsidy Program and Food Security

	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	1.164	1.286		.906	.369
Training of Farmers	.653	.087	.694	7.530	.000
R=.694	**R^2=.482**	**Adj. R^2=.473**			

Table 4.9 is a breakdown of the model fitting:

$Y=1.164+0.653X_2+\varepsilon$……. ……..(iii)

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_3 is Coefficient

ε = error term

X_3= training of farmers on the use of agricultural input subsidy program subsidies

The findings in Table 4.9 show that 48.2% change in food security among poor households in Meru County is as a result of training of farmers on use of Agricultural Input Subsidy Program. The study noted that training of farmers on the use of agricultural input subsidy program had significant effect on food security ($p<0.05$). The finding agrees with Leuveld, Nillesen, Pieters, Ross, Voors and Sonne (2016) who pointed out that extension and knowledge of farmers are directly connected with each other. Ragasa and Mazunda (2018) noted that provision of overall outreach is not adequate, there is need to increase effectiveness of the advice that is provided to farmers and that the method used to communicate information to farmers is a key predictor of farming outcomes.

Joint Effect of agricultural input subsidy programs on the food security

The main objective of the study was to establish the effect of agricultural input subsidy programs on the food security. The findings were determined through correlation and multiple regression analysis and presented as shown in the subsequent sections.

Correlation Results

According to Gogtay and Thatte (2017), correlation analysis is an inferential analytical method that helps establish the strength, direction and nature of relationship between study variables. Cohen, Cohen, West and Aike (2013.) provides three ranges of Pearson Correlation coefficient values (r) and how they can be interpreted as follows: 0-0.29 means weak relationship, 0.3-0.49 means moderate and 0.5-1 means strong links between variables. The relationship between government agricultural input subsidy programs and food security among poor households residing in Meru County, Kenya was explored through correlation analysis and Table 4.10 is a breakdown of the findings.

Table 4.10: Correlation Results

		Food security	Social-Economic effects	Fertilizer Subsidies	Training of Farmers
Food security	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	63			
Social-Economic effects	Pearson Correlation	.225	1		
	Sig. (2-tailed)	.016			
	N	63	63		
Fertilizer Subsidies	Pearson Correlation	.763	.196	1	
	Sig. (2-tailed)	.000	.124		
	N	63	63	63	
Training of Farmers	Pearson Correlation	.694	.492	.595	1
	Sig. (2-tailed)	.000	.000	.000	
	N	63	63	63	63

Table 4.10 shows that while fertilizer subsidies (r=0.763) and training of farmers (r=0.694) had a strong and positive relationship with food security among poor households residing in Meru County, Kenya, social-economic effects registered weak but positive relationship (r=0.225). It can then be inferred that government agricultural input subsidy programs are positive correlates of food security among poor households residing in Meru County, Kenya.

Regression Analysis Results

The effect of independent on dependent variable is best analyzed through regression analysis (Senthilnathan, 2019). Regression is an important analytical method that generates probability values which when appropriately interpreted at a set level of significance like 5% can help in testing of hypotheses (Sarstedt, Mooi, Sarstedt & Mooi, 2019). Against this background, regression analysis was conducted between government agricultural input subsidy programs and food security among poor households residing in Meru County, Kenya and two outputs being model summary and the table with coefficients and p-values were generated and summarized. Table 4.11 is the model summary of the study.

Table 4.11: Beta Coefficients and Significance

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	3.305	1.559		2.120	.038
Social-Economic effects	.186	.086	.086	2.163	.020
Fertilizer Subsidies	.629	.111	.529	5.691	.000
Training of Farmers	.397	.099	.421	4.025	.000
R=.823[a]	**R^2=.677**	**Adj. R^2=.661**			

From Table 4.11, the following model is fitted linking government agricultural input subsidy programs and food security:

$Y=3.305+0.186X_1+0.629X_2+0.397X_3+\varepsilon$……. (iv)

Where Y= food security of Kenya's poor households residing in Meru County

B_0 = Constant

β_1, β_2, and β_3 are Coefficients

ε = error term

X_1= social-economic effects

X_2= fertilizer subsidies

X_3= training of farmers on the use of agricultural input subsidy program subsidies

Table 4.5 gives R Square value as 0.677. As observed by Chatterjee and Simonoff (2013), such values above 0.5 provide evidence of the overall fitness of the model adopted for analysis. It then follows on this assertion that there was fineness in the regression model that was embraced for analysis. Table 4.5 further report that 66.1% variation in food security among poor households residing in Meru County, Kenya is explained by government agricultural input subsidy programs (Adj. R^2=0.661). The findings on beta coefficients and significance are summarized in Table 4.6.

Based on beta coefficients, the study established that fertilizer subsidies (β=0.629) had greatest effect on food security of Kenya's poor households residing in Meru County followed by training of farmers (β=0.397) and lastly social-economic effects (β=0.186) respectively. At 5%, social-economic effects, fertilizer subsidies and training of farmers were all found to have significant effect on food security of Kenya's poor households residing in Meru County ($p<0.05$). Therefore, government agricultural input subsidy programs are significant predictors of food security.

Discussion

There were slight social-economic effects that were associated with agricultural input subsidy program among poor households residing in Meru County, Kenya. The finding agree with a study conducted by (Wang *et al.*, 2019) in Bhutan aiming to assess the social-economic impact of

agricultural subsidies among farmers revealed that farmers who were beneficiaries of agricultural subsidies such as poultry and seed products led to an improved income level which resulted in a reduction of poverty magnitude. Social-economic effects registered a weak but positive relationship (r=0.225) with food security among poor households residing in Meru County. Social-economic effects had a significant effect on food security among poor households residing in Meru County. The result agree with Wang et al., (2019) who noted that provision of jersey cows not only led to an improved livelihood but also led to an increased production of biogas which was made more available among poor households. At the same time, Solaymani, Aghamohammadi, Falahati, Sharafi and Kari (2019) conducted an analysis of food security and its implication on socio-economic issues of agriculture subsidies and the analysis showed that policies to remove agriculture subsidies by the government had negative socio-economic implication on the growth of Malaysia as a country. Wang, Manjur, Kim and Lee (2019) did an assessment of socio-economic implications of agriculture related subsidies taking a case of Bhutan. The study noted that above nighty per cent of the studied households got at least one kind of subsidy except from piglets, and machineries. The study further noted that population from non-poor families had more access to subsidies as compared to those from poor backgrounds.

Fertilizer subsidies were in place among poor households residing in Meru County, Kenya. Fertilizer subsidies (r=0.763) had strong and positive relationship with food security among poor households residing in Meru County, Kenya. Fertilizer subsidies have significantly contributed towards food security among poor households residing in Meru County. The finding disagrees with Morris et al. (2007) who that fertilizer applications to be unprofitable in several African regions due to huge costs, including transportation. However, experimental evidence in Kenya by Kremer and Robinson (2009) shows that providing small, time-limited fertilizer subsidies at

harvest increases fertilizer usage in the following season. The finding further agrees with Mkwara and Marsh (2011) did an analysis of subsidies to maize farmers and the implication on food security in Malawi and noted from analysis that food security has direct implication on fertilizer subsidies. Robert and Nie (2015) conducted an investigation on fertilizer subsidy program and its implication on vulnerable population where results were that provision of fertilizer subsidies improved income of the vulnerable population. Mulupi, Sibiko and Mose (2021) conducted an analysis of fertilizer subsidy program as a strategy that can be embraced to counter low productivity of maize in Kakamega in Kenya where it emerged from analysis that productivity of maize was significantly shaped by the level of participation in subsidy program that was estimated at five per cent.

Training was being conducted among poor households residing in Meru County on the use of agricultural input subsidy program subsidies. The finding disagrees with Anderson and Feder (2004) who established that Kenya witnessed a significant decline in extension services, from 58% in 1992 to 30% in 2002 for maize growers. Training of farmers (r=0.694) had strong and positive relationship with food security among poor households residing in Meru County, Kenya. Training of farmers is significantly linked with food security among poor households residing in Meru County. The finding disagree with Anderson and Feder (2004) who observed that rigorous evaluation of the influence of the training and visit approach in Kenya shows discouraging results. Similarly, Leuveld, Nillesen, Pieters, Ross, Voors and Sonne (2016) pointed out that extension and knowledge of farmers are directly connected with each other. Ragasa and Mazunda (2018) noted that provision of overall outreach is not adequate, there is need to increase effectiveness of the advice that is provided to farmers and that the method used to communicate information to farmers is a key predictor of farming outcomes. Wiredu (2015) conducted an investigation in

Ghana with focus on fertilizer subsidy and its implication on productivity at firm level and food security and noted that there is need to regularly train farmers on the need to increase the adoption of fertilizers.

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The chapter details conclusion and recommendations as well as areas that require further research. This study was set out to provide an analysis of the implication of government agricultural input subsidy programs on the food security among poor households residing in Meru County, Kenya. More specifically, the focus of the study was on determination of social-economic effects of the agricultural input subsidy program, fertilizer subsidies and training of farmers on the use of agricultural input subsidy program as far as food security among poor households residing in Meru County, Kenya. The transaction cost theory and the Sustainable livelihood theory were used to provide anchorage to the study.

In total, 100,345 poor households in Meru County in Kenya were targeted from which 398 were sampled through stratified random sample. Descriptive survey was adopted and information was obtained in its primary form with aid of structured questionnaire. A total of 18 research assistants were recruited and trained on research objectives and ethical consideration then they were deployed across 9 sub-counties to aid data collection. The analysis of the gathered information was supported by Statistical Package of Social Science (SPSS) version 24 guided by means and standard deviations, correlation and regression. From the 398 questionnaires that were administered, 291 were dully filled in presenting an adequate response rate that guided this analysis. Key observations from the analysis were that while there were slight social-economic effects that were associated with agricultural input subsidy program, fertilizer subsidies and raining conducted among poor households residing in Meru County on the use of agricultural input subsidy program subsidies were all in place and they significantly affected food security.

Conclusions

There were slight social-economic effects that were associated with agricultural input subsidy program among poor households residing in Meru County, Kenya. Social-economic effects registered weak but positive relationship with food security among poor households residing in Meru County. Social-economic effects had significant effect on food security among poor households residing in Meru County.

Fertilizer subsidies were in place among poor households residing in Meru County, Kenya. Fertilizer subsidies had strong and positive relationship with food security among poor households residing in Meru County, Kenya. Fertilizer subsidies have significantly contributed towards food security among poor households residing in Meru County.

Training was being conducted among poor households residing in Meru County on use of agricultural input subsidy program subsidies. Training of farmers had strong and positive relationship with food security among poor households residing in Meru County, Kenya. Training of farmers is significantly linked with food security among poor households residing in Meru County.

Recommendations

Based on the established findings, the study suggests the following recommendations:

i. There is need for both the national and the county government in Kenya to invest in regular monitoring and review of the agricultural input subsidy programs with emphasis on relevance and impact.
ii. More efforts need to be made to increase training of farmers on subsidies by increasing the frequency which the same is conducted

iii. The implementation mechanisms of fertilizer subsidy programs should be evaluated to ensure that desired beneficiaries are the one benefiting from the same. This will call for a review of the mechanisms that are used to distribute fertilizer to farmers

iv. In order to complement sustainability efforts, the government of Kenya should encourage and support the adoption of natural as opposed to artificial fertilizers among farmers. This can be done by providing more subsidies on naturally created fertilizers as opposed to the artificially generated ones

Limitations of the Study

This study was limited to only one county which was Meru. In Kenya, there are 47 counties. This is a limitation since findings from only county cannot be used as a basis for generalization to the rest of the counties in the country at large. Another limitation presented by this study is that it exclusively relied on information that was gathered supported by questionnaire. It implies that similar inquiries conducted using a different approach of information gathering may yield inconsistent findings. Time was another limitation that was encountered by this study. Basically, the geographical scope was the entire County of Meru and it could not have been possible to obtain information from 398 respondents with the aid of the research assistants. If additional time could have been allocated, more participants could have been include to generate a more robust analysis.

Unique Contribution of the Study

The subsequent sections detail the contribution of the study to knowledge and the existing theories.

Contribution of the Study to body of Knowledge

The study has contributed towards an understanding that government agricultural input subsidy programs play an instrumental role in solving food insecurity concerns and particularly among

poor households. In particular, it was evident that providing fertilizer subsidies is an important undertaking that make this commodity affordable particularly to poor households and this in turn contributes to the increase in yields from their farming activities. The study has further contributed towards an understanding the provision of training on use of government agricultural input subsidies among poor households is an important initiative that allow them to increase their yields which in turn leads to an improvement in food security. It has emerged from the study that government agricultural input subsidy programs provided to farmers in Meru County in Kenya has resulted into average socio-economic impacts. Surprisingly, although this program has allowed the poor farmers in Meru County to generate sustainable income, it has only moderately contributed towards livelihoods of these farmers. This could possibly be explained by the increase in cost of living as well as low financial literacy skills that concerned stakeholders should take steps to solve.

Theoretical Contribution of the Study

This study has contributed to the views of sustainable livelihood approach theory by recognizing that provision of government agricultural input subsidy programs provided to farmers in Meru County in Kenya allowed them to generate sustainable incomes even when the same did not contribute towards an improvement in their livelihoods so much. By sustainable income, it implies that even when the inflows from farming activities of these farmers were limited, they had assurance of generating the same even in future without doubts that the same may be evident in future.

Personal Reflection

Embarking on this research was one of the amazing endeavors. The whole process equipped me with writing skills including the ability to cite and reference the information that I reviewed. It helped me to understand that by doing so, I was avoiding possibility of plagiarism that was an

illegal practice that could attract litigation. I gained knowledge on data collection and data analysis that I did not have previously. If I was to carry out this research for another time, I would incorporate secondary data alongside primary data to support robust analysis.

Areas of Further Research

In the present study, 66.1% variation in food security among poor households residing in Meru County, Kenya was found to be explained by government agricultural input subsidy programs (Adj. R^2=0.661). This implies that there are still other issues that were not addressed by this study which also have an effect on food security and thus further research should seek to establish them.

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APPENDICES

INTODUCTION LETTER.

Dear Respondent,

I hope that this letter finds you well.

My name is Linda Kendi Kiara, a master's student at Griffith College and a resident of Meru County. As such I am conducting a study on the impact of Agricultural input subsidy programs on the food security of poor households residing in Meru County, Kenya.

I am reaching out to you to because your valuable insights, knowledge, and first-hand experience on the status of food security of poor households residing in the county is crucial to the success of this research outcome. I therefore kindly request your voluntary participation in completing the attached questionnaire. Your participation will be of utmost importance as it will provide valuable data for this study. Rest assured that your responses will not only remain anonymous but also confidential. The data collected will be used solely for this research and will be reported anonymously ensuring your privacy. Thereafter the same will be destroyed Five years from the day of the primary data collection.

It will take you roughly 10mins to complete the attached questionnaire. Please note that your participation is entirely voluntary, and you have the right to withdraw at any time without providing a reason. By completing the questionnaire, you confirm your informed consent to participate in this study.

If you have any questions and or require further clarifications before proceeding, please do not hesitate to reach out to me on +2547 13 520 211. I am more than happy to help and offer any additional information you may need. Your contribution to this research will significantly enhance our understanding of the impact of these subsidies.

The findings from this study will help Inform policies and practice and hence promoting sustainable equitable development in the Agricultural sector.

Thank you very much for considering this request and for your valuable time and co-operation. Your involvement in this study is highly appreciated. I am grateful for your support. Together we will make Meru County A HOME OF SURPLUS.

Regards
Kendi.

Appendices 1: Questionnaire

SECTION A: GENERAL INFORMATION OF RESPONDENTS

1. Kindly indicate your gender

Male ( ) Female ( )

2. Please, indicate your highest level of education

No formal education ( ) Primary level of education ( ) Secondary level ( ) College and above ( )

3. Please, how many years have been a resident of Meru County?

Less than 5 years ( ) 6-10 years ( ) 11-15 years ( ) Over 16 years ( )

4. Kindly specify your main source of income for the family

Farming ( ) Formal employment ( ) Casual employment ( )

SECTION B: AGRICULTURAL INPUT SUBSIDY PROGRAMS

5. Below are a number of statements on social economic impact, fertilizer subsidy and training farmers on subsidy use in relation to agricultural input subsidy programs in Meru County. Kindly indicate the extent of your agreement with each of these statements on a 5-point Likert scale where 1-strongly disagree, 2-disagree, 3-undecided, 4-agree and 5-strongly agree.

Statements on social economic impact	**Strongly disagree**	**disagree**	**Undecided**	**agree**	**Strongly agree**
The agricultural input subsidy program has resulted into sustainable food among poor households residing in Meru County					
I generate sustainable income from farming activities after rolling out the agricultural input subsidy program					
The agricultural input subsidy program has improved my livelihood					
There is long term food security after rolling out the agricultural input subsidy program					
Statements on fertilizer subsidy	**Strongly disagree**	**disagree**	**Undecided**	**agree**	**Strongly agree**

The fertilizer subsidy I receive has improved the quality of my land					
Improvement in quality of land after fertilizer subsidy has increase the quantity of yields I harvest					
The fertilizer subsidy has motivated me to maximize the use of land					
There has been an improvement in management of land my land in order to receive more fertilizer subsidies					
Statements on training farmers on use of agricultural input subsidy program	**Strongly disagree**	**disagree**	**Undecided**	**agree**	**Strongly agree**
I receive formal training on use of the agriculture subsidies					
I receive online training on use of the agriculture subsidies					
I receive training subsidy use two times per year					
Training on subsidy use is always available to me					

SECTION C: FOOD SECURITY

6. Below are a number of statements on food security among poor households in Meru County. Kindly indicate the extent of your agreement with each of these statements on a 5-point Likert scale where 1-strongly disagree, 2-disagree, 3-undecided, 4-agree and 5-strongly agree.

Statements on social food security	**Strongly disagree**	**disagree**	**Undecided**	**agree**	**Strongly agree**
I have adequate food to feed my family					
I afford to purchase food for my family					
There is staple food supply					

THANK YOU