IMPACT OF AGRICULTURAL SUBSIDIES TO SMALLHOLDER MAIZE FARMERS OF MBeya DISTRICT COUNCIL IN TANZANIA

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in the Graduate School of the Ohio State University

By

Christopher Lameck

Graduate Program in Agricultural and Extension Education

The Ohio State University

2016

Master's Examination Committee:

Dr. Scott Scheer, Advisor

Dr. Jerry Thomas
Abstract

Tanzania depends on agriculture for food production. It is an industry which is occupied mostly by smallholder farmers who on average cultivate less than one hectare of land. To smallholder farmers, farming is a household activity implemented at the subsistence level. The government of Tanzania launched the Subsidy Program as a bridge to shift subsistence farming to farming as a business and to promote food secure households. Food insecurity was associated by low rate of application of fertilizers and usage of improved seeds among smallholder farmers due to fertilizer and seed costs which led to an increase in food prices. These conditions were the major reasons for launching of the Subsidy Program.

This study aimed at assessing the impact of the agricultural subsidies to smallholder maize farmers. The study had four research objectives focusing agricultural productivity, food security, usage of improved inputs, and farmers’ perception on how the program functioned.

The study used an ex post facto research design to analyze 120 smallholder farmers in areas where subsidy programs operated. The investigation involved 60 smallholder farmers who received subsidies and 60 who did not. These farmers were
selected from their respective households from four different wards (i.e., 15 smallholder farmers who received subsidies and 15 smallholder farmers who did not receive subsides). Hence from each wards, 30 smallholder farmers were randomly selected to form a sample used in the study. The study used an interviewer administered questionnaire where by all participants who were asked to participate in a survey completed the study.

Most of the respondents in this study were male (71.7%), this is due to the setup of the program. The program operated by issuing subsidies to heads of households who were surveyed who were mostly male. For education level, most of them were standard seven (i.e., equivalent to grade 8 in the U.S.) and most respondents were married (87.5%).

Farmers who received subsidies significantly improved maize production. Comparison of average output before and after subsides shows an increase in number of bags (100 kg) per acre from an average of 5.35 bags to 10.10 bags (i.e., about doubled average harvest of maize). Farmers who did not receive subsides produced about the same amount of maize at time 1 and time 2. There was general satisfaction with the functioning of the program, however certain areas need to be improved and making sure the objectives of the program are followed, selecting intended farmers, making sure farmers can manage market price of inputs, and enhancing extension services that will enable farmers to produce more surplus.
Despite the contributions of the subsidy program, reaching goals of the program can be hampered by not following the guidelines for operation of the subsidy programs. Not adhering to guidelines have victimized some farmers into inability of achieving objectives of the program because they exited the program as premature graduates. Farmers who received subsidies late, incomplete package, and not receiving subsidies for three consecutive years underperformed in terms of productivity, income, and hence inability to purchase inputs at market prices.
Acknowledgments

This thesis work is a result of tireless support from my academic advisor Dr. Scott Scheer who has spent his valuable time in ensuring this whole process of completing this study is successful. It would have taken me much longer to have completed this work without his support.

I extend my sincere thanks to all my instructors in the Department of Agricultural Communication Education and Leadership at the College of Food and Environmental Sciences of the Ohio State University. I cannot mention all but I will be ungrateful not to express gratitude to Dr. Jerry Thomas of the Ohio State University and Dr. Kizito Mwajombe of Sokoine University Agriculture for serving on my academic committee.

I personally and on behalf my family, my mother, and all siblings in the Lameck’s extended family express sincere thanks to the USAID-iAGRI for funding my studies in the United States of America. I am also very grateful to my wife Salome Bryson for her support in my entire period of studies and for taking care of our daughters Yvonne and Catherine while I was busy with my studies several thousand miles from home.

Finally, I thank God for His mighty arrangement; all the stated above wouldn’t be possible if it were not for his lovingly blessing on me. God bless you all.
Vita

October 01, 1977............................................Born – Mbeya, Tanzania

2003..........................................................College Diploma, Morogoro Teachers College, Morogoro, Tanzania

2009..........................................................B.S. in Agricultural Education and Extension, Sokoine University of Agriculture, Morogoro, Tanzania

2014 to present ...........................................Graduate Student, Department of Agricultural Communication, Education, and Leadership

FIELD OF STUDY

Major Field: Agricultural and Extension Education
Table of Contents

Page

Abstract ........................................................................................................................................ ii

Acknowledgments....................................................................................................................... v

Vita.............................................................................................................................................. vi

Table of Contents........................................................................................................................ vii

List of Tables ................................................................................................................................ xii

List of Figures ............................................................................................................................... xiv

Chapter 1: Introduction.............................................................................................................. 1

Background of the Study.............................................................................................................. 1

Problem Statement ..................................................................................................................... 5

Purpose of Study ............................................................................................................................ 6

Research Questions ..................................................................................................................... 6

Significance of Study..................................................................................................................... 7

Definition of Terms...................................................................................................................... 8

Limitations and Scope of the Study............................................................................................. 9

Chapter 2: Review of the Literature.......................................................................................... 12
Farmers’ Perception on Program’s Efficacy .......................................................... 32

Instrument’s Reliability ..................................................................................... 32

Instrument’s Validity ....................................................................................... 33

Data Analysis .................................................................................................... 34

Implications of the Study ................................................................................ 36

Chapter 4: Results ............................................................................................ 37

Sample Statistics ............................................................................................... 37

Gender and age. ............................................................................................... 37

Education .......................................................................................................... 38

Marital status. ................................................................................................. 38

Sample description by subsidy category. ....................................................... 39

Seasons in program ........................................................................................ 40

Findings of Research Questions ...................................................................... 40

Research question #1: Does agricultural subsidies contribute to the smallholder
farmers’ productivity? .................................................................................. 40

Agricultural productivity of farmers between subsidy groups. ................... 40

Agricultural productivity within groups of farmers who received subsides and
farmers who did not receive subsidies. ......................................................... 41

Opinions of farmers on agriculture productivity. ....................................... 43
Improvement in agriculture productivity by surplus production. ......................... 44

Research Question #2: How does agricultural subsidies contribute to farmers’ food
security? .............................................................................................................. 46

Significance of maize in food security............................................................... 46

Contribution of input subsidy program to number of meals and its composition. 47

Research Question #3: What role does the agricultural inputs subsidy program
contribute to post-program usage of improved inputs? ................................. 48

Research Question #4: What are farmers’ perceptions on how the agricultural
subsidies program functioned? ........................................................................ 49

Improvement in agricultural activities. ............................................................ 49

Farmers’ attitude toward farming as a business.............................................. 51

Farmers’ opinions on the functioning of the subsidy program. ..................... 52

Chapter 5: Summary, Discussion, Recommendations for Future Research and
Conclusions........................................................................................................ 54

Introduction ..................................................................................................... 54

Summary of Findings ........................................................................................ 54

Question 1: Does agricultural subsidies contribute to the smallholder farmers’
productivity? ..................................................................................................... 54

Question 2: How does subsidizing agricultural inputs contribute to farmers’ food
security? ............................................................................................................ 57
Question 3: What role does the agricultural inputs subsidy program contribute to post-program usage of improved inputs? .......................................................... 58

Question 4: What are farmers’ perceptions on how the agricultural subsidies program functioned? ........................................................................................................... 59

Implications .......................................................................................................................... 63

Recommendations for Future Research ............................................................................. 68

Recommendations for Practitioners ..................................................................................... 69

Conclusions ........................................................................................................................... 70

References ............................................................................................................................. 73

Appendix A ............................................................................................................................. 80

Correspondence ..................................................................................................................... 80

Recruitment Letter ................................................................................................................ 81

Informed Consent .................................................................................................................... 82

Institutional Review Board Approval .................................................................................... 84

Appendix B ............................................................................................................................... 85

Questionnaire for farmers who received subsidies ............................................................. 86

Questionnaire for farmers who did not receive subsidies ..................................................... 93
List of Tables

Table 1. Sample distribution by gender........................................................................38
Table 2. Sample distribution by education level.............................................................38
Table 3. Sample distribution by marital status.................................................................39
Table 4. Sample distribution by gender: those who received subsidies and those who did not .................................................................................................................39
Table 5. Number of seasons that farmers received subsidies .........................................40
Table 6. Independent samples t-Test between farmer groups who received and did not receive subsidies ..........................................................................................................41
Table 7. Paired samples T Tests with farmer groups who received and did not receive subsidies..................................................................................................................42
Table 8. Farmers’ opinion on improvement of agriculture productivity .......................43
Table 9. Explanation of farmers’ opinion on agricultural productivity .........................44
Table 10. Group category: farmers who produce and sell (n=60 in each category) ............44
Table 11. Cross tabulation; farmers who produce surplus by group category...............45
Table 12. Food security based on stored maize (n=60) ..................................................46
Table 13. Farmers’ response on improvement in food security........................................46
Table 14. Number of time in a week, a household consume maize related foods per week
..............................................................................................................................................47

Table 15. Number of meals eaten per day before and after subsidy program .............. 47

Table 16. Use of inputs in 2015 and plan to use in 2016 agriculture seasons ............... 48

Table 17. Whether subsidy program have improved agricultural activities ............... 49

Table 18. Suggestions for improvement in subsidy program to improve agricultural
activities ...................................................................................................................................... 50

Table 19. Farmers’ opinions on the functioning and the impact of subsidy program ..... 51

Table 20. Farmers’ opinions on their attitude to farming as a business .................... 52

Table 21. Farmers’ opinion on the functioning of the subsidy program .................... 53
List of Figures

Figure 1. Conceptual framework ................................................................................. 24
Chapter 1: Introduction

Background of the Study

The economy of Tanzania depends heavily on agriculture, it is a backbone of the economy (URT, 2014). Currently, 27% of Gross Domestic Product (GDP) comes from agriculture (Cochrane & D'Souza, 2015). It alone provide 85% of the total exports and it employs about 80% of the work force of the rural population (Juma, 2007; URT, 2014; Cochrane & D'Souza, 2015). Those employed in agriculture are mainly smallholder farmers cultivating less than one hectare of land (Cochrane & D'Souza, 2015). Farming is a household activity implemented at the subsistence level along with other activities such as handicraft, shops, fishing, seaweed farming and tailoring (Juma, 2007).

Subsistence farming is a “mode of agriculture in which all of the food produced by a family or community farm is consumed by the family or community. No farm produce is sold for income (NWE, 2008). It is associated with poverty and probably with inability to purchase inputs. According to FAO (1996), the average rate of fertilizer application in African countries was about 20 kilograms per hectare compared to 41 kilograms in Latin America, 85 kilograms in Asia and 225 kilograms in Western Europe. To address this situation, the New Partnership for African Development (NEPAD) summit of 2006 developed the Abuja Declaration on Fertilizer Use for an African Green
Revolution. This declaration stated that all African Union (AU) member countries should increase fertilizer application rates to an average of 50 kg/ha by 2015 (Yawson, Armah, Afrifa, & Dadzie, 2010, p. 192).

According to an evaluation by Danish International Development Agency - DANIDA (2011) of Agricultural Inputs Subsidies in Sub Saharan Africa, the average fertilizer application rate by Tanzania’s farmers was 8 kilograms per hectare which was below the Sub-Saharan Africa average of 9 kilogram per hectare of arable land. It was also reported that only 5.7% of rice farmers and 0.7% of maize farmers use improved seed varieties together with fertilizers. As a result agricultural productivity is lower by international standards and relative to Tanzania’s own potential as estimated by research field tests and on-farm trials (World Bank, 2009, p. 11). The government, therefore, has argued that the best way to improve national food security in the face of higher international food prices was to promote the use of agricultural inputs to raise productivity (DANIDA, 2011). Attention to this declaration was abetted by high food, and fertilizer prices in 2007/2008. Subsequently, the Government of Tanzania launched the Agricultural Subsidies Program (DANIDA, 2011).

The main value of agricultural subsidies is their potential to result in higher incomes, reduced poverty, and improved food security for farmers and the nation. Several important objectives of agricultural subsidies are greater economic efficiency and the reallocation of income to a particular constituency (Wiggins & Brooks, 2010). Wiggins &
Brooks (2010, p.7) have identified eight economic objectives of agriculture subsidies, these are:

i. Stimulate agricultural production;

ii. Compensate for high costs of transport from port or factory to farms that raise costs of inputs;

iii. Improve soil quality and combat soil degradation (in the case of fertilizer);

iv. Offset high costs of supplying inputs when markets have low volumes and economies of scale in logistics cannot be achieved;

v. Make inputs affordable to farmers who cannot buy them, owing to poverty, lack of access to credit, and inability to insure against crop losses; and;

vi. Learning: to allow farmers to try novel inputs and become familiar with their advantages;

vii. Transfer income to farmers who are poor, live in remote disadvantaged areas, or both and;

viii. Political patronage – to win favor with voters and reward supporters.

The Government of Tanzania (GOT) has been subsidizing agricultural inputs to improve productivity among smallholder farmers since 2008/09. Subsidies are ostensibly designed to provide agricultural inputs that promote staple crops mainly maize and rice. The Mbeya region is one of the main producers of these crops. However, for the purpose
of this study, maize crop will be the major focus. The program administers subsidies to smallholder farmers through the allocation of vouchers to purchase organic fertilizers and improved seeds. Select farmers receive a subsidy to purchase 10 Kg of either hybrid or Open Pollinated Variety (OPV) seeds, and 100 Kg of fertilizers in which 50 Kg is for basal fertilizers, mainly Minjingu Rock Phosphates (MRP) or Di Ammonium Phosphates (DAP) fertilizers, and 50 Kg is for top dressing fertilizers, mainly Urea. The price of subsidized inputs is 50 percent lower than non-subsidized inputs (Druilhe & Hurlé, 2012, p. 20).

Farming households receiving the subsidy were selected by the government using the following criteria (Chibwana, Fisher, Jumbe, Masters, & Gerald, p. 8):

i. Households that owned land being cultivated during the relevant season.

ii. Household members who are bona fide resident of the particular village where the land is located.

iii. Vulnerable groups, especially households headed by women.

iv. Households that cultivated one hectare or less of maize.

v. Farmers who follow good agronomical practices.

vi. Farmers who are willing and able to co-finance the cost of inputs to meet the market price on inputs.

vii. Farmers who have not used fertilizers for more than five years.

---

¹ The study is about impact of agricultural subsidies on maize smallholder farmers.
Problem Statement

Access and use of improved varieties of agriculture inputs is one of the critical inputs to increase crop yields and improve agriculture productivity (World Bank, 2014). Barriers to access, availability, and use are key constraints to many agricultural smallholder farming households in Africa, including Tanzania. This is in part caused by reliance on imported fertilizers in many of the African countries and high costs of inputs which most farmers cannot afford. In compliance to Abuja Declaration, the Government of Tanzania decided to increase efforts on subsidizing inputs in production of staple crops by supporting smallholder farmers to purchase basal and top-dressing inorganic fertilizers and improved varieties of seeds by the use of vouchers. Subsidies were justified by being efficient in increasing the use of fertilizers to an optimal level for farmers who have limited knowledge and low ability to purchase inputs and also to transfer income to poor farming households. The aim was to increase productivity and making inputs affordable on a very large scale over longer time period (Druilhe & Hurlé, 2012). However, provision of agricultural subsidies has been facing some challenges and problems. These challenges include the cost involved, late distributions of vouchers causing farmers not to use basal fertilizers, farmers accepting small amounts of money in exchange of the vouchers instead of buying inputs, thefts of agricultural inputs vouchers, farmers resistance to use of inputs chosen by the government, and financial inabilities of some farmers to copay the price (Druilhe & Hurlé, 2012).

Recognizing these evident issues with the program, this study aims to assess the impact of agricultural subsidies on smallholder farmers, particularly with regard to
increasing productivity levels and food security. It will focus on optimal levels of fertilizer use and improved seed uptake. The study will also assess the overall impact of agricultural subsidies on smallholder farmers by specifically examining the impact of subsidies on maize productivity of smallholder farmers, levels of household food security, sustainability of fertilizer use once after a subsidy program is phased out, and farmer satisfactions with subsidy programs.

**Purpose of Study**

The purpose of the study is to assess the impact of Mbeya District Council agricultural subsidy program on smallholder farmers who participated during the program’s first three years. It is anticipated that the study will yield practice and policy recommendations that improve agricultural subsidies in Mbeya region and other regions of Tanzania that are similar to the Mbeya District Council. If these recommendations lead to improved policy and practice, they in turn should lead to improvements in farmer livelihoods, and contribute to attempts by the Tanzanian economy to achieve the economic growth of 7% per year (AU, 2006).

**Research Questions**

This study is based on four research questions which are specific to agricultural inputs subsidies program in relation to food sufficiency in Mbeya District Council. The questions are:

i. Does agricultural subsidies contribute to the smallholder farmers’ productivity?

ii. How does subsidizing agricultural inputs contribute to farmers’ food security?
iii. What role does the agricultural inputs subsidies program contribute to post-program usage of improved inputs?

iv. What are farmers’ perceptions on how the agricultural subsidies program functioned?

Significance of Study
Launching agricultural subsidies in Tanzania is a response to the Abuja Declaration on Fertilizers for an African Green Revolution of June 13, 2006 and the continuous government effort to improve the agriculture sector. The declaration was made by the New Partnership for Africa’s Development (NEPAD) in efforts to achieve the vision of economic development in Africa. To achieve the vision, it was agreed that Africa’s economic growth must be sustained at higher rates of 7% per year. Collectively, African heads of states adopted the Comprehensive African Agricultural Development Program which called for a 6% annual growth in agricultural production. However the challenge for increasing agricultural production was due to several reasons including low rate of fertilizer and improved seeds usage (AU, 2006). Addressing the fertilizer crisis, African leaders unanimously agreed to have a commitment to achieve African Green Revolution by taking immediate actions to make fertilizers available and affordable. To make that happen, the government of Tanzania has been spending heavily to improve agricultural productivity (DANIDA, 2011). It is estimated that GOT has been spending US$100 million per year for the National Agricultural Inputs Voucher Scheme. To expand subsidies in Tanzania, the World Bank offered a concessional loan of US$160 million (URT, 2014).
In Tanzania, green revolution entails transformation of agriculture from subsistence farming towards commercialization and modernization (URT, 2013). These efforts are made toward eradicating extreme poverty and hunger. Hence it was an effort toward reaching the Millennium Development Goals and also the solution to the challenge of global food crisis (URT, 2013).

In Tanzania, it is recognized that agriculture is a major source of employment to more than 80% of the rural areas. Most of these are smallholder farmers are handicapped with inability to have an access to improved inputs, and the Tanzania economy is mostly depending on. Hence it was important to give special attention to smallholder farmers who are the majority of agriculture producers (URT, 2014; AU, 2006).

**Definition of Terms**

*Agriculture input*: Refers to basal fertilizers, topdressing fertilizers, and maize seeds.

*Agriculture Sector*: Comprised of the crops, livestock, fisheries, forestry and hunting subsectors (URT, 2013). Agriculture is defined in the scope of crop production with a focus on maize production by smallholder farmers.

**Farming households**: Households owned by smallholder farmers.

**Food security**: Exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (WHO-World Food Summit of 1996).
**Improved varieties of agriculture inputs:** Refers to hybrid and open pollinated varieties of seeds and also industrial or inorganic fertilizers.

**Post-program usage of improved agriculture inputs:** Refers to the use of agricultural inputs by farmers once program has ended. Usually after a consecutive three years of support.

**Productivity of maize:** Amount of maize in tonnes produced by small holder farmer per unit area of land whereby at least three tonnes per unit area should be reached by an ordinary smallholder farmer.

**Smallholder farmers:** Farmers cultivating less than one hectare of land who are beneficiaries of the agriculture input subsidies program.

**Smallholder productivity:** The amount of farm production in tonnes per unit area of land cultivated by a smallholder farmer.

**Subsidies:** Amount of money that the government gives to farmers by a special coupon called agriculture input vouchers.

**Limitations and Scope of the Study**

Limitations are matters and occurrences that arise in a study which are out of the researcher’s control; they limit the breadth and depth to which a study can reach (Simon & Goes, 2013). This study will be conducted during the 2015 national election which will involve vibrant rallies of political campaigns. Although Mbeya region is known for
peaceful political campaigns, it is not easy to predict what the situation will be in this coming election.

Another limitation to this study is the inherent design of the research itself. Being an ex post facto research design, the study took place after the independent variable was already assigned. The researcher was bound to using independent variables which can neither be controlled nor manipulated without random assignment. Nonrandom assigned variables affect generalization issues. Therefore due to the research design employed in this study, findings cannot be generalized beyond the population of study.

As noted in the literature review, some farmers did not receive vouchers for three consecutive agricultural season as stipulated by guidelines for operation of the program. This study assessed farmers who received subsidies either in one season or in all three seasons. This led to assessing farmers who received subsidies over a potential three year period. As a result of projected sample size, the cell sizes maybe too small to assess agricultural productivity by the number of seasons that farmers participated in the subsidy program.

The scope of the study refers to the parameters under which it will be operating (Simon & Goes, 2013). This study will assess the effectiveness of the agriculture input subsidies program to farmers who have graduated from program. There are many interventions taking place to improve agriculture in Mbeya District Council. This study focused on agriculture input subsidies of maize in relation to productivity, food security,
sustainability, and the farmers ‘general welfare. This research will not go beyond examining the subsidy program, although other interventions aim at similar outcomes.
Chapter 2: Review of the Literature

Introduction
This chapter provides the background and context for the research problem. It establishes the need for this research and its importance. This section also presents the conceptual framework guiding this study, and also the implications of this study.

Agricultural Subsidies
Subsidies are assistance given by the government to farmers usually in the form of a coupon. These assistance are given to relief the burden of agricultural inputs, to elevate their abilities to purchase improved agricultural inputs. The Online Oxford Dictionary defines ‘subsidy’ as “a sum of money granted from public funds to help an industry or business keep the price of a commodity or service low”. Therefore agricultural subsidies are given to help the agriculture sector to relieve the price of agricultural inputs. Agriculture subsidies goes beyond helping the industry and keeping the price of agricultural commodities low. The US-legal website defines agricultural subsidies as the financial assistance provided by government to farmers through government-sponsored price-support programs (US Legal, 2016). Governments provides agriculture subsidies to stabilize food prices by, ensure adequate and surplus food
production, assure basic income to farmers, manage the supply of agricultural commodities, and influence the cost and supply of such commodities.

As noted earlier in Chapter 1, the aim of agriculture subsidies was to promote fertilizer applications to an optimal level. Crawford (2006) categorized the objectives of input promotion into the following five groups (p. xii)

i. **Financial**: increases in the net financial income of farmers, consumers, traders, or other participants in the agricultural economy.

ii. **Economic**: increases in real income for the economy or society overall, valuing costs and benefits in terms of opportunity cost rather than financial prices (which may be affected by taxes or subsidies), and attempting to take into account positive and negative externalities and linkage or multiplier effects.

iii. **Environmental**: contributions to environmental objectives that are difficult to express in terms of economic gains, or that are regarded as having intrinsic value.

iv. **Social**: improvements in indicators of welfare are difficult to quantify and value in monetary terms, including those that focus on the distribution of income.

v. **Political**: although the political balance is potentially affected by any change in the level or distribution of benefits as a result of government intervention, some programs may be designed deliberately (if not explicitly) to build political support by rewarding particular constituents.

**From Universal to SMART Agricultural Subsidies**

In Tanzania, like many other African and some Asian countries, the ‘universal subsidy’ was the agricultural input subsidies policy since 1967 to 1982 (URT, 2014;
Crawford, Jayne, & Kelly, 2006), it was implemented by providing ‘across the board’ price subsidies to all producers (Dorward, 2009). The subsidy program was controlled by the government and it was successful and led to increase in agricultural productivity. However there were some shortcomings, such as assisting farmers who are well-off and better connected, productivity continuously depended on the government support, and most of all it was expensive due to administrative costs, and government monopolies (DANIDA, 2011).

In Tanzania, agricultural inputs subsidies phased out gradually in 1991 and 1994, it dropped from 80% to 55% between 1990 and 1992, and then dropped to no more than 20% in 1992 (Puttermann, 1995, p. 320). The government of Tanzania resumed agricultural subsidies in 2003 with the aim of supporting technology adoption among smallholder farmers. The reason for launching inputs subsidies was due to low levels of fertilizer application which was below the Sub Sahara Africa average. These subsidies were to help reduce transport cost, whereby the government used a strategy of contracting transporters and subsidized transporting fertilizers. The system was later found to be weak in accounting for the fertilizers, debates over its cost effectiveness, debatable targeting, and distribution of benefits derived from this form of subsidy (URT, 2012; URT, 2014).

In 2007, SMART subsidies named as National Agricultural Input Voucher Scheme (NAIVS) was launched to take over the halted transport subsidy, NAIVS used the strategy of ‘vouchers’ which was aiming at elevating the purchasing power of
smallholder farmers (URT, 2014). The word ‘SMART’ in the phrase ‘SMART Subsidies’ has been used as an acronym to mean Specific, Measurable, Achievable, Results, and Time. SMART is explained as follows:

“All specific targeting to farmers who would not otherwise use purchased inputs (or to areas where added fertilizer can contribute most to yield improvement), Measurable impacts, achievable goals, a Results oriented, and a Timely duration of implementation, i.e., being time-bound or having a feasible exit strategy” (Minde, Jayne, Crawford, Ariga, & Govereh, 2008, p. 5).

SMART subsidies have been proposed because of its usefulness in the short run to address some identified problems that contribute to low usage of improved inputs especially with scarce resource to support indefinitely the high financial and administrative costs. Even with the availability of resources to support subsidies indefinitely, the long-term solution to the structural problem of missing fertilizer market will not be addressed. Hence a need to support a measure that addresses the problems underlying the structural problems affecting incentives to supply and to use fertilizer is needed (Morris, Valerie, Kopicki, & Byerlee, 2007). This led to improvisation of SMART subsidies targeting specific farmers and crop to be subsidized (DANIDA, 2011). SMART subsidies are designed to conform the following principles (DANIDA, 2011, pp. 2-3).

1. Targeting specific farmers. Use identified criteria such as farmers who haven’t applied improved agricultural inputs, as well as the needy and most vulnerable
households. “This reduces the risks of displacing commercial (non-subsidized) input sales and promotes pro-poor growth” (p. 2).

ii. Market-based solutions. This came to address the issue of government monopolization of agricultural inputs monopolization. SMART subsidy programs exists to “utilize and support the further development of existing private input supply networks rather than supplant them with state controlled distribution systems” (p. 2). This reduces the cost of supervision, increases efficiency of input delivery as well as increases the likelihood that the program has a sustained impact after its termination.

iii. Exit strategy. SMART subsidy programs are time bounded hence there are farmers who did not receive subsidies after three consecutive years. Dorward (2009) argued that:

“While this carries important benefits it also carries important risks, as if subsidies are not set up with clear time limits and if they continue for long periods then already substantial risks of their being politically entrenched and ‘hijacked’ are increased. Similarly the longer subsidies are in place and the more stable the subsidy systems, the greater the opportunities for those wishing to perpetrate fraud and divert subsidies to find ways of doing so” (Dorward, 2009, p. 28).

In addition to that explanation of SMART Subsidies, Carter (2015) add by arguing that, subsidies can be SMART if they can break a low technology trap by making
technology affordable for low income farmers, sharing the risk of experimentation, and reducing learning costs and break the ‘let someone else experiment’ equilibrium (p. 7).

**Current Agricultural Subsidies in Other African Countries**

From the time universal subsidies were halted to the time subsidies were resumed in most time most African countries, the Malawian government was the first to reintroduce fertilizer subsidies in 1998 by distributing free fertilizers. Other countries followed include Nigeria in 1999, Zambia in 2000, Tanzania 2002 and Kenya in 2006 (Druilhe & Hurlé, 2012). The Malawian government implemented its subsidies through the Starter Pack program whereby smallholder farmers were given 10 to 15 kg of fertilizer which was meant to serve 0.1 hectare. Later in 2000, the program was changed to Targeted Input Program (TIP). In 2005, the program was redesigned to be the Agricultural Inputs Subsidy Program (AISP) which was a voucher based, universal and allowed farmers to buy 100 kg of fertilizer at one-fifth the market price. The program increases the both the use of fertilizers and fiscal cost to run the program.

The AISP stimulated maize output and gained acceptance as a success by the most of the African leaders. This led to other countries to adopt the use of vouchers in 2008; these countries include Ghana, Kenya, and Tanzania (Minot & Benson, 2009; Druilhe & Hurlé, 2012). These countries adopted the SMART subsidies by using the experience from Malawi. The current subsidies in African countries are a result of the implementation of the 2006 African Fertilizer summit whereby African policy makers unanimously agreed that member states should grant “targeted subsidies on favor of the fertilizer sector” (Minot & Benson, 2009, p. 2). Furthermore, the call for increasing
fertilizer use in Africa through subsidies was due to the global increase in food price in 2007/08. However the use of vouchers in Malawi was later discontinued due to the allegations of misuse (Minot & Benson, 2009; AU, 2006).

Agricultural subsidies are advocated differently according to individual’s training background and the career. Development agencies considers agricultural subsidies as way to catalyze African Agriculture toward addressing the issue of food insecurity and improving incomes in rural areas; agronomist base their arguments on restoring the depleted soils nutrients; politicians took subsidies as prompt intervention to assist rural households; and as a way toward the goal of green revolution in Africa is a view of most development agencies (Minot & Benson, 2009).

Druilhe & Hurlé, (2012) identified two strategies to raise the level of efficient fertilizer use (p. 10):

i. Increasing the marginal benefit of fertilizer use by promoting technology adoption and farmer learning by encouraging farmers to test inputs;

ii. Increasing the affordability of fertilizer by reducing input prices, until a market reaches a size sufficient to capture economies of scale.

The first one is meant reduce “farmers’ perceived risks and/or lack of knowledge of fertilizers benefits and use” (Druilhe & Hurlé, 2012, p. 10); and the second aims at addressing the issue of high cost of inputs. They argued that increasing affordability of agricultural inputs by subsidizing them can improve the supply chain and stimulate the market. Druilhe & Hurlé (2012) cited Dorward (2009) as follows:
“Subsidies are expected to relieve both affordability and profitability constraints to increased staple crop productivity from increased input use, and in doing so it would raise land and labor productivity and improves food security for large numbers of poor households through some combination of increased real wages and reduced food prices” (Druilhe & Hurlé, 2012, p. 11)

On the other hand, some analysts are concerned about the possibilities of the short-lived impacts of the fertilizer adoption, this is due to the prevailing conditions of soil structure in many parts of Africa. Available technologies such as improved seeds, inorganic fertilizers, and pesticides do not promise profitable outputs due to poor soils. This coupled with the nature of smallholder farmers of being risk-aversive explains the low use of fertilizers and hence likely to lead to short lived impacts of the fertilizer adoption (Carter, Laajaj, & Yang, 2014).

**Agricultural Subsidies in Tanzania**

The government of Tanzania started subsidizing agriculture inputs in 2002 (as stated in earlier sections). The government of Tanzania used the experience and lessons from Malawi and redesigned its subsidies in 2008 where it introduced the voucher based subsidies called the National Agricultural Inputs Voucher Schemes (NAIVS). The NAIVS was designed to accommodate the participation of private dealers to whom farmers submit their vouchers to get inputs. According to Minot & Benson (2009) “Tanzania voucher program appeared to be more successful in promoting the development of a private distribution network” (p. 6), unlike the Malawi program that
displaced private sector dealers by largely relying on the distribution managed by two state-owned enterprises which led to the fall of the market share of private input distributors to 58%.

The voucher based subsidies (NAIVS) have operated from 2008 to 2014. Problems and challenges associated with the use of vouchers led the government to stop using vouchers. These problems include deceitful officers and agricultural inputs dealers that led to delays in delivering inputs to farmers on time (URT, 2014). As of July 11 2014, the government of Tanzania announced agricultural inputs subsidies scheme by credits to smallholder farmers in groups. This new setting aims at reaching 794,041 households in 24 regions (URT, 2014).

The Effectiveness of the Voucher Based Subsidies in Tanzania

Studies indicate that generally the vouchers based subsidies have been successful in increasing the use of inorganic fertilizer among small holder farmers (Minot & Benson, 2009; Hepelwa, Selejio, & Mduma, 2013). The study conducted by Hepelwa, Selejio and Mduma (2013) found a significant difference in welfare among households that received and those who did not receive the subsidies. By using expenditure as a proxy to measure welfare, they found households which accessed vouchers had higher expenditures than those who had no access. In addition to general expenditure, it was also found that expenditures on hired labor is relatively high among those who accessed than those who did not. The study also compared production in 2012 to that of 2007 and found that the yield was much higher in 2007. However, the authors associated the increase with a doubling of cultivated area by the same households. Finally they found that the
majority of poor households did not access the NAIVS as compared to the relatively well-off farmers, this was due to the higher market prices of inputs. It was concluded that the objective of increasing the use of fertilizers have been achieved, however the intended objective of increasing productivity among poor smallholder farmers has not been reached (Hepelwa, Selejio, & Mduma, 2013).

Assessments of Agricultural Subsidies on Poverty in Tanzania

A study conducted by Kato (2013) and Aloyce et.al. (2014) showed agricultural subsidies have increased the production of the subsidized crops, and increases the agricultural productivity particularly in places where the vouchers were distributed according the national guidelines set for the subsidies. Assessments also reveals positive contributions of vouchers program in reducing poverty (Aloyce, Gabagambi, & Hella, 2014). In Ruvuma region where they used to harvest not more than 5 bags of maize per acre, with subsidies the harvest increased to about 10 to 15 bags per acre. Qualitatively, the increased in production has led farmers to improve their life conditions in terms of housing improvement (i.e. from mud to bricks houses, thatched to corrugated metal roofing). There also was an improved living standard as evident through examples of buying mattress, bicycles, and ability to pay for children’s school fees (Kato, 2013). These findings contradict a study by Hepelwa, Selejio and Mduma (2013) who found that subsidies have not succeeded in improving the situation of poverty among poor households.

The study by Kato (2013) found five issues impeded the impact of vouchers in maize productivity and poverty alleviation. Kato indicated that late delivery of vouchers
caused farmers to use less improved varieties of seeds and less amount of fertilizers because most of them missed the basal fertilizers application. It was also reported that farmers given vouchers for subsidies was not implemented by using standard criteria in the targeted villages. It was reported in Songea District Council which is in Ruvuma region, that village committee members were given 4 to 5 vouchers per one household. Kato (2013) claimed that “it seems that there is an allocation bias of vouchers toward powerful households” (p. ii). The third issue was about the price of inputs. In 2011, there was a price increase but the value of subsidies remained the same as it was in the previous year. The price of basal fertilizer (UREA) went up by 2.2 times, and that of top dressing fertilizer, the price was 4.4 times during the same year. The fourth issue is farmers selling vouchers to agro-dealers in the first year of the which Kato (2013) claims was in part due to farmers’ unawareness on the using of inorganic fertilizers and improved seeds in their productivity. The fifth issue is cheating among small agro-dealers who had no ability to supply an amount of fertilizer large enough to suffice the requirements in villages where they were supposed to supply the inputs. Also the study found cheating in terms of selling fake fertilizer and amount less than the labeled weight. Cheating was not only among agro dealers, but also among employees of the government and village voucher committees who grabbed the vouchers for themselves by using misleading documentation such as listing names of their children and those of dead people. In addition to these issues, the study done by Aloyce et.al. (2014) found the violation of the guidelines in distributing vouchers where by farmers were given vouchers alternatingly, (i.e. farmers who received vouchers did not received the next year).
limited amount of vouchers also led to claims of being discriminated and those who argued that refused to contribute to the community development projects.

**The role of Fertilizer Subsidies in Food Security**

Druilhe & Hurlé, (2012) argues that although the subsidies program present a large share of national budget and that agriculture subsidies program has become unavoidable in agriculture policy portfolio, yet their contribution to food security remains debatable. The innovativeness of SMART Subsidies has been successful at meeting the primary objective of national agricultural productivity (Druilhe & Hurlé, 2012), yet the study conducted by Hepelwa, Selejio & Mduma (2013) showed the increase in production was due to the increase in area of production from what it used to be in 2007 to more than double in 2012.

**Conceptual Framework**

A conceptual framework is a researcher’s perspective on the problem he/she is investigating. It guides the research to explain the relationships between variables. Usually researchers can adapt the existing frameworks with modification if needed. In this study, a constructed logical model will be used. A logic model is a planning tool used to clarify and graphically display what a particular project intends to do and what it hopes to accomplish and impact (Fitzpatrick, Sanders, & Worthen, 2011).

The precondition led to the launching of SMART Subsidies in many sub-Saharan countries was the low adoption of agricultural technologies. These technologies are mainly fertilizers and improved seeds. Absence of the two led to poor soils and low yield.
This caused the low productivity among many smallholder farmers. The situation was worsened by the increase in inputs and prices of food. To address this, African leaders decided to adopt subsidy strategies that would increase the uptake of fertilizers among the smallholder farmers. Subsidies made agricultural inputs affordable to most of smallholder farmers and the goal was through the use of improved inputs to increase productivity, establish food security, improve farmers welfare and enable smallholder farmers to be self-dependent in buying inputs when subsidy programs stopped. The framework is summarized in the Figure 1.

Figure 1. Conceptual framework


**Literature Review Summary**

From the literature review, it can be concluded that universal agricultural subsidies was the agriculture policy in most Sub-Saharan African countries. Many of these countries later adopted the SMART Subsidies to address the problems of the universal subsidies programs by targeting specific crops, particular areas that are known to be high producers of the targeted crops, specific farmers (i.e. the smallholder farmers), and within certain period of time (i.e., 3 years). In re-introduction of subsidies, different advocacies of subsidies have been put into place. Yet some analysts are concerned about the practice of the SMART subsidies. Also there are several studies which have been conducted to assess impacts of these subsidies. These studies seem to have a coinciding argument on the success of the program in increasing the fertilizer uses, and improve production where guidelines were adhered. However, there are some contradictions to the extent subsidies addressed poverty. While findings suggest production increases and poverty decreases, subsidies seemed to have benefited capable households which have connections to the village vouchers committee and those which could afford the co-pay leaving the poor remaining poor. While findings suggest increase in fertilizer uptake, there are studies arguing that smallholder farmers are pessimistic on profitability of using fertilizers (i.e. the perceived risks or lack of knowledge on the benefits of fertilizers). Also there are studies that claim an increase in production is due to an increase in the cultivated area and not due to productivity. Finally it can be deduced that if subsidies went to capable farmers and the poor farmers were unable to afford the co-pay, then the poor are most
likely to be food insecure because they did not access the affordable inputs. Hence it is uncertain that subsidies have improved food security.

This study aims at assessing the impact of subsidies to smallholder farmers in Mbeya District Council, one among the Tanzanian districts known to be a high food crops producer in the country. This implies that it has good climatic conditions, supportive soils and zealous farmers. The research sites have been purposively selected to obtain information in smallholder farmers’ perspective in an environment which is supportive for agricultural activities and where impacts due to interventions can be ascertained.
Chapter 3: Methods

Research Design

This study collected information from participants by using a survey. This study aims at assessing the impact of subsidies to smallholder farmers who were part of the program since it began in 2008/2009 to 2011/2012 when the first cohort of farmers graduated. This investigation was a descriptive and it employed ex post facto research design. According to the Office of Human Research Protections (OHRP), descriptive study is defined as any study that is nor truly experimental; it is a study that can provide information about the naturally occurring health status, behaviour, attitudes or other characteristics of a particular group (ORI, 2016).

Ex post facto research is “a type of research that attempts to determine the cause for, or the consequences of, differences that already exist in groups of individuals” (Ary, Jacobs, Sorensen, & Walker, 2014, p. 676). Patten (2014) identified two characteristics of ex post facto: “researchers observe and describe some current condition”, and “researchers look to the past to try to identify the possible cause(s)” (p. 7). Viewing these characteristics in the perspective of this study: the current condition that have been observed are farmers’ productivity, food security, use of improved agricultural inputs,
and farmers’ satisfaction as to how the program has functioned; and looking into the past involved assessing ‘how subsidies have impacted smallholder farmers?’.

In ex post facto research, the study does not manipulate the independent variable which has occurred, it simply compares groups differing on the pre-existing independent variable to determine any relationship to the independent variable (Ary et al, 2014). The independent variable in this study is the agricultural subsidies which were given to some farmers. The independent variable cannot be manipulated because the assigning of groups (i.e. the control group-those who did not receive subsidies, and those who received subsidies-the experiment group) were already completed during the targeting of farmers to be given subsidies.

Agricultural productivity, food security, and sustainable post usage of improved fertilizer are the dependent variables. Other independent variables which can be used to assess correlation to the dependent variables in this study are gender, marital status, age, education level, and advisory services. The design selected has been used to determine the current difference between the two groups (i.e. the control and experiment group) and the situational difference of the experiment group before and after subsidies.

**Population of the Study**

This study used the population of smallholder farmers who are bona fide residents of Mbeya District Council since 2003. The year 2003 has been chosen to allow average data collection for a period of up to five years before the implementation of National Agricultural Inputs Vouchers Scheme in 2008. For the purpose of this study, the
population comprised smallholder farming households in Wards that are known to be high maize (corn) producers.

**Sampling Procedure and the Sample Size**

Kothari (2004) defines sampling as “the selection of some part of an aggregate or totality on the basis of which a judgment or inference about the aggregate or totality is made” (p. 152). The aggregate is a population of interest that by collecting information from the sample, a generalizable knowledge about that population can be obtained. The sampling process in this study was a two stage process involving purposive sampling and a systematic sampling. Ary et al, (2014) defines purposive sampling as “a nonprobability sampling technique in which subjects judges to be representative of the population are included in the sample” (p. 681). The same authors defines systematic sampling as “a probability sampling in which every kth element of the population list is selected for the sample.

Purposive sampling involved selection of four (4) wards, these wards were selected based on the characteristic of being high maize (Corn) producers, and the geographical position based on the four cardinal directions (i.e. north, east, south, and west). For varied geographic location, one ward from each of these directions was selected. The participants were identified through the Ward Executive Officers (WEO) in each ward. These WEOs were requested to provide a list of names of smallholder farming households that received subsidies and those who did not from 2008/2009 to 2011/2012. From the list, a systematic random selection of smallholder farming households was performed. Fifteen farming households of those who received, and 15 of
those who did not receive the subsidies were surveyed. Each ward had 30 participants which makes a total of 120 participants; 60 of those who received the subsidies and 60 who did not. An oversampling of 10 farmers per ward was done case some farmers’ dropouts or refusal to participate.

**Data Collection**

The study employed survey techniques of data collection. Two constructed questionnaires have been used to collect data from the respondents. These questionnaires were made for farmers who received subsidies and those who did not. The survey was conducted by interviewing each head of household or their representative. An interviewer administered questionnaire was used for the purpose of address issues related to literacy and reduction of missing information. The survey was done by the researcher and assisted by three trained enumerators in each ward. It was arranged to be done in person with the smallholder farmers at their place of residence. Data was collected after receiving Ohio State University Institutional Review Board (IRB) approval for human subjects research (Protocol Number 2015E0621).

**Instrumentation**

The survey employed two questionnaires. The two questionnaires were designed to collect information from the farmers who received the subsidies and those who did not. These two questionnaires have similar sections, the main differences is that, the questionnaire for the farmers who did not receive subsidies, excludes questions about the subsidy program. The questionnaire consisted of items that elicit participants to give responses categorized into demographics, agriculture productivity, food security, current
usage of improved agriculture inputs, and farmers’ satisfaction on the impact of the subsidy program and farmers attitude toward farming as a business.

**Demographics.**

This section collected information about gender, marital status, age, and education level; and number of times a particular farmer received subsidies. Marital status was measured in terms of whether the participant is single, married, divorced or widowed and educational level is ranging from none to university education.

**Agriculture productivity.**

Information collected in this section included data about agricultural production, that focused on area of the cultivated farms, yields in number of 100 kilograms bags, information about surplus, selling the maize surplus, ease of reaching and getting the maize to market.

**Food Security.**

Food security data was collected by describing the extent to which households are food secure with available stock of maize in households, number of maize dishes per week, and number of meals eaten per day.

**Usage of improved agricultural inputs.**

Usage of agricultural inputs contained items about the use/buying of inputs, amount of inputs per area of land cultivated, and farmers’ future plans to use improved agricultural inputs.
Farmers’ Perception on Program’s Efficacy.

The last section is the farmers’ perceptions on program’s efficacy; this section is for the farmers who received the subsidy only. This section employed Likert type items with declarative statements. Examples include, ‘the objectives of agriculture input subsidies program have been reached,’ and ‘extension services were adequately provided to me during subsidies provision’. The items had four points Likert’s type statements with no neutral response to minimize social desirability bias and the likeness of distortions due to the present of the mid-point values (Garland, 1991). These responses were ‘strongly disagree’, ‘disagree’, ‘agree, and ‘strongly agree’. The fill-in-the-blank items will be placed to collected information such as average production, inputs usage and opinions of farmers. See Appendix A and B.

Instrument’s Reliability

Reliability is “the consistency or stability of test scores” (Johnson & Christensen, 2014, p. 166). There are different ways of assessing reliability, each giving a slightly different index of reliability. In this research, the reliability of the instruments was assessed by using the internal consistency reliability i.e. “the consistency with which the items on a test measure a single construct” (Johnson & Christensen, 2014, p. 169). This method has been chosen because it is based on a single administration of the questionnaire and is time efficient (Patten, 2014).

The reliability coefficient was determined by the Cronbach’s alpha by administering a onetime test to 30 respondents, 15 in each group, (i.e. farmers who received subsidies and those who did not with respective designed questionnaire). To
determine the reliability coefficient, the questionnaires were segmented according to items which measures same construct. These sections were maize productivity and surplus production, use of improved inputs, amount used and amount planned to be used, farmers’ opinions toward the functioning of the subsidy program and farmers’ attitude toward farming as a business. These subsections have indicated an internal consistency of Cronbach’s alpha ranging from α=0.517 to α=0.799. These values are above 0.5 indicating a suitability of the newly constructed instrument for data collection as recommended by Nunnally & Bernstein (1994) who stated that new instruments should have Cronbach’s value above 0.5 with values desired in the 0.7 or greater range.

**Instrument’s Validity**

Validity refers to “the accuracy of the inferences, interpretations, or actions made on the basis of test scores” (Johnson & Christensen, 2014, p. 172). Validity has to do with the ability of the questionnaire to measure what it is purported to measure. The validity of constructed questionnaires was assessed by a panel of experts that consisted of four individuals who were well acquainted with research instrumentation and those who were familiar with the Tanzania smallholder agricultural practitioners. This was done by studying the construct, examining the questionnaire content, and deciding whether the test content adequately represents the construct. The assessment of content validity was done by Professor David Hansen of the Ohio State University and Professor Gary Straquadine of Utah State University because of their knowledge on data collection and survey instrumentation. The panel also included two experts who are well informed about Tanzania context, Mr. Gosbert Shausi who is a Ph.D. Candidate and Assistant Lecturer at
Sokoine University of Agriculture and Dr. Kizito Mwajombe who is a lecturer at Sokoine University of Agriculture in Tanzania.

**Data Analysis**

Data were analyzed by using Statistical Package for Social Sciences (SPSS) version 22 at 0.95 confidence interval (i.e. at $\alpha = 0.05$). For meaningful comparison, standardization of figures involving acreage and yield was done, also descriptive values of means and standard deviation were used to describe the data obtained in the study. More specifically, the research questions were answered as follows:

**Question 1:** Does agricultural subsidies contribute to the smallholder farmers’ productivity? The question was answered by collecting participants’ opinions on the current state of agricultural productivity among smallholder farmers (before and after subsidies). Averages form these data were compared by the use of a t-test to determine statistical differences in production before and after and across between the receiver and those who did not receive subsidies. In addition to that, Cohen’s D was used to assess the effect size for the extent to which farmers have changed their production levels.

**Question 2:** How does subsidizing agricultural inputs contribute to farmers’ food security? To answer this question, the study collected information about the condition of food security, major reasons for the perceived condition, dependency on maize, number of meals eaten each day before and after subsidy program, average composition of meals eaten each day before and after the subsidy program and other crops grown by smallholder farmers. Most of the information collected to answer this question was
analyzed by using the t-test to assess how significantly the situation differs before and after the inputs subsidies program and across those who received the subsidies and those who didn’t. The study collected information on crops other than those under subsidies program that are grown by smallholder farmers. With regard to food security, this was used to assess other crops which smallholder farmers grow.

Question 3: What role does the agricultural inputs subsidies program contribute to post-program usage of improved inputs? For this question, data on type of inputs before and after, amounts of inputs (fertilizers and seeds), farmer’s education, and advisory services (extension services) were collected after they have three consecutive years of receiving subsidies. These were analyzed by utilizing descriptive statistics and Cohen’ D. The analysis were done to farmers who received subsidies to determine if their participation to the program have led to changes in their behaviors.

Question 4: What are farmers’ perceptions on how the agricultural subsidies program functioned? This question was answered by a combination of Likert type questions, ranking items, and the open ended questions to gather opinions of the farmers who received subsidies. The Likert type questions were analyzed by cross-tabs with descriptive statistics (frequencies and percent). The open ended questions were analyzed by observing commonalities in participants’ responses and ranking the responses according to frequencies and percent.
Implications of the Study

Agricultural inputs subsidies program is an on-going effort in all wards in Mbeya District Council. This study was conducted in a district which is one of the high maize producers in the region. The expectation was to generate useful information that can be used to improve the program. This study assessed the contribution of maize to food security and explore other crops that are important to farmers themselves but have been overlooked in the program. Since this is an evaluative study, policy and practice recommendations will be shared on how program implementation can be improved.
Chapter 4: Results

This chapter presents the results of the data analysis utilized to answer the research questions for this study. The majority of the statistics used in this study involved frequencies and percent, and t-test statistics. There are two categories of items, those specific to farmers who received subsidies and those who did not. Hence the analysis was done with 60 farmers who received subsides and 60 who did not making a total of 120 smallholder farmers. All farmers who were asked, agreed to participate in the survey, therefore the response rate was 100%. The study was able to achieve this response rate because it employed an interviewer administered questionnaire and everyone participated.

Sample Statistics

Gender and age.

As noted in earlier chapters, this study was based on survey technique of data collection in which 120 smallholder farmers who were interviewed. Among these 86 (71.7%) were male and 34 (28.3%) were female with ages ranging from 23 to 78 years old. Table 1 shows the sample distribution by gender.
Table 1. Sample distribution by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>86</td>
<td>71.7%</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>28.3%</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**Education.**

The participants in this study had education levels ranging from no school to ordinary level secondary school (equivalent to twelfth grade in the US). One hundred and thirteen [113 (94%, n=120)] participants had some level of formal education, most of these were standard seven meaning they have gone through primary level of education (i.e., equivalent to 8th grade in the US education system) 70.8% of total sample (n = 85, total n = 120). See Table 2.

Table 2. Sample distribution by education level

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>5.8</td>
</tr>
<tr>
<td>Standard Four</td>
<td>11</td>
<td>4</td>
<td>15</td>
<td>12.5</td>
</tr>
<tr>
<td>Standard seven</td>
<td>59</td>
<td>26</td>
<td>85</td>
<td>70.8</td>
</tr>
<tr>
<td>Ordinary Level Secondary</td>
<td>11</td>
<td>2</td>
<td>13</td>
<td>10.8</td>
</tr>
<tr>
<td>School</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>86</td>
<td>34</td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>

**Marital status.**

The participants in the sample were mostly married smallholder farmers, this constituted of 105 (87.5%, n=120) married participants. These participants can be used to explain why participants in the study were dominantly male (71.1%) who essentially were the heads of households. See Table 3.
Table 3. Sample distribution by marital status

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>105</td>
<td>87.5</td>
</tr>
<tr>
<td>Single</td>
<td>7</td>
<td>5.8</td>
</tr>
<tr>
<td>Divorced</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Widow/Widower</td>
<td>8</td>
<td>6.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Sample description by subsidy category.**

The study was designed to collect information from smallholder farmers who received and those who did not receive subsidies. Respectively to their status (i.e. whether received or did not receive subsidies), 48 (80%, n=60) were male and 12 (20%, n=60) were female who received subsidies; 38 (63.3%, n=60) were male and 22 (36.7%, n=60) were female who did not received the subsidies, (Table 4). Again, male dominance can be explained by married males as head of households.

Table 4. Sample distribution by gender: those who received subsidies and those who did not

<table>
<thead>
<tr>
<th>Gender</th>
<th>Received Subsidies</th>
<th>Percent</th>
<th>Did not Receive Subsidies</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>48</td>
<td>80</td>
<td>38</td>
<td>63</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>20</td>
<td>22</td>
<td>37</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>100</strong></td>
<td><strong>60</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Seasons in program.

Results indicated that 20%, (n=12) farmers received subsidies for three consecutive season. Majority of them received subsidies for only one season, 43.3%, (n=26)). See Table 5.

Table 5. Number of seasons that farmers received subsidies

<table>
<thead>
<tr>
<th>Agriculture seasons that a farmer received subsidies</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>One season</td>
<td>21</td>
<td>5</td>
<td>26</td>
<td>43.3</td>
</tr>
<tr>
<td>Two seasons</td>
<td>18</td>
<td>4</td>
<td>22</td>
<td>36.7</td>
</tr>
<tr>
<td>Three seasons</td>
<td>9</td>
<td>3</td>
<td>12</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>48</strong></td>
<td><strong>12</strong></td>
<td><strong>60</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Findings of Research Questions

Research question #1: Does agricultural subsidies contribute to the smallholder farmers’ productivity?

Agricultural productivity of farmers between subsidy groups.

Independent samples t-Tests were utilized to access difference between farmer groups who received subsides and farmer who did not. Standardized scores for agricultural productivity were determined by dividing the number of 100 kg bags of maize by farming area (acre). Standardized scores were created for both groups of farmer who received and did receive subsidies (before and after subsidies or time 1 and time 2). At time 1 or before subsidies, both groups of farmers were similar in terms of yield in number of bags per acre. There was a small significant difference (p<.05) in means scores
for time 2/after subsidies between farmer groups that received subsidies and the farmers who did not. See Table 6.

Table 6. Independent samples t-Test between farmer groups who received and did not receive subsidies

<table>
<thead>
<tr>
<th>Group Category</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of bags per acre before subsidies</td>
<td>Received Subsidies</td>
<td>60</td>
<td>5.35</td>
<td>3.50</td>
<td>112</td>
</tr>
<tr>
<td>Did Not Receive Subsidies</td>
<td>54</td>
<td>6.22</td>
<td>4.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of bags per acre after subsidies</td>
<td>Received Subsidies</td>
<td>60</td>
<td>10.10</td>
<td>6.06</td>
<td>116</td>
</tr>
<tr>
<td>Did Not Receive Subsidies</td>
<td>58</td>
<td>7.33</td>
<td>5.88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * p<.05

*Agricultural productivity within groups of farmers who received subsides and farmers who did not receive subsidies.*

The paired samples test indicated a statistically significant difference between the number of bags (100 kg) per acre before subsidies and number of bags (100 kg) after subsidies for farmers who received subsidies. There was not a statistical difference in mean scores (time 1/before and time 2/after) for farmers who did not receive subsidies. There was a slight increase in maize production but not significant. See Table 7.
Table 7. Paired samples T Tests with farmer groups who received and did not receive subsidies

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received Subsidies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of bags per acre before</td>
<td>60</td>
<td>5.35</td>
<td>3.50</td>
<td>59</td>
<td>9.06***</td>
</tr>
<tr>
<td>subsidies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of bags per acre after</td>
<td>60</td>
<td>10.10</td>
<td>6.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>subsidies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did Not Receive Subsidies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of bags per acre time 1</td>
<td>52</td>
<td>6.26</td>
<td>4.92</td>
<td>51</td>
<td>0.18</td>
</tr>
<tr>
<td>Number of bags per acre time 2</td>
<td>52</td>
<td>7.01</td>
<td>5.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *** p<.0001

To determine the effect size of the subsidy program for farmers, a Cohen’s d score was calculated. Effect size for Cohen’s d uses the following scale: small effect (d = .20), medium effect (d = .5), and large effect (d = .90 or greater) (Cohen, 1988). The subsidy program had a large effect for maize agricultural productivity according to a Cohen’s d score of 0.96. The farmers who did not receive the subsidies in comparing maize production from time1 to time 2 had a small or little effect (d = 0.15). See formula below for Cohen’s d effect size.

\[
Cohen's \, d = \frac{M_1 - M_2}{\sigma_{pooled}} \quad \text{Whereby;}
\]

\[
\sigma_{pooled} = \sqrt{\left(\frac{\sigma_1^2 + \sigma_2^2}{2}\right)}
\]
**Opinions of farmers on agriculture productivity.**

Most of farmers who participated in the subsidy program have positive perceptions on the contribution of agricultural subsidies to the improvement of agriculture productivity. Among farmers who participated in the program, 91.6%, (n=60) stated that their productivity improved (i.e. who responded significantly improved, improved, and somewhat). Only 8.3% (n=60) of the respondents indicated that their productions were same as previously (i.e. before subsidies). Farmers who have positive perceptions regarding improvement in agriculture productivity associates “increase in yield” to their perceptions, these count to 71.67%, (n=43) while those who have negative perceptions have associated the non-improvement to insufficient inputs (16.7%) and late distribution of inputs (16.7%). See Tables 8 and 9.

Table 8. Farmers’ opinion on improvement of agriculture productivity

<table>
<thead>
<tr>
<th>Improvement in productivity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significantly improved</td>
<td>5</td>
<td>8.3</td>
</tr>
<tr>
<td>Improved</td>
<td>33</td>
<td>55.0</td>
</tr>
<tr>
<td>Somewhat</td>
<td>17</td>
<td>28.3</td>
</tr>
<tr>
<td>Same as previously</td>
<td>5</td>
<td>8.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 9. Explanation of farmers’ opinion on agricultural productivity

<table>
<thead>
<tr>
<th>Category</th>
<th>Explanation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Perceptions</td>
<td>Increase in yield</td>
<td>43</td>
<td>71.67%</td>
</tr>
<tr>
<td>Negative Perceptions</td>
<td>Insufficient inputs</td>
<td>10</td>
<td>16.67%</td>
</tr>
<tr>
<td></td>
<td>Late distribution of inputs</td>
<td>7</td>
<td>11.67%</td>
</tr>
</tbody>
</table>

**Improvement in agriculture productivity by surplus production.**

In order to assess improvement in agriculture productivity, current (i.e. after the year 2012) information about production and selling of maize surplus were collected. Data shows 55% (n=120) produce surplus and 49.2% do sell the produced surplus (Table 10).

Table 10. Group category: farmers who produce and sell (n=60 in each category)

<table>
<thead>
<tr>
<th></th>
<th>Received Subsidies</th>
<th>Did Not Receive Subsidies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers who produce surplus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35</td>
<td>31</td>
</tr>
<tr>
<td>No</td>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
</tr>
<tr>
<td>Farmers who sell surplus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>31</td>
<td>26</td>
</tr>
<tr>
<td>No</td>
<td>29</td>
<td>34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

By cross tabulating farmers who produce surplus by farmers who sell surplus and the group category (i.e. received subsidies and did not received subsidies); results shows farmers who do both are 50% (n=60) (i.e. produce surplus and sell it) are many in the group of ‘received subsidies’ compared to those in the group of ‘did not received
subsidies’. In terms of those who do not do both are 46.7% (n=60) (i.e. they neither produce surplus nor sell it) are fewer in the group of ‘received subsidies’ compared to those in the group of ‘did not received subsidies’. The same cross tabulation’s results shows data for farmers who produce surplus and sell it are more than those who do not (Table 11).

Table 11. Cross tabulation; farmers who produce surplus by group category

<table>
<thead>
<tr>
<th>Group Category</th>
<th>Farmers Who Produce Surplus</th>
<th>Farmers Who Sell Surplus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Received Subsidies (n=60)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers who produce surplus</td>
<td></td>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>51.7%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>51.7%</td>
<td>48.3%</td>
</tr>
<tr>
<td>Did not received subsidies (n=60)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers who produce surplus</td>
<td></td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>38.3%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>26</td>
<td>34</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>43.3%</td>
<td>56.7%</td>
</tr>
<tr>
<td>Total (n=120)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers who produce surplus</td>
<td></td>
<td>54</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>3</td>
<td>51</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>45.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>57</td>
<td>63</td>
</tr>
<tr>
<td>% of Total</td>
<td></td>
<td>47.5%</td>
<td>52.5%</td>
</tr>
</tbody>
</table>
Research Question #2: How does agricultural subsidies contribute to farmers’ food security?

_Significance of maize in food security._

Results indicate most of farmers agrees that availability of maize stored in their household makes them feel secure in terms of food, 90.8% of 120 farmers agreed to that. In addition to that, 90% (n=60) farmers who received subsidies have a positive opinions on improvement of food security due to their participation in the subsidy program (Table 12 and 13).

Table 12. Food security based on stored maize (n=60)

<table>
<thead>
<tr>
<th></th>
<th>Received Subsidies</th>
<th>Did Not Receive Subsidies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
</tr>
<tr>
<td>Yes</td>
<td>57</td>
<td>95.0</td>
<td>52</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>5.0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>60</td>
<td>100.0</td>
<td>60</td>
</tr>
</tbody>
</table>

Note: f = frequency

Table 13. Farmers’ response on improvement in food security

<table>
<thead>
<tr>
<th></th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significantly improved</td>
<td>7</td>
<td>11.7</td>
</tr>
<tr>
<td>Improved</td>
<td>25</td>
<td>41.7</td>
</tr>
<tr>
<td>Somewhat</td>
<td>22</td>
<td>36.6</td>
</tr>
<tr>
<td>Same as previously</td>
<td>6</td>
<td>10.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>60</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: f = frequency

Food that are made from maize are frequently eaten by the most of the respondents. Thirty respondents who received subsidies respondents have indicated seven
times that maize related foods were consumed in a week, also 31 do the same after subsidies (Table 14).

Table 14. Number of time in a week, a household consume maize related foods per week

<table>
<thead>
<tr>
<th>Number of time</th>
<th>Frequency before subsidies</th>
<th>%</th>
<th>Frequency after subsidies</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>5.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6.7</td>
<td>5</td>
<td>8.3</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>11.7</td>
<td>7</td>
<td>11.7</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>18.3</td>
<td>9</td>
<td>15.0</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>6.7</td>
<td>6</td>
<td>10.0</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1.7</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>7</td>
<td>30</td>
<td>50.0</td>
<td>31</td>
<td>51.7</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: f = frequency

Contribution of input subsidy program to number of meals and its composition.

Most the farmer have indicated they eat two meals per day. This is in both before and after subsidy whereby 30 farmers indicated two meals per day before subsidy program and 31 farmers have indicated 2 meals after subsidy program (Table 15)

Table 15. Number of meals eaten per day before and after subsidy program

<table>
<thead>
<tr>
<th>Number of meals eaten per day</th>
<th>Frequency before subsidy program</th>
<th>%</th>
<th>Frequency after subsidy program</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>7</td>
<td>11.7</td>
<td>31</td>
<td>51.7</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>50.0</td>
<td>25</td>
<td>41.7</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>38.3</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>
Research Question #3: What role does the agricultural inputs subsidy program contribute to post-program usage of improved inputs?

Data for post program usage of inputs were collected based on current situation (i.e. 2015 and the 2016 agricultural season). Generally there is closeness of numbers of farmers who used improved agriculture subsidies in both seasons, however the number of farmers of who received subsidies are more than those who do not. 63.3% (n=60) used improved agricultural inputs in 2015 and the number shall increase in 2016 for those who plan to use inputs are 78.3% (n=60). See Table 16.

Table 16. Use of inputs in 2015 and plan to use in 2016 agriculture seasons

<table>
<thead>
<tr>
<th>Group Category</th>
<th>Received Subsidies Count</th>
<th>Did not received subsidies Count</th>
<th>Total Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of improved inputs in the 2015 ag-season</td>
<td>Yes</td>
<td>38</td>
<td>35</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>22</td>
<td>25</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
<td><strong>120</strong></td>
</tr>
<tr>
<td>Plans to use improved inputs in 2016 ag-season</td>
<td>Yes</td>
<td>47</td>
<td>40</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>13</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>
Research Question #4: What are farmers’ perceptions on how the agricultural subsidies program functioned?

Improvement in agricultural activities.

Data shows that subsidy program have generally improved agricultural activities, 73.3%, (n=44) indicated their agricultural activities have improved as a result of their participation in the program. Farmers who responded ‘no’ have stated that there were no improvement in agricultural activities due incomplete package of subsidies, delays in distribution of inputs, premature graduate farmers due to not receiving subsidies for three consecutive years and inadequate training on good agronomic practices. This led low performance in their agricultural activities and hence low income that was not sufficient enough to make farmers capable of buying inputs at market price. Other explanations include inadequate control to ensure farmers get subsidies for three consecutive years, and inadequate training on good agronomical practices (Table 17 and 18).

Table 17. Whether subsidy program have improved agricultural activities

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>44</td>
<td>73.3</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>26.7</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 18. Suggestions for improvement in subsidy program to improve agricultural activities

<table>
<thead>
<tr>
<th>Suggestions for improvement of agricultural activities</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidies should be provided in a complete package</td>
<td>6</td>
</tr>
<tr>
<td>Subsidies should be done earlier to catchup with the agricultural calendar</td>
<td>6</td>
</tr>
<tr>
<td>There should be a means of control to ensure farmers receives subsidies for three consecutive years</td>
<td>2</td>
</tr>
<tr>
<td>It should be done in line with training in good agronomical practices</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Table 19 shows results for items intended to assess farmers opinions on the functioning of the subsidy program, the items used were made of four point Likert’s items with strongly disagree, disagree agree, and strongly agree. Farmers’ satisfaction on these items are measured by assessing the positive responses. For easy of assessment, ‘strongly agree’ and ‘agree’ are merged to form a positive opinion and ‘strongly disagree’ and ‘disagree’ are merged to form a negative opinion. Since satisfaction is assessed based on positive opinions, all items will be ranked basing on positive opinions. Hence items that are ranked higher indicates farmers opinions to which they are satisfied most.
Table 19. Farmers’ opinions on the functioning and the impact of subsidy program

<table>
<thead>
<tr>
<th>Item</th>
<th>Responses</th>
<th>f</th>
<th>Merged Score</th>
<th>%</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>My attitudes is now aligned with the use of improved agriculture inputs</td>
<td>Agree</td>
<td>36</td>
<td>53</td>
<td>88.3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers’ knowledge about the use of improved agriculture inputs have improved</td>
<td>Agree</td>
<td>37</td>
<td>50</td>
<td>83.3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension services were adequately provided to me during subsidies provision</td>
<td>Agree</td>
<td>28</td>
<td>43</td>
<td>71.7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture inputs subsidies program reached the intended farmers</td>
<td>Agree</td>
<td>29</td>
<td>34</td>
<td>56.7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The objectives of agriculture input subsidies program have been reached</td>
<td>Agree</td>
<td>25</td>
<td>26</td>
<td>43.3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Farmers’ attitude toward farming as a business.

Table 20 show results for farmers responses in regard to their attitude to farming as business. The same computational procedures made in table 19 have been done to get table 20.
Table 20. Farmers’ opinions on their attitude to farming as a business

<table>
<thead>
<tr>
<th>Item</th>
<th>Responses</th>
<th>f</th>
<th>Merged score</th>
<th>%</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>My skills on good agronomical practices have improved</td>
<td>Agree</td>
<td>37</td>
<td>49</td>
<td>81.7</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My aspirations towards farming as a business have significantly</td>
<td>Agree</td>
<td>34</td>
<td>44</td>
<td>73.3</td>
<td>2</td>
</tr>
<tr>
<td>improved</td>
<td>Strongly agree</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can manage to buy input at market price</td>
<td>Agree</td>
<td>33</td>
<td>40</td>
<td>66.7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I produce more surplus and sell it for income</td>
<td>Agree</td>
<td>26</td>
<td>35</td>
<td>58.3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Strongly agree</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Farmers’ opinions on the functioning of the subsidy program.*

The functioning of the subsidy program was assessed by asking farmers who received subsidies to give their opinions on how it performed. Sixty farmers who received subsidies responded to the item and came with several responses which have been categorized to form a thematic list of 8 opinions (Table 21). The list was developed based on the commonality of the core issue which farmers wanted to present. These opinions were coded and entered into SPSS for analysis. Table 21 indicates each occurrence in descending order.
Table 21. Farmers’ opinion on the functioning of the subsidy program

<table>
<thead>
<tr>
<th>Overall opinion about how the subsidies have performed</th>
<th>Frequencies</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>The government should consider the beginning and the end of agricultural seasons when issuing subsidies</td>
<td>26</td>
<td>43.3%</td>
</tr>
<tr>
<td>The government should consider increasing the budget for subsidies so that farmers can get adequate inputs</td>
<td>11</td>
<td>18.3%</td>
</tr>
<tr>
<td>The functioning of the subsidy program should be adhering to the set of guidelines.</td>
<td>6</td>
<td>10.0%</td>
</tr>
<tr>
<td>The government should consider to make subsidy a sustainable program rather than making it a short intervention</td>
<td>6</td>
<td>10.0%</td>
</tr>
<tr>
<td>Subsidy programs give relief to farmers, the government should consider adding more crops that will be subsidized</td>
<td>5</td>
<td>8.3%</td>
</tr>
<tr>
<td>There should be a way to ensure all farmers who receive subsidies use it as intended</td>
<td>2</td>
<td>3.3%</td>
</tr>
<tr>
<td>The government should consider increasing the money value of voucher so as to give a relief to an amount paid by farmers</td>
<td>2</td>
<td>3.3%</td>
</tr>
<tr>
<td>Provision subsidy should be coupled with provision of necessary training on good agronomical practices of priority crops</td>
<td>2</td>
<td>3.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

The most common perception about the subsidy program performance was based on the timing for issuing of subsidies in relation to onset of the agricultural calendar. Often time, inputs arrive to farmers when crops are at stages which do not require its application. For this situation, farmers stated that ‘the government should consider the beginning and the end of agricultural seasons when issuing subsidies’.
Chapter 5: Summary, Discussion, Recommendations for Future Research and Conclusions

Introduction

This chapter presents five subsections, these are a summary of findings, discussion, recommendations for future research and conclusions of the study drawn from findings. The summary subsection is organized based on research questions and organized to give meaning for the findings of the study.

Summary of Findings

Question 1: Does agricultural subsidies contribute to the smallholder farmers’ productivity?

This question was phrased to connect agricultural subsidies and farmers productivity; more specifically ‘does agricultural subsidies contribute to the smallholder farmers’ productivity?’ Generally, agricultural subsidies have contributed positively to improvement in agricultural productivity. Items that were used to answer the question included assessment of farmers’ opinion on improvement in productivity in which most of them, with their same plots of lands have achieved increased yield; those who had higher yields before subsidies tend to produce higher yields after subsidies. Some farmers associated ‘no contribution of subsidies’ with insufficient inputs of incomplete package
(i.e. one or two of either improved seeds or basal fertilizers or top-dressing fertilizers were not provided). Late distribution of inputs though not mentioned by many respondents as a factor leading to no contribution of subsidies because by receiving them late, farmers misses the opportunity to apply them. Usually the agricultural calendar begins in August and in November depending on monthly distribution of rain across the year. By distributing subsidies in mid to late November in which the subsidies are usually distributed, they arrive to farmers when they have already sown their fields. Late issuing of vouchers and distribution of inputs deprives farmers the opportunity to apply improved high yielding seeds and the application of basal fertilizers. This leads weak-start of maize growth due to poor formation of roots and shoots, also leads to the use of locally selected seeds season to season causing recurrence of seed-borne diseases such as maize streak which was observed during the survey.

Ability to produce and sell surplus was assessed with the aim of determining whether farmers can now produce to feed themselves and be able to sell part of their produce for income generation. An outcome of increased use of fertilizers have been achieved and has increased yield. Farmers who received subsidies do produce more compared to their production before subsidies, also they do produce more than those who did not received subsidies. This has enabled farmers who received subsidies to produce and sell surplus. Comparatively, those who received subsidies and sell surplus are greater than those who did not receive subsidies and sell surplus. This implies subsidies have contributed to the elevation of farmers from subsistence farming, it also implies that the intentions of transforming ordinary farmers to business farmers is achieved. This is
confirmed by the comparisons of amount sold and revenue obtained before and after subsidies whereby there is an increase with positive mean differences.

There are some challenges that need to be resolved. These challenges include difficulties in reaching (i.e. physical place where markets are located) and getting maize to the market. Most of farmers have associated these two difficulties with absence of nearby market places, buyers setting own prices and lacking information about places where they can get good prices. All three mentioned factors (i.e. absence of nearby market places, buyers setting own prices, and lacking information about places where they can get good prices) leads to inability for a smallholder farmer to achieve profits in farming activities. Looking at each individually; absence of nearby market increases transport cost burden to farmers, loss due to inefficient ways of storing maize – as most of them indicated sack storage which leads to 30 – 40% loss (Suleiman & Kurt, 2015). Buyers setting own prices affect farmers most often, price set by buyers do not put into consideration the total cost incurred by farmers. Farmers who refuse to accept prices offered by buyers are being cheated by buyers who dwindle the amount of maize sold by means of measurements such as using bags that are more than 100 Kgs. Lacking information about places where they can get good prices makes farmers dependent of buyers who are mostly middle-men, these gets richer by taking advantages of farmers unawareness.

These challenges need attention for they demotivate smallholder farmers in producing more maize and also hinder them to reach the goal of being able to buy inputs
at market prices. Although subsidies seem to increase productivity, it implies that farmers may have learnt the benefits of using improved agricultural inputs, reaching this goal of ‘being able to buy inputs at market price’ may be hindered because selling maize cannot generate enough income for farmers to be able to buy unsubsidized inputs. Therefore the government should put in place means of helping farmers to get good prices by convenient means of selling maize.

**Question 2: How does subsidizing agricultural inputs contribute to farmers’ food security?**

The major focus of this question was to assess how subsidy program elevate farmers’ food security through promotion of maize. Most of farmers indicated maize as favorite staple food and its availability is an insurance to their food security and it is a cash crop for generating farmers’ income. Due to subsidy program intervention, farmers who have participated in the program indicated that they are food secure due to increase in maize production, increase in income, and availability of sufficient food. On the other hand subsidies have given farmers an opportunity to increase their capital, and also it provides price relief to buy inputs. This in turn enables farmers to use the money that were meant for input in other activities that improve their lives.

Regarding number of meals eaten per day, farmers in their households are shifting from eating two meals (as indicated by many) to eating three or more meals per day. On average, farmers who were eating few meals per day are now showing improvement by
increasing number of meals per day and the composition of meals is made of at least three foods.

The study also assessed other crops that farmers prefer to grow. Two most common preferred crops were round potatoes and beans. The two are mostly grown for both food and cash. Therefore the goal of achieving improved food in terms of quality and quantity is achieved.

**Question 3: What role does the agricultural inputs subsidy program contribute to post-program usage of improved inputs?**

Question three was stated to connect subsidy program and usage of improved inputs after farmers have graduated from program. As of 2014/2015 agriculture season, the average use amount of seeds used is 7.19 kilograms, basal fertilizers is 43.71 kilograms, and top dressing fertilizers is 60.12 kilograms. These indicates increase compared to the average of 8 kilogram of fertilizers application before subsidy program (World Bank, 2009). Data shows 60% of the farmers who were interviewed uses improved seeds compared to 0.7% farmers who were using improved seeds before subsidy program as reported by DANIDA (2011). Those who did not use improved fertilizer are using animal manure and the reason is they cannot afford the market price for improved inputs.

The rate of fertilizers application among smallholder farmers is affected by farmers who exchange vouchers with money. Observations have revealed that vouchers were given to some farmers who are old age and those who could not afford to pay for
the subsidized inputs (i.e. the amount which is supposed to be co-paid by farmers – market price less the subsidy amount). This problem arises due to lack of education to smallholder farmers especially about reserving some harvest to sustain their household until the next harvest. Absence of stored harvest makes them unable to have favorable means of generating income to buy inputs. When these farmers get the voucher, they sell them to farmers who are well-off who use the vouchers to buy inputs in bulk. Hence the subsidy program may not always benefit smallholder farmers.

**Question 4: What are farmers’ perceptions on how the agricultural subsidies program functioned?**

This question was intended to collect farmers’ perceptions regarding to how the subsidy program functioned. This was assessed by a four point Likert type question, whether subsidy program has improved agricultural activities and open ended questions which gave farmers an opportunity to explain their responses. Generally the opinions of farmers are in favor of the functioning of the program that it have improved agricultural activities, however there are farmers who had negative opinions. They stated that incomplete package and delays in distribution of inputs have hampered the intentions of the program in improving agricultural activities. This is reflected in regional agricultural data (Mbeya Regional Secretariat, 2015) which indicates general increase in production although the projected efficiency (i.e. production per acreage) has not yet fully reached as it was projected in 2008/2009 agricultural season, that after five years (i.e. in 2014/2015) the production - of maize - per hectare would have increased from an average of 2 tons to 3.5 tones; the current production is at 3 tons per hectare which is 86% of the projection.
In the order of priority, farmers have suggested the following: subsidies should be provided in a complete package (i.e. improved seeds, basal fertilizers, and top dressing fertilizers); subsidies should be done earlier to catchup with the agricultural calendar, this will enable farmers to utilize inputs in a full set as per recommended agronomical practices; there should be a means of control to ensure farmers receives subsidies for three consecutive years, the same control should be in place to make sure those who receives subsidies use the subsidies in their farms instead of exchanging vouchers for money.

In the subsidy program, the ultimate beneficiaries are smallholder farmers. Some of the objectives of the program were set with respect to farmers’ behaviors and attitudes after program intervention. Hence their satisfaction toward the program may determine whether the program was a success or otherwise. To assess this, the four point Likert type questions were used and the responses were used to rank the items with the most responses for “agree” and “strongly agree”.

i. The program have helped changing farmers’ attitudes toward the use of improved agriculture inputs. This implies that an outcome\(^2\) intending to increase the use of improved inputs is being achieved.

ii. The program have improved farmers’ knowledge about the use of improved agriculture inputs have improved. This implies that after participating in the subsidy program, farmers now knows the benefit of

\(^2\) Refer to the conceptual framework also were words ‘output’, ‘outcomes’ and ‘goal’ appears, please refer to the same conceptual framework on page 24.
using agriculture inputs. Hence the goal of instilling to farmers the benefit of using improved inputs is also being achieved, this came second in terms of farmers’ satisfaction.

iii. Satisfaction on provision of extension services came on the third place. This implies that subsidy program was coupled with extension service though not to farmers’ expectation. Therefore it suggest that there were a number of farmers who were engaging in agricultural activities by following their old ways of agricultural practices.

iv. Farmers’ satisfaction on the program reaching the intended farmers came the fourth, this may mean there are doubts whether those who benefited from subsidies program were chosen based on criteria set for farmers to qualify for subsidies. One farmer stated “criteria for selecting farmers to be given subsidies should be reviewed, for example it does not make sense giving subsidies to old aged people who are aged to the extent they cannot withstand the demands of manual works that are involved in farming activities. Also by giving subsidies to people who are in destitute poverty is meaningless because they exchange vouchers for money instead of getting inputs and to them it make sense because they do not own land for farming activities”. This in turn deprives eligible smallholder farmers the opportunity to get subsidies. Hence the stated outcome which intended to make agricultural inputs affordable to most of smallholder farmers was hampered.
v. An item 'the objectives of agriculture input subsidies program have been reached received least farmers’ satisfaction. It came the fifth and last in ranking. If subsidies program in Tanzania was meant for smallholder farmers who are not satisfied with the program in reaching the intended farmers, then it is most likely the program is not reaching its objectives. Alternatively, it can be stated that some of the achievement by subsidy program is attributed to farmers whose status were not the primary intent of the subsidy program. This have hampered the outcome that intended for all farmers who received subsidies to be able to buy inputs at market price.

Attitudes to farming as a business was also assessed by using four point Likert questions as explained earlier. Shifting to farming as a business involve elevating from subsistence farming in which farmers produce for own consumptions. Elevating to farming as a business involves the ability to produce enough surplus that can be sold to generate income for immediate consumption and saving for other investments and to meet financial needs. The following has been ranked in descending order:

i. Farmers’ skills on good agronomical practices have improved. This finding could be a result of the program intervention or a result of farmer curiosity in taking initiatives to improve their farming activities with good agronomical practices, farmers can increase production and produce more than it is needed to feed themselves. This enables the outcome which was intended for increased productivity, improving food situation and instill in farmers the attitude of farming for business.
ii. Subsidy programs have improved farmers’ aspiration to farming as a business. There are some hindrance in some places where farmers have indicated difficulties in reaching and getting market for maize and also in some places farmers relies on buyers who set own prices which are not profitable.

iii. Ability to buy input at market price scored relatively low and ranked third, in regards to farmers’ attitude toward farming as a business. The expectation of the program was to have graduate farmers who can stand on own in purchasing inputs, however there have been stated issues which include delays in distribution of subsidies which led to not using improved seeds and basal fertilizers, and incomplete package which is derived (i.e. forcing farmers to use top dressing fertilizers which even if subsidies are delayed, they were distributed when its application time is not yet laid off). These altogether made some farmers who received subsidies not to graduate to the extent of being able to buy input at market price.

iv. Farmers were least agreeable in terms of their ability to produce surplus and sell it for income generation. This can be attributed to not adhering to guidance that were issued in regard to issuing subsidized inputs by using vouchers.

**Implications**

The subsidy program contributed to improvement in agricultural activities to some smallholder farmers. Those farmers who have exited the program after participating
in the program by receiving three vouchers for three consecutive years are considered graduated of the program as it was intended by the government. Others have exited the program with some issues, these issues includes receiving incomplete package (i.e. farmers were not given the three vouchers), and others did not receive vouchers consecutively. These are considered as farmers who have exited the program prematurely contrary to the government intentions. Exiting the program prematurely is an assumed causative of inadequacy in performance of the program in reaching its goals. Inadequate performance is mostly associated with the inability to increase production among smallholder farmers who participated in the program, yet they produce at subsistence level. Producing at subsistence level implies farmers are not producing surplus which can be used for generating income that can be used to meet household’s needs and buying input.

Subsidizing the production of maize have contributed to food security since most foods made of maize makes the daily dish to most of farmers. Farmer responses indicates that food security through maize inputs of the subsidy program is improving. However, the FAO’s definition of food security mentions 'availability of sufficient quantity of quality food at all times (FAO, 2002). By looking at this subsidy program in another perspective, it focus on quantity at the expense of quality which in turn raises the question of balanced dietary requirements. The issue of balanced diet is mostly to farmers who are still not able to produce surplus for income generation that can be used to buy other foods to compliment maize food. The issue of dietary requirements brings attention to the need of diversifying the coverage of subsidies to other crops. To get information
about other crops to be included in the program, farmers were asked to list crops which are currently not under the subsidy program but it is in their wish to be included in program. The list of crops mentioned happened to be those performing better on their respective agro ecological zone in which the wards are located and whereby the weather conditions are favorable to grow them (potatoes and beans)

Basing on current data, the usage of agricultural inputs have increased. Farmers who have fully graduated from the program are using improved inputs more than it was before subsidies program. Findings indicates among the 60 participants who received subsidies, 60% of farmers have used improved inputs in the 2014/2015 agricultural season. The expectation is agricultural subsidies had to enable farmers to buy inputs at market price, however there some farmers who graduated and yet are not capable of buying inputs at market price. The major reasons for this is graduating from the program prematurely leads to some farmers not being able produce surplus.

Farmers stated that delays in distributing inputs hinder them from using improved inputs because they arrive when time to apply them had already passed. These smallholder farmers depends on rain fed agriculture which forces them not to wait for the subsidies to arrive. This situation mostly affects farmers who do not produce surplus that can be sold to generate income.

Seeds are the foundation of farming and therefore farming requires farmers to use pure, healthy seeds as per the minimum certification standard which have standard germination percentage (Lal, n.d.). Therefore, by using locally selected seeds which are
neither quality declared nor certified seeds, farmers will keep on low production. It is of paramount importance to make these inputs available on time and where there are challenges of distributing inputs on time, farmers should be educated to cope with the situation. In this scenario, farmers must learn to be opportunist by taking the subsidies even though they are late and keep them for the next agricultural season. This must be done with great care depending on their respective agro-ecological zones because it may indirectly cause farmers to disregard some agronomical practices that restore nutrients in the soil – such as crop rotation.

Farmers’ perceptions toward the functioning of the program is seen satisfying in some aspects, while others need attention to improve the functioning of the program. Generally there are improvements in farmers’ attitudes toward using improved inputs and they are now knowledgeable on the contribution of improved inputs in increasing yield. This knowledge can be enhanced by strengthening the extension service in each village. Unfortunately, farmers’ satisfaction regarding provision of extension services happens to be among the aspects that scores low. This implies that, probably the component of extension services were overlooked during the setting of the program. This counteract toward reaching the program objectives and it may cause only few farmers to stick to using improved inputs.

The other aspect that requires attention to make the program more functional is reviewing the criteria of deciding who gets subsidies. One of the farmers’ opinion indicates there is no point of giving subsidies to farmers who are old aged, those who are
in destitute poverty, and those who may not have farms to cultivate. They say old-aged farmers and those who are in destitute poverty do not use the subsidies as meant by the program because the old aged do not have the energy to engage in agricultural activities which are mostly manual work; and those in destitute poverty cannot afford to copay for the inputs. To them, these (old aged and very poor farmers) makes up the group of farmers who sells vouchers to earn cash instead of getting inputs. If this is true, then there are possibilities for the program to not reach its objectives because it include farmers who actually gets subsidies and do not use them. The aspect that received least score is the whether the program is achieving its objectives because farmers believes it includes people who claims to be farmers while they are not really engaging in agricultural activities.

Farming as a business begins with farmers’ adherence to good agronomical practices in making sure produces meets standards of the available markets. In ranking, the aspects of farmers’ attitude toward farming as a business; knowledge about good agricultural practices scores highest. However there are farmers who have some difficulties in reaching market places for maize and also difficulties in getting them sold. These difficulties can lead farmers to see no point of adhering to good agricultural practices because the produced maize is consumed locally to fellow residents who do not bother much about quality.

Investments in suitable agricultural inputs is an essential ingredient to farming as business. However farmers’ ability to buy inputs at market price is still an issue to some
farmers. Most of farmers cannot afford to buy inputs at market price which implies they cannot afford available technologies of production to increase yields and eventually they cannot be able to produce surplus. Inability to produce surplus is an indication of persistence subsistence farming with very little or no surplus to generate income. This issue mostly affects farmers who exited the program prematurely.

**Recommendations for Future Research**

Based on methods used in this study, future research is recommended to improve generalizability, coverage and for practice improvement of the program itself. Areas recommended for future research include the following areas:

i. Replicating this study by using a larger sample size that involves farmers’ perspectives to assess the impact of subsidy program to smallholder farmers in places where subsidized crops are highly cultivated.

ii. Conducting research that aims at studying government interventions that contradict recommended agricultural practices. One of the intervention is this subsidy program that support cultivation of maize for three consecutive years. Being consecutive makes farmers not follow recommended practices such as crop rotation which restore nutrients in the soil and controls pest and diseases.

iii. Conduct research to establish groups that are most responsive to subsidy program intervention in terms of technology adoption, increase in yield, improved living of standards, increased incomes and practicing farming as business.
Recommendations for Practitioners

i. Subsidies should be provided to support crops which are farmers’ choice. The use of subsidies should not be dictated by authority on a particular crop rather agro-ecological zone, climate, and farmers preferences. Guidelines should proclaim the primary intention of subsidies, if for example the intentions are for improvement of food security then farmers should be given a degree of freedom in choosing any food crop which is cultivated in their respective agro-ecological zone.

ii. Subsidies should not be limited to one acre of land owned by smallholder farmers, rather be given to sufficient amount of inputs needed by farmers. To reduce and eventually avoid the tendency of farmers who sell to vouchers to those well-off, a need of special subsidies to these farmers arises so that they are not tempted to entice poor farmers exchange their vouchers for money.

iii. There is a need of establishing a database of farmers with respective area of land they hold. This will serve as a control to determine the amount of inputs required by farmers. To further enhance it, extension service should be improved by building the capacity of extension workers to be able to go around supervising and making sure inputs acquired are used as intended and applied in a recommendable rates.

iv. For farmers to be able to use the full package of inputs as recommended, subsidies should be issued on time when agricultural season begins. Farmers must have inputs ready on the onset of the season, tenable them to use improved seeds
and apply fertilizers. This can be achieved by putting into consideration differences in time when agricultural seasons begin.

v. Subsidy program should be in line with sensitizing farmers to be cooperative with common interests, goals and objectives; when farmers are in this sorts of group, it becomes easy to design training materials that best suit their needs. Further, it is easier for farmers to have collective marketing for their produce and have collective negotiation power to sell produce at prices that are profitable.

vi. There should be ways of simplifying availability of market of produce at prices that motivate farmers to produce more. This can be done by the government through National Food Reserve Authority (NFRA) by increasing its capacity to buy maize from farmers at prices which improve the welfare of farmers.

vii. There should be bylaws that govern the whole process of issuing subsidies to farmers. These bylaws will enhance responsibility and accountability to farmers who are recipients, government employees who supervise the operation of the subsidy program, and the agro dealers who supply inputs. These bylaws should clearly state penalties to all who are engaged in misappropriation of any element of the subsidy program.

**Conclusions**

On average, the application of fertilizers in Tanzania was below Sub-Saharan Africa average of 9 kilogram per hectare (DANIDA, 2011). Only 0.7% of maize farmers use improved seeds leading to low productivity by international standard and to Tanzania own potential (World Bank, 2009). It is for that reason, the government of Tanzania
launched subsidy program to raise productivity and hence to improve food security, cope with increasing food price and inputs prices (DANIDA, 2011).

This study assessed the impact of agriculture subsidies by comparing the situation of smallholder farmers before and after subsidies, and also by comparing farmers who received subsidies and those who did not receive it. Farmers who received subsidies are performing better compared to those who did not receive it in terms of yield, and also they are now have increased number of meals eaten per day.

Generally there is an increase in number of farmers who uses improved seeds and fertilizers. On average, farmers in the population of study have increased the use of seeds to 7.19 kilograms, basal fertilizers is 43.71 kilograms, and top dressing fertilizers is 60.12 kilogram. These rates are much higher compared to the sub-Saharan Africa averages as noted earlier. Success in increase of inputs usage have significantly improved maize production. There is about doubled average output, from 5.35 bags before subsidies to 10.10 bags per acre after subsides. Farmers who did not receive subsides produced about the same amount of maize at time 1 and time 2. According to the projection by the URT, subsidies was expected to contribute in increase in yield per hectare from an average of 2 tons to 3.5 tons per hectare. According to Mbeya Regional Secretariat Report, an index for average production of maize per hectare is 3 which is 86% of the projection (Mbeya Regional Secretariat, 2016). Increase in production of maize, which is a staple food, improves food security to the population of study since many farmers believe security is based on stored maize.
Despite the contributions of the subsidy program noted, they can be hampered by not adhering to the guidelines for operation of the subsidy programs. Not adhering to guidelines have victimized some farmers into inability of achieving objectives of the program because they exited the program as premature graduate. Farmers who received subsidies late, incomplete package, and not receiving subsidies for three consecutive years are still underperforming in terms of productivity, income and hence inability to purchase inputs at market prices.
References


http://www.agecon.purdue.edu/academic/agec640/FISP.pdf


http://www.vnrseeds.com/Uploadimage/Article_Importance%20of%20Seed.pdf


http://fsg.afre.msu.edu/inputs/documents/resakss_fertilizer_comparative_countries.pdf


http://ori.hhs.gov/education/products/sdsu/res_des1.htm


http://reliefweb.int/sites/reliefweb.int/files/resources/NonAsciiFileName0.pdf

Appendix A

Correspondence
Recruitment Letter

The Ohio State University
College of Food, Agricultural, and Environmental Sciences
Department of Agricultural Communication, Education, and Leadership

P. O. Box 754,
Mbeya

Dear Participant,

My name is Christopher Lameck and I am a student from the Department of Agricultural Communication, Education and Leadership of the Ohio State University. I am writing to invite you to participate in my research study about the Impact of Agricultural Subsidies to Smallholder Maize Farmers of Mbeya District Council. You’re eligible to be in this study because you received agricultural subsidies for fertilizers and improved seeds. I obtained your contact information from your Ward Executive Officer.

If you decide to participate in this study, you will be requested to complete a short survey which is written in English and will be translated to you into Swahili. This research is part of my master degree studies. You are titled with a 5,000 Tanzanian Shillings as an incentive to participate in this study. Please note, this amount will be given to all participants and it is not based on completion of the survey.

It should be definitive to you that, your participation in this study is completely voluntary. You can choose to be in the study or not. If you’d like to participate or have any questions about the study, please email or contact me at Lameck.L@osu.edu or by using mobile number +255755815171.

Thank you very much.

Yours Faithfully,

C. Lameck
Informed Consent

The Ohio State University
College of Food, Agricultural, and Environmental Sciences
Department of Agricultural Communication, Education, and Leadership

**Study Title:** Impact of Agricultural Subsidies to Smallholder Maize Farmers of Mbeya District Council in Tanzania.

**Researcher:** Christopher Lameck

**Sponsor:** USAID-iAGRI Scholarship

**Participants’ right:**

Your participation in this research is absolutely voluntary and you do not give up any personal legal rights by agreeing to participate. Refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled and subjects may discontinue participation at any time without penalty or loss of benefits.

**Purpose of the Study:**

The purpose of the study is to assess the impact of agriculture subsidies to smallholder farmers. The study will involve collecting information on agricultural productivity, food security, use of improved agricultural inputs, and the farmers’ perception on how the program has generally functioned. As a prospect participant in this study, you are being asked to participate because you are a maize smallholder farmer residing in Mbeya Rural District Council.

**Study tasks or procedures:**

The study will collect information about demographic, agricultural productivity, food security, and your perception on how the program functioned. Only demographic information such as gender, education level, and marital status will be collected. No information that identifies you such as ‘name’, ‘social media ID’, ‘physical address’, ‘email address’ and ‘phone numbers’ will be collected.

**Duration of the study:**
The research study uses a questionnaire administered by an interviewer to you, and the survey will take about 45 to 75 minutes of your time. The survey will be done at a place convenient to you (e.g. at your farm, home, or at the village office), pictures of your farm may be taken.

Confidentiality of participants’ records:

The survey instrument used in this study does not require information that identifies you as a participant. Numbers will be assigned to the questionnaires for ease of reference during data analysis. You may wish to fill in the questionnaire on your own so as to remain anonymous. The completed questionnaires will be kept for four months and destroyed after the analysis is completed by August 2016. The findings form this research will be used for academic purposes, recommendation for agricultural policies, and for practice improvement without any reference to you as a participant. Data collected in this study and the final report will be kept and stored in the Department of Agricultural Communication, Education and Leadership in the College of Food Agriculture and Environmental Sciences of The Ohio State University.

Contacts and Questions

In case you have any questions regarding your rights in this research or any further enquiries about this study, you may contact Dr. Scott Scheer by calling +1 614-292-6758 or email him at scheer.9@osu.edu.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251, +1 614-688-8641, or meadows.8@osu.edu

Incentives provided:

During the survey, you will be given refreshments such as soda and snacks plus a 5,000 TSH equivalent to US$2 depending on the availability of funds. You can withdraw at any time and still receive the stated amount as an incentive.

Sponsor:

This research will be conducted for the fulfillment for the requirement of completion of the master’s degree of science in Agriculture and Extension Education of the Ohio State University. My studies are sponsored by USAID-IAGRI scholarship in which this research is part of it.
Institutional Review Board Approval

Office of Responsible Research Practices
300 Research Administration building
1960 Kenny Road
Columbus, OH 43210-1083
Phone (614) 688-6457
Fax (614) 688-0366
orap.osu.edu

11/18/2015

Study Number: 2015E0521
Study Title: Impact of Agricultural Subsidies to Smallholder Maize Farmers in Mbeba District Council-Tanzania

Principal Investigator: Scott Scheer
Date of determination: 11/18/2015

Qualifying exempt category: #2

Dear Scott Scheer,

The Office of Responsible Research Practices has determined the above referenced project exempt from IRB review.

Please note the following about this determination:

- Retain a copy of this correspondence for your records.
- Only the Ohio State staff and students named on the application are approved as Ohio State investigators and/or key personnel for this study.
- Simple changes to personnel that do not require changes to materials can be submitted for review and approval through BuckIRB.
- No other changes may be made to exempt research (e.g., recruitment procedures, advertisements, instruments, protocol, etc.). If changes are needed, a new application for exemption must be submitted for review and approval prior to implementing the changes.
- Records relating to the research (including signed consent forms) must be retained and available for audit for at least 5 years after the study is closed. For more information, see university policies, Institutional Data and Research Data.
- It is the responsibility of the investigators to promptly report events that may represent unanticipated problems involving risks to subjects or others.

This determination is issued under The Ohio State University’s CHRP Federally Assured #00000637A, Human research protection program policies, procedures, and guidance can be found on the ORRP website.

Please feel free to contact the Office of Responsible Research Practices with any questions or concerns.

Cheri Pettery
pettery.6@osu.edu
(614) 688-0389

https://mail.google.com/mail/u/0?ik=b181f5e032&rd=1
Questionnaire for farmers who received subsidies

1. Participant’s personal information
   1.1. Gender
        ( ) Male  ( ) Female
   1.2. Marital status
        ( ) Married  ( ) Single
        ( ) Divorced  ( ) Widow/Widower
   1.3. Age

   1.4. Education Level
        ( ) None  ( ) O-Level Secondary School
        ( ) Standard 4  ( ) College Level (Certificate)
        ( ) Standard 7  ( ) College Level (Diploma)
        ( ) A-Level Secondary School  ( ) University Level (Degree)

   1.5. How many times did you receive vouchers for agricultural inputs subsidies?
        ( ) Once
        ( ) Two times
        ( ) Three times

   1.6. What input did you used timely i.e. right on time when the agricultural season begin *(put a tick to indicate inputs that were provided to you)*
        ( ) Improved seeds
        ( ) Basal fertilizers
        ( ) Top-dressing fertilizers
        ( ) All the three
        ( ) No input came on time

2. Agriculture productivity after the agriculture input subsidies program
   2.1. Generally, there is improvement in agriculture productivity among smallholder farmers after agriculture input subsidies program?

<table>
<thead>
<tr>
<th>Significantly improved ( )</th>
<th>Improved ( )</th>
<th>Somewhat ( )</th>
<th>Same as Previously ( )</th>
</tr>
</thead>
</table>

   2.2. Please give reasons(s) for your response in 2.1 above? *[refer to answer in 2.1]*
2.3. Please indicate your farm area in acre and give an average production of number of 100 kg bags of maize per acre before subsidies and to after subsidies:

<table>
<thead>
<tr>
<th>BEFORE SUBSIDIES</th>
<th>AFTER SUBSIDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (Acre)</td>
<td>Number of Bags</td>
</tr>
</tbody>
</table>

2.4. Do you produce surplus in your maize harvest? [check whichever applies]

a. Yes ( )
b. No ( )

2.5. If the answer is ‘No” please give reasons

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2.6. How do you store the surplus harvested maize? [see the attached pictures]

- Sack Storage ( )
- Storage Cribs ( )
- Storage Baskets ( )
- Concrete Silos ( )
- Mud Block Silos ( )
- Metal Silos ( )
- Village’s warehouse ( )
- Airtight Plastic Bags ( )
- Underground Storage Pits ( )
- Roof Storage ( )
- Earthenware Pots and Gourds ( )
- Suspension of Crops on a tree or above the fire place ( )
- Warehouse House Receipt System ( )
- Others: __________________________

2.7. Do you sell your surplus maize?
a. Yes ( )
b. No ( )

2.8. Please estimate the number of 100 Kilogram that you sold in a year and the respective revenue

<table>
<thead>
<tr>
<th>BEFORE SUBSIDIES</th>
<th>AFTER SUBSIDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (Acre)</td>
<td>Revenue</td>
</tr>
</tbody>
</table>
2.9. Is it easy to reach maize market place?
   a. Yes ( )
   b. No ( )

   If the answer is ‘No’ please explain
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2.10. Where do you sell the surplus harvest?
   ( ) National Food Reserve Authority ( ) Trade persons
   ( ) Nearby market place ( ) Contractual selling as an out grower
   ( ) Local brewers ( ) Others: ________________________________

2.11. How do you sell the surplus harvest?
   ( ) Sell while on farm ( ) Anytime money is needed
   ( ) Wait until price are high ( ) Others: _______________________

2.12. Is it easy to get market for maize?
   a. Yes ( )
   b. No ( )

   If the answer is ‘No’ please explain
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. Food Security:

   3.1. If you have maize reserve in your household, would you consider your household food secured?
   a. Yes ( )
   b. No ( )

   3.2. Please explain [with reference to your choice in item 3.1.]
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3 Food Security exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (WHO-World Food Summit of 1996)
3.3. Generally, there is improvement in Food Security among smallholder farmers after agriculture input subsidies program.

<table>
<thead>
<tr>
<th>Significantly improved</th>
<th>Improved</th>
<th>Somewhat</th>
<th>Same as previously</th>
</tr>
</thead>
<tbody>
<tr>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

3.4. Please explain your answer briefly with regard to food security *[refer to an answer in item 3.3]*?

3.5. How many times do your household consume maize related foods per week?

<table>
<thead>
<tr>
<th>BEFORE SUBSIDIES</th>
<th>AFTER SUBSIDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>&gt;7</td>
<td>&gt;7</td>
</tr>
</tbody>
</table>

3.6. Comparatively, what was an average number of meals eaten each day before and after agriculture input subsidies?

<table>
<thead>
<tr>
<th>BEFORE SUBSIDIES</th>
<th>AFTER SUBSIDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 meal</td>
<td>1 meal</td>
</tr>
<tr>
<td>2 Meals (Lunch and Dinner)</td>
<td>2 Meals (Lunch and Dinner)</td>
</tr>
<tr>
<td>3 Meals (Breakfast, Lunch, and Dinner)</td>
<td>3 Meals (Breakfast, Lunch, and Dinner)</td>
</tr>
<tr>
<td>More than 3 Meals</td>
<td>More than 3 Meals</td>
</tr>
</tbody>
</table>

3.7. For the past seven days, what was the composition of food in each day that you ate? *(e.g. rice, beans, beef, fruits...give the most recent one)*

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Day 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.8. If you were to choose crops to apply inputs subsidized, which will be those? (Mention according to priority)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Estimated Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. **Post-Program Usage of Improved Agriculture Inputs**

4.1. Did you use improved agriculture inputs last agriculture season?
   a. Yes  (  )
   b. No    (  ) *If the answer is ‘no’, please give reason(s)*

4.2. If the answer in [item 4.1] is ‘yes’ what amount in Kgs of each input did you used per acre?

<table>
<thead>
<tr>
<th>Type of input</th>
<th>Kilogram per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved maize seeds</td>
<td></td>
</tr>
<tr>
<td>Basal fertilizers</td>
<td></td>
</tr>
<tr>
<td>Top-dressing fertilizers</td>
<td></td>
</tr>
</tbody>
</table>

4.3. Do you plan to use improved agriculture inputs in the next agriculture season?
   a. Yes     (  )
   b. No      (  ) *If the answer is ‘no’, please give reason(s)*

4.4. If the answer in [item 4.3] is ‘yes’ what amount in Kgs of each input do you plan to use per acre?

<table>
<thead>
<tr>
<th>Type of input</th>
<th>Kilogram per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved maize seeds</td>
<td></td>
</tr>
<tr>
<td>Basal fertilizers</td>
<td></td>
</tr>
<tr>
<td>Top-dressing fertilizers</td>
<td></td>
</tr>
</tbody>
</table>
4.5. Are you going to keep using inorganic fertilizers and improved seed?
   a. Yes ( )
   b. No ( ) *If the answer is ‘no’, please give reason(s)*

4.6. Farmers’ perceptions on general program’s functioning:

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>The objectives of agriculture input subsidies program have been reached.</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>ii.</td>
<td>Agriculture inputs subsidies program reached the intended farmers.</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>iii.</td>
<td>Extension services were adequately provided to me during subsidies provision</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>iv.</td>
<td>Farmers’ knowledge about the use of improved agriculture inputs have improved</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>v.</td>
<td>My attitudes is now aligned with the use of improved agriculture inputs</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

4.7. Farmers attitude toward farming as a business

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>My skills on good agronomical practices have improved</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>ii.</td>
<td>My aspirations towards farming as a business have significantly improved</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>iii.</td>
<td>I produce more surplus and sell it for income.</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>iv.</td>
<td>I can manage to buy input at market price.</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

4.8. Did agricultural subsidy program have improved your agricultural activities?
   a. Yes
   b. No
4.9. If the answer is ‘No’ in item 4.8, please explain or give your suggestions on how to improve agricultural activities,

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

4.10. How many times would you prefer the subsidies be given to you?

   a. years as it is now
   b. More than three years, Specify ____________

4.11. What crops other than those which have been subsidized would you like to be included for subsidies?

____________________________________________________________________________
____________________________________________________________________________

4.12. What is your overall opinion about how the agriculture input subsidies program has worked?

____________________________________________________________________________
____________________________________________________________________________

THANK YOU FOR YOUR PARTICIPATION

92
Questionnaire for farmers who did not receive subsidies

1. Participant’s personal information
   1.1. Gender
       ( ) Male       ( ) Female
   1.2. Marital status
       ( ) Married       ( ) Single
       ( ) Divorced       ( ) Widow/Widower
   1.3. Age

   1.4. Education Level
       ( ) None
       ( ) O-Level Secondary School
       ( ) Standard 4
       ( ) Standard 7
       ( ) A-Level Secondary School
       ( ) College Level (Certificate)
       ( ) College Level (Diploma)
       ( ) University Level (Degree)

2. Agricultural Productivity
   2.1. Please indicate your farm area in acre and give an average production of number of 100 kg bags of maize per acre before 2008 and to after 2012:

<table>
<thead>
<tr>
<th>BEFORE 2008</th>
<th>AFTER 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (Acre)</td>
<td>Number of Bags</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>

   2.2. Do you produce surplus in your maize harvest? [check whichever applies]
      a. Yes ( )
      b. No ( )

   2.3. If the answer is ‘No’ please explain.

   2.4. How do you store the surplus harvested maize? [see the attached pictures]
      ( ) Sack Storage       ( ) Airtight Plastic Bags
      ( ) Storage Cribs       ( ) Underground Storage Pits
      ( ) Storage Baskets   ( ) Roof Storage
      ( ) Concrete Silos       ( ) Earthenware Pots and Gourds
      ( ) Mud Block Silos       ( ) Suspension of Crops on a tree or above the fire place
      ( ) Metal Silos       ( ) Warehouse House Receipt System
      ( ) Village’s warehouse       ( ) Others:___________________________________
2.5. Do you sell your surplus maize?
   a. Yes ( )
   b. No ( )

2.6. Please estimate the number of 100 kg bags that you sell per year and its respective revenue.

<table>
<thead>
<tr>
<th>BEFORE 2008</th>
<th>AFTER 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Bags</td>
<td>Revenue</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.7. Is it easy to access market for maize?
   a. Yes ( )
   b. No ( )

If ‘No’ give reasons

____________________________________________________________________

____________________________________________________________________

2.8. Where do you sell the surplus harvest?

( ) National Food Reserve Authority
( ) Nearby market place
( ) Local brewers
( ) Trade persons
( ) Contractual selling as an out grower
( ) Others: _______________________

2.9. How do you sell the surplus harvest?

( ) Sell while on farm
( ) Wait until price are high
( ) Anytime money is needed
( ) Others: _______________________

3. Food Security:

3.1. If you have maize reserve in your household, would you consider your household food secured?
   a. Yes ( )
   b. No ( )

3.2. Please explain [with reference to your choice in item 3.1.]

____________________________________________________________________

____________________________________________________________________

4 Food Security exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (WHO-World Food Summit of 1996)
3.3. How many times do your household consume maize related foods per week?

<table>
<thead>
<tr>
<th>Before 2008</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>()</td>
</tr>
<tr>
<td>1</td>
<td>()</td>
</tr>
<tr>
<td>2</td>
<td>()</td>
</tr>
<tr>
<td>3</td>
<td>()</td>
</tr>
<tr>
<td>4</td>
<td>()</td>
</tr>
<tr>
<td>5</td>
<td>()</td>
</tr>
<tr>
<td>6</td>
<td>()</td>
</tr>
<tr>
<td>7</td>
<td>()</td>
</tr>
<tr>
<td>&gt;7</td>
<td>()</td>
</tr>
</tbody>
</table>

3.4. Comparatively, what was an average number of meals eaten each day before 2008 and after 2012 to now?

<table>
<thead>
<tr>
<th>Before 2008</th>
<th>After 2012 to Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 meal</td>
<td>()</td>
</tr>
<tr>
<td>2 Meals (Lunch and Dinner)</td>
<td>()</td>
</tr>
<tr>
<td>3 Meals (Breakfast, Lunch, and Dinner)</td>
<td>()</td>
</tr>
<tr>
<td>More than 3 Meals</td>
<td>()</td>
</tr>
</tbody>
</table>

3.5. For the past seven days, what was the composition of food in each day that you ate? (e.g. rice, beans, beef, fruits... give the most recent one)

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 6</th>
<th>Day 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.6. What other crops do you grow using improved inputs? (Mention in priority)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Estimated Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Improved Agriculture Inputs Usage

4.1. Did you use/buy improved agriculture inputs this agriculture season?
   a. Yes ( )
   b. No ( ) If the answer is ‘no’, please give reason(s)
4.2. If the answer in [item 4.1] is ‘yes’ what amount in Kgs of each input did you used per acre?

<table>
<thead>
<tr>
<th>Type of input</th>
<th>Kilogram per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved maize seeds</td>
<td></td>
</tr>
<tr>
<td>Basal fertilizers</td>
<td></td>
</tr>
<tr>
<td>Top-dressing fertilizers</td>
<td></td>
</tr>
</tbody>
</table>

4.3. Do you plan to use improved agriculture inputs in the next agriculture season?

   a. Yes ( )
   b. No ( ) If the answer is ‘no’, please give reason(s)

4.4. If the answer in [item 4.3] is ‘yes’ what amount in Kgs of each input do you plan to use per acre?

<table>
<thead>
<tr>
<th>Type of input</th>
<th>Kilogram per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved maize seeds</td>
<td></td>
</tr>
<tr>
<td>Basal fertilizers</td>
<td></td>
</tr>
<tr>
<td>Top-dressing fertilizers</td>
<td></td>
</tr>
</tbody>
</table>

4.5. Are you going to keep using inorganic fertilizers and improved seeds?

   a. Yes ( )
   b. No ( ) If the answer is ‘no’, please give reason(s)

THANK YOU FOR YOUR PARTICIPATION