EFFECTIVENESS OF SUBSIDIZED FERTILIZER DELIVERY SYSTEM IN REACHING MAIZE SMALLHOLDER FARMERS IN NJOMBE REGION, TANZANIA

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ABSTRACT

Njombe region which was part of Iringa until 2012, has been receiving subsidized fertilizer since the National Agricultural Input Voucher Scheme (NAIVS) was introduced in 2008. This study aimed at assessing whether targeting subsidized fertilizer through its delivery system to reach maize smallholder farmers was achieved as intended under the NAIVS. More specifically the study was undertaken to determine the level of awareness among farmers regarding their eligibility to subsidized fertilizer in Njombe, identify actors and distribution channels (supply chain) for subsidized fertilizers within the study area and assess farmers' level of satisfaction and factors affecting their satisfaction with the subsidized fertilizer delivery system. A field survey was conducted at Kisilo and Ihalula villages in Njombe district where a total of 123 respondents (including farmers and key informants) were randomly selected and interviewed using a structured questionnaire and a checklist respectively. Study findings showed that there was high level of awareness in the study area on the National Agricultural Input Voucher Scheme (NAIVS) where 81.7 % of the respondents were aware of the programme. Moreover awareness on eligibility criteria was also high in the study area by 51.7%. Cross tabulation was performed to establish the relationship between farmers' level of satisfaction across their socio-demographic characteristics. Sex of the farmer was the only variable that was statistically significant ($\rho<0.05$). Regarding the supply chain of subsidized fertilizer, results indicated low diversification of distribution channels of subsidized fertilizer in the study area. A binary logistic regression model was used to assess farmers' satisfaction with subsidized fertilizer delivery system. Availability of subsidized fertilizer was statistically significant ($\rho<0.05$). Based on the findings, the following recommendations are made: (i) When programmes such as NAIVS are introduced by the government, awareness creation to

intended groups of beneficiaries is of paramount importance to allow for the targeted goals to be achieved (ii) In formulating programmes such as NAIVS, there is need for the government to monitor and evaluate all procedures of the delivery system. The government may in most cases be compelled to introduce implementation control systems.

DECLARATION

I, Martha Charles Kikwa, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

_____ _____

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The above declaration is confirmed by;

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Dr. Daniel Ndyetabula Date

(Supervisor)

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DEDICATION

To my lovely parents CHARLES AND ANNA KIKWA and my son ADRIEL MSHANA.

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ACRONYMS AND ABBREVIATION

ACT	Agricultural Council of Tanzania
Ag. GDP	Agricultural Gross Domestic Product
AU	African Union
FAO	Food and Agriculture Organization of United Nations
GDP	Gross Domestic Product
IFM	International Monetary Fund
MALF	Ministry of Agriculture Livestock and Fisheries
MU	Marginal Utility
NAIVS	National Agricultural Input Voucher Scheme
NMB	National Microfinance Bank
SACCOS	Savings and Credit Cooperatives
SAEBS	School of Agricultural Economics and Business Studies
SAP	Structural Adjustment Progamme
SPSS	Statistical Package for Social Sciences
SSA	Sub Saharan Africa
SUA	Sokoine University of Agriculture
TBS	Tanzania Bureau of Standards
TFC	Tanzania Fertilizer Company
TPRA	Tanzania Pesticides Regulatory Authority
TRDB	Tanzania Rural Development Bank
URT	United Republic of Tanzania
VVC	Village Voucher Committee
WB	World Bank

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The use of agricultural inputs is fundamental in modern agriculture. It constitutes primary ingredients of the green revolution that swept through Asia and Latin America during the period of 1960s and 1970s and passed through some parts of Sub-Saharan Africa (SSA) (Isinika, 1998). In SSA, the contribution of Agricultural Gross Domestic Product (Ag.GDP) to economies has remained significant, above 10% as shown in Table 1.

Table 1: Share of Gross Domestic Product in Sub Saharan Africa

	2005	**2006**	**2007**	**2008**	**2009**
Agriculture	16.9	16.4	15.4	12.4	12.7

Source: World Bank (2010)

In 2016, the Food and Agriculture Organization of the United Nations (FAO) reported that the agricultural GDP on average contributed 15% of the national Gross Domestic Product (GDP) in SSA and that the sector has been growing from 3% to 50% per annum on average. With such share and positive growth rate of agricultural GDP, some improvements in agricultural performance such as higher commodity prices have been observed in the last two decades (Maene, 2000). In spite of the importance of agriculture to the development of economies in the SSA, the sector is still highly underfunded. For example, agriculture accounts for less than 4% of annual budgets for many countries in SSA such as Tanzania. As a result, countries in SSA experience very low use of agricultural inputs (Crawford *et al.,* 2006) that is highly associated with low productivity

mismatching with the apparent food demand. In 2002/3, farmers in SSA used on average 9 kg of fertilizers per ha compared to farmers in South Asia, Southeast Asia and Latin America who used 100 kg per ha, 135 kg per ha and 73 kg per ha respectively (Baltzer, 2011). To increase the level of input use many countries around the world have resorted to providing subsidies for input acquisition.

In SSA, the performance of fertilizer subsidies in the pre-reform period (Prior to the mid-1980s) was disappointingly low (Skarstein, 2005). Although there was some success in increasing fertilizer use and food production after the reforms, a review of the performance of agricultural input subsidies in some countries such as Malawi showed that improvements in yields, in subsidy intervened areas were very limited (Chinsinga, 2010). Due to poor performance of previous agricultural subsidies, new subsidy programmes began to emerge in several African countries such as Nigeria in 1997, Malawi in 1998, Zambia in 2000, Tanzania in 2003, Kenya in 2006, Ghana, Rwanda, Mali and Senegal in 2008 (Banful, 2011). In 2006 the Africa Fertilizer Summit under the auspices of the African Union (AU) was hosted in Abuja (Nigeria) where African Union (AU) member states set out goals and commitment to increase fertilizer intensity to an average of 50 kg per hectare by 2015 (Banful, 2011). The average fertilizer application in SSA has been increasing in the past years after the Abuja Declaration, whereby in 2008 the average application was 6-7 kg per hectare to 11 kg per hectare in 2014 (World Bank, 2017). Reaching Abuja's target is a priority for most African agricultural developments and requires joint efforts from all stakeholders.

In Tanzania fertilizer subsidies were first introduced in 1975 and continued for ten years until 1984. During the mid 1980s agricultural markets were liberalized, price controls and

input subsidies were removed while public enterprises were privatized. By 1995 all subsidies (direct and indirect) were completely removed in order to conform to the market economy (Isinika *et al.*, 2003).

The removal of subsidies was followed by a period of declining levels of agricultural input use, hence declining productivity and production, especially for maize in the big four regions of the Southern Highlands namely Ruvuma, Mbeya, Iringa and Rukwa (URT, 2013). Consequently, the subsidy was restored in 2003/4 to support technology adoption by smallholder farmers in the country (Isinika *et al.*, 2003) and respond to prevailing high prices of food and fertilizer (Edward, 2013). Under the renewed subsidy programme, initially the subsidized inputs were supplied at the district level and below (divisions, wards and villages) by selected dealers. This was done to enable any farmer to access the subsidized input, buying at a lower price than the market rates. Initially in 2003, the subsidy was on transport cost for fertilizer up to the regional level (Lameck, 2016). Maize and sorghum seeds were added in the year 2005 while pesticides and herbicides were added in 2006 (Isinika and Msuya, 2016).

It was then realized that poor members of the farming community were not getting the inputs as intended. In 2008 the government launched the National Agricultural Input Voucher Scheme (NAIVS) to cover the setback experienced in the previous subsidy programmes and in 2009 the scheme was up-scaled. The subsidy level under NAIVS was up to 50% of the costs for two 50 kg bags of basal and top dressing fertilizer and 10 kg bag of improved seeds. This subsidy programme was administered as a market smart input programme which aimed at intensifying food production in high agro-ecological potential areas for producing the main staple foods in the country; maize and rice (URT, 2013). The

NAIVS employed a voucher system whereby vouchers were distributed to targeted farmers under eligibility criteria as stated by the scheme. Three vouchers were offered to a targeted farmer; one for seed, one for basal fertilizer and another for top dressing fertilizer. The recipients were expected to pay in cash 50% of the cost to top up for the full cost of the subsidized package they receive. Once selected to join a subsidy scheme, farmers were to receive the support for three years after which they were expected to graduate from the scheme, assuming that they will have acquired enough experience and income to continue purchasing fresh seed and fertilizer from the market (URT, 2012).

Despite such efforts to promote higher rates of agricultural inputs use, studies show that in Tanzania the level of adoption of agricultural technologies is very low. Only about 12% of farmers use mineral fertilizers (Hepelwa *et al.,* 2013), which is far below that of other countries in Africa with similar conditions. In comparison farmers in Malawi and South Africa used 27 kg and 53 kg respectively while other regions like Latin America, Asia and Western Europe used even higher levels of 41 kg, 85 kg and 225 kg respectively.

This brief discussion shows the government has been making various efforts to improve crop production by supporting agricultural subsidy schemes. The administration of subsidies in Tanzania has been changing over time consistent with the prevailing political and economic conditions in order to address challenges of administering the subsidy and promoting equity. Yet the levels of fertilizer use and the proportion of adopting farmers remain very low.

1.2 Problem Statement

The blue print for development in Tanzania the Tanzania Development Vision 2025 states that by 2025 Tanzania will become a strong, diversified and competitive economy (URT,

1999). Agriculture is one of the sectors envisaged to facilitate achieving that goal. Formulation and execution of agricultural subsidy programmes such as NAIVS is one of the strategies (Bumb *et al.,* 2003). By re-introducing the input subsidy programme in 2003/4, the government of Tanzania intended to increase the adoption of improved fertilizer and seed among smallholder maize farms, in order to raise productivity and improve food security (Hepelwa *et al*., 2013). The subsidies were particularly intended to reach poor smallholder farmers as primary beneficiaries. However, it has been reported that this objective (reaching poor smallholder farmers) has not been achieved due to several problems (Hepelwa *et al.*, 2103). There have been some negative practices and outcomes in delivering the subsidy example late delivery of the inputs, poor quality of the fertilizer and so forth. Corruption has been a leading constraint, where benefits of the subsidy system were largely captured by a few powerful members of society, such as; government officers, village voucher committees, agro-dealers, financially able farmers and politicians due to most poor farmers not being able to afford the 50% share of the input cost and in some cases not being aware of the eligibility criteria and benefit of the subsidized fertilizer (Aloyce *et al.,* 2014). Therefore corruption being a leading constraint, targeting has not been effectively achieved in most areas receiving subsidies.

Different studies have been conducted in different regions of Tanzania to assess the impact of subsidies on farm productivity as well as on farmers' welfare. For example Kato (2013) conducted a study in Ruvuma to assess the impact of agricultural input subsidies on poverty in Tanzania; Edward (2013) conducted another study in Morogoro to examine the impact of NAIVS on rice production at Kiroka Irrigation Scheme. Another study was conducted by Mng'olage (2008) in Mbeya Rural to evaluate the subsidy fertilizer distribution to smallholder farmers. Although in some instances findings of these studies

revealed common administrative and operational anomalies in distribution of subsidized fertilizers, other findings are specific to contexts within which such studies were conducted. This study is set out to assess the delivery system of subsidized fertilizer under NAIVS in relation to targeting among maize smallholder farmers in Njombe.

1.3 Justification of the Study

Njombe region was established in March 2012. Having previously been part of Iringa region, most of the data and analysis on agriculture and other aspects have therefore been done under Iringa region. As such there has been limited analysis of agriculture focusing exclusively on Njombe region. This region is among the leading maize producing area in the country competing for resources with other Southern Highlands regions. This study intended to fill the geographical gap on fertilizer subsidy and based on the findings they are intended to inform planners and leaders to improve future administration and operation of agricultural subsidy programmes especially in relation to targeting poor farmers.

1.4 Objective of the Study

1.4.1 Overall objective

The overall objective of the study was to assess the effectiveness of subsidized fertilizer delivery system in Njombe region, Tanzania.

1.4.2 Specific objectives

The specific objectives of this study were:

(i) To assess the level of awareness among farmers regarding their eligibility to subsidized fertilizers in the study area.

(ii) To identify actors and distribution channels (supply chain) for subsidized fertilizers within the study area.

(iii) To assess farmers level of satisfaction and factors affecting farmers' satisfaction with services of the delivery system for subsidized fertilizer in the study area.

1.4.3 Hypothesis

The null hypothesis derived from question three states;

Ho: The input supply system characteristics and the farmers' socio-demographic characteristics have no influence on farmers' level of satisfaction with the input delivery system. .

Mathematically the null hypothesis is represented as follows

Ho:$\beta_{ij} = \beta_{ij} = \beta_{ij} = \cdots \ldots \ldots = \beta_{nj}$;

For i = 1, 2, 3, ……,120 = n the number sampled farmers

j = 1, 2, 3, ….p are the input supply system characteristics influencing satisfaction levels.

Where β_{ij} = the coefficient associated with input supply system characteristics

1.5 Organization of the Dissertation

The dissertation is organized in five chapters; Chapter 1 describes the introduction that covers the background information, problem statement, objective of the study, research questions and hypotheses, Chapter II reviews relevant literature related to the study and provides an overview of the National Agricultural Input Voucher Scheme in Tanzania (NAIVS). The methodology is covered in Chapter III while results of the study are discussed in Chapter IV. Chapter V presents the conclusion and recommendations based on the findings.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Access to modern agricultural inputs by farmers is crucial for high productivity to ensure household food availability and national food security. Agricultural inputs range from improved seeds, fertilizers and chemicals for crop protection as well as machinery; irrigation infrastructure and knowledge (Sahel, 2014). Fertilizers supply plants with nutrients and thus are essential for growth. In terms of value, farmers often require a higher value of fertilizer compared to other agricultural inputs. At the macro level (national and global) increased production resulting from fertilizer use brings political stability, improved quality of life and higher living standards due to increased income (Sahel, 2014). Food availability also brings about global political stability. Considering the importance of agricultural inputs, the subsidy programme which was restored in 2003/4 and improved under NAIVS in 2008 should be assessed in order to inform any subsidy initiatives in future.

2.2 Definition of Subsidy

The Cambridge dictionary (2016) defines a subsidy as money given as part of the cost of something, to help or encourage it to happen. A subsidy is also defined as assistance to a business or economic sector for producers. In development context, a subsidy can be defined as a payment made from public resources that reduce the price a buyer pays for a good or service below the actual price which the seller requires.

A subsidy can also be termed as a negative tax whereas the effect on the quantity produced and the quantity consumed is just the opposite of the effect of a tax (Takeshima and Lee,

2012); that is instead of reducing consumption as a tax would, a subsidy increases the quantity demanded, hence the amount demanded, since the effective price is lower. Most subsidies are set in place by the government for producers or are distributed as subventions in an industry to prevent the decline of that industry (Todaro and Smith, 2009). After reciting these definitions, the next section reviews the history of subsidies in Tanzania.

2.3 Historical view on fertilizer subsidies and the National Agricultural Input Voucher Scheme in Tanzania (NAIVS)

During the mid-1980s agricultural markets were liberalized where price controls and input subsidies were removed to minimize their fiscal constraints (Skarstein, 2005). The Tanzania Fertilizer Company (TFC) and Tanzania Rural Development Bank (TRDB) were responsible for fertilizer supply and distribution in Tanzania before economic liberalization, whereby TRDB was responsible for providing credit for fertilizers on crops, which were covered under crop production credit programme and TFC was responsible for distributing domestically produced fertilizers and fertilizer imported through commodity aid while TRDB distributed fertilizer through cooperative unions (Nguruse, 2008).

During the early 1990s as part of the Structural Adjustment Programme (SAP), the government started to phase out subsidy. The subsidy was phased out over a five year period. Initially it was reduced during the 1990/91 agricultural season by 70%. Subsequent reduction occurred in 1991/92 by 55%, in 1992/93 by 40%, in 1993/94 by 25% and was zero rated (0%) in 1994/95 (Skarstein, 2005). This means fertilizer subsidies were completely removed by1995 as part of the International Monetary Fund (IFM) economic liberalization policies since it was recommended by the World Bank (WB) that

agricultural subsidies were causing economic inefficiencies. The main argument from the IMF and WB for abolishing subsides was that government interference in the fertilizer markets was constraining supply by the private sector (Lameck, 2016). Thereafter, the nation experienced a period of declining productivity and production (Isinika *et al.*, 2003).

To address this decline, in 2003/4 the government re-introduced the subsidy programme for inputs to support technology adoption by smallholder farmers because utilization levels of improved agricultural inputs in Tanzania had declined to very low levels by national and international standards (URT, 2013). The programme was implemented through subsidizing transport for companies that were directly involved in the distribution process. This was done to reduce input cost below the market price to all farmers. This arrangement was however reported to face several shortcomings. Farmers reported that subsidized fertilizers were exhausted early at shops designated as subsidized input suppliers. Most farmers therefore ended buying the inputs at the market price or not buying at all if they could not afford the market rate (Lameck, 2016). Other problems related to smuggling subsidized inputs to neighboring countries, late delivery of inputs, re-bagging subsidized fertilizers in warehouses and quality deteriorating of the inputs. Many of the targeted farmers could not easily access the inputs under the programme's modalities because it was difficult to identify beneficiaries and non beneficiaries (Aloyce *et al*., 2014). Following these constrains experienced by the 2003/4 subsidy programme, the government launched another programme in 2008.

In 2008 with support from the World Bank, the National Agricultural Input Voucher Scheme was launched as a smart-market subsidy for providing small scale famers'access to critical agricultural inputs like fertilizer and improved seed at a 50% subsidy (URT,

2013). The programme was piloted in 2008 and scaled up in 2009, being implemented by the government (Mwaijande, 2013), aiming to raise production of maize and rice and hence improve farmers' income and national food security.

As an implementation strategy, vouchers were distributed to beneficiaries through the Local Government system. The beneficiaries (farmers) used the voucher to acquire and use more fertilizer (i.e. in addition to what they bought without the subsidy), thereby increasing their production, income and living standards (URT, 2014). The vouchers were issued to the Village Voucher Committee (VVC) who was responsible for distributing them to targeted and eligible farmers. The voucher recipients were then entitled to buy inputs from agro-input dealers at a subsidized price (URT, 2014). The subsidy programme was scheduled for implementation over a three year period after which there would be an exit mechanism (URT, 2014). Thereafter, former beneficiaries were expected to have become converted adopters such that they would continue to buy fertilizer at market prices.

The Ministry of Agriculture Livestock and Fisheries (MALF) reported that the NAIVS program was constrained with several factors example late delivery of inputs, late delivery of vouchers, farmers not being aware of eligibility criteria and thus leads to recipients being in the programme for more than three years, moreover benefits of the programme where captured by powerful members of the village and therefore targeting could not be easily achieved (URT, 2014) and thus making it difficult for the subsidy to reach the poorest household as per its objective. Due to these problems in 2014/15 the voucher system was stopped by the government and replaced with a loan system (URT, 2014). The government initiated a strategic plan to supply subsidized fertilizer through loans which

were issued to farmers groups who produce maize and rice. This system was to serve 999 926 households, 121 local councils and 24 regions in Mainland Tanzania. Loans were issued through commercial and community banks who signed a contract with farmers groups to enable them to buy agricultural inputs from agro-dealers. After this agreement, farmer groups were required to open an account with the respective bank where they would pay 20% as fee for the agricultural inputs and in return the bank would facilitate other expenses for acquiring the agricultural inputs from an agro-dealer of their choosing. In 2015/16 the government decided to revert to NAIVS since the loan system was unsuccessful due to hastened process of implementation without much preparation (URT, 2015).

Generally, the subsidy system in Tanzania has been changing from time to time, but its primary goal, which is to reach the poorest farmers, has not changed over the years. The next section discusses on targeting of input subsidy in general and how it was implemented under NAIVS.

2.3.1 Targeting of beneficiaries

The National Agricultural Input Voucher Scheme primarily targeted poorest farmers who had limited experience of using improved seeds and fertilizers, but they had other farming resources such as land and labour so as to improve farmers' income, livelihood and overcome poverty (URT, 2013). The NAIVS set a number of criteria that a farmer has to meet in order to qualify as a targeted subsidy recipient. The criteria include;

(i) Willingness and ability to co-finance half the cost of the voucher inputs.

(ii) Full time resident in the village.

(iii) Willingness to use the provided inputs.

(iv) Not own more than 1 hectare (2.5 acres) of land.

(v) Exiting the programme after 3 years.

Targeting is important so as to reach farmers who will bring the intended outcome of improving production, food security and income to a large proportion of the population and also to direct resources to the less privileged category of farmers so as to bring about equity. This intention has been met in some areas, Kato (2013) reported that the distribution of the voucher system for subsidized inputs has shown a positive impact in Ruvuma region, especially in Songea and Tunduru districts where the production of maize increased, and it has been associated with increased cash income and improved living standards. However, in some parts of the country, targeting was not so successfully achieved.

A baseline survey that was conducted for NAIVS in 2010 and a follow up survey in 2012 revealed that there was inconsistency relating to targeting, where 62% of those who received vouchers were not eligible. Moreover, the rules of targeting were not clearly stated to the beneficiaries and administrators, hence they were poorly enforced (Patel, 2011). This made it difficult to achieve the primary goal of reaching the poor resource farmers. Apart from vouchers being issued to ineligible farmers, bribery was also reported as a setback to the programme (Patel, 2011; URT, 2013).

Farmers were bribed by agro dealers to sign vouchers without receiving any inputs in return (Patel, 2011). In the case of Southern Highlands, 2.4% to 2.7% of the previous subsidy beneficiaries reported to have paid something in order to remain in the programme (Patel, 2011). Similar constrains have been experienced by other African countries with subsidies programmes example Malawi and Ghana as shown in the next paragraphs.

According to Holden and Lunduka (2010) based on a study in Malawi it was reported that targeting had failed to reach many of the poorest households. The targeting criteria provided by the Malawian Ministry of Agriculture and Food Security were not equally and clearly stated, that led to a mix up in their interpretation, making it impossible to successfully achieve the intended targeting. Houssou *et al*., (2017) also reported that in Ghana, the main beneficiaries of the subsidized fertilizers are larger scale and wealthier farmers even though the primary goal was to target smallholder farmers. They further report that effective targeting can improve effective use of the subsidized fertilizer by the intended beneficiaries, however targeting entails significant transaction cost and may even be infeasible in some cases.

In most developing countries such as Tanzania, the primary beneficiaries of subsidy programmes are the resource poor smallholder farmers. Targeting has been revealed as a challenge in most programs, but the question arises; Are these targeted farmers aware of their eligibility in becoming beneficiaries?

2.3.2 Farmers' awareness on NAIVS and access to subsidized inputs

While the government's intention to introduce the subsidy was good (to achieve high productivity of maize and rice production while also achieving equity and poverty reduction), administration of the subsidy proved to be tricky, such that, subsidized fertilizers did not reach the intended beneficiaries and if it did, they did not use the inputs for the intended crops as stipulated in the agreement. In some cases, targeted farmers could not access the inputs under the programmes due difficult administrative modalities. A study by Malhotra (2013) on the National Agricultural Input Voucher Scheme (NAIVS 2009-2012) reported that out of the entire1863 surveyed household (51% beneficiaries and

49% non-beneficiaries) 93% were aware of the programme and were able to explain that the programme provided farmers with vouchers to buy fertilizer and seeds. However about half (50%) of the respondents were unaware that they were also eligible to receive the vouchers since they did not know the eligibility criteria.

According to Isinika and Msuya (2016) citing Patel (2011) and URT (2013) reported a higher level (98%) of awareness about the programme in general in the Southern highlands, however, only 6% of the respondents were aware of NAIVS three year duration of the programme during the baseline study in 2010 and only 43% were aware of the targeting criteria. The level of awareness regarding these specific facts of NAIVS had risen 22% and 51% respectively by 2012 (URT, 2013). Low awareness about specific aspects of the voucher scheme proved to be a hindrance in achieving intended goals.

For instance, Kato (2013) reported about collusion between farmers and agro dealers to sell the vouchers, attributed to two main factors; farmers were either not aware of the importance of using improved inputs for their production or they had other pressing needs. Hence, they sold signed vouchers back to the agro-dealers at a cheaper price, whereas the agro-dealers could sell the subsidized inputs to any farmer at a higher price.

A study by Howale *et al.* (2015) in India (Western Maharashtra) on government subsidies, demonstrated a high level of awareness and participation. The study revealed that about 73% of the surveyed farmers were aware about subsidies provided by the government but the proportion of beneficiaries participating in the subsidy scheme was 67%, which implies that only 6% of the respondents were unable to get benefits of the subsidies. Moreover, most of the respondents were aware about the advanced fertilizers, but due to shortage of funds, they were unable to use the resources. The subsidy helped them to apply

input rates consistent with their actual demand. Late delivery of inputs has also been reported as a problem under the NAIVIS.

2.3.3 Timely delivery of vouchers

Besides the problem of poor targeting, there has been the problem of untimely delivery of vouchers and inputs to targeted beneficiaries. The Agricultural Council of Tanzania (ACT, 2007) reported that the main channel for fertilizer supply to farmers is through the government subsidy programme, however different distribution systems were identified in Songea and Kilombero where the study was conducted. These distribution systems included; Savings and Credit Cooperatives (SACCOS) for Songea district and selected stockists for Kilombero district. Through these channels, wholesalers and stockists were found to be the weakest links in the fertilizer supply chain because they were financially weak and their managerial capability was not effective in handling their functions in the chain. Farmers have faced serious problems in identifying reliable sources of the inputs and markets for their crops due to information asymmetry among actors and between actors and service providers. Furthermore late delivery of inputs was reported due to bureaucratic and administrative processes since only 30% of the perceived needs were met by the subsidy programme.

A review of NAIVS shows that vouchers were delivered on time for the first two cropping season (2008/09; 2009/10) but in the 2011/12 season vouchers were delivered late due to delay by the MALF (Edward, 2013). During the seasons 2010/11 and 2011/12 vouchers arrived so late that it was difficult for farmers to use the inputs since they had already planted (Malhotra, 2013). Aloyce *et al.*, (2014) similarly revealed that 88% of the surveyed household did not receive the inputs on time and about 68% of the vouchers

were delayed for more than seven weeks. Some of the reasons for the delay as well as other problems of the input delivery system are better analyzed in the context of the input supply chain.

2.4 Fertilizer (Agricultural Input) Supply Chain

Sayeed (2013) defined a supply chain as the active management of supply chain activities and relationships in order to maximize customer value and achieve a sustainable competitive advantage. A supply chain consists of all parties involved directly or indirectly in fulfilling a customer's request. A supply chain includes not only manufactures and suppliers but also transporters, warehouse, retailers and even customers themselves. The primary purpose of a supply chain is to satisfy the customers need and in the process generate profit for actors and service providers. A supply chain involves different stages of the transactions involving; customers, retailers, wholesalers/distributors, manufactures and raw material suppliers whereby each stage is connected through the flow of products, information and funds (Chopra, 2010).

The supply chain for subsidized fertilizer starts at the port of Dar es Salaam because the port acts as a check point in the supply of fertilizer into the country where the fertilizer is unloaded and bagged after been imported. Fertilizer for Tanzania is obtained from international producers of Nitrogen, Phosphate and blended NPKS fertilizer which are in Western Europe, the Persian Gulf, Russia and North America. There are a number of companies in Tanzania that deal with wholesaling and importation of fertilizer. In 2010/11 only three companies were consistently importing fertilizer to Tanzania namely YARA, Premium Agro-chemical and Export Trading Group, while other companies dealt with wholesaling of the fertilizer, but these companies vary to what extent they specialize in

fertilizers (Mng'olage, 2008). Table 2 presents small companies and big companies in specializing in fertilizer distribution in Tanzania.

Table 2: Firms specializing in fertilizer business

Small firm specializing in fertilizer business	Big firms specializing in fertilizer business
	1. Premium Agro-chemical
1. DRTC	2. Shival Tank & Company Ltd.
2. Mohammed Enterprises	3. Export Trading Group
	4. YARA
	5. MEA Ltd.
	6. Tanzania Fertilizer Company (TFC)

Most of these importers and wholesalers with exception of YARA have depots in the principal farming areas of the country primarily in the Southern Highlands (Benso *et al.*, 2012). After unloading from the port, fertilizer is inspected and ready for transportation to storage facilities in the regions. At the regional level, fertilizer is then distributed to wholesalers/ agro-dealers who are selected by the government to distribute the fertilizer to intended households/beneficiaries. Wholesalers/ agro-dealers can directly distribute the fertilizer to farmers or use agents of their choosing to distribute the fertilizer within wards and villages on their behalf.

2.5 Analytical Issues

Different approaches have been use to analyze the issue of targeting agricultural subsidies among smallholder farmers. Mason *et al*. (2013) on "A Review of Zambia's Agricultural Input Subsidy Programs: Targeting, Impacts and the way forward" used the Tobit

regression model to analyze the issue of targeting in terms of who receives a significant share of the subsidized fertilizer. Results revealed that household with larger holdings got a significantly larger share of subsidized input. Moreover results showed that targeting subsidized fertilizer is mostly directed to households with more assets (non-land). Another interesting finding was that female headed households did not receive more fertilizer during the early years of the Fertilizer Input Support Programme (FISP) but in 2010/11 they received an average of 13 to 14 kg of subsidized fertilizer more than male headed households. In conclusion, the findings point out that majority of the FISP is not allocated to the poorest households but rather to households that cultivate more land. Such households are likely to fall above the poverty line. Hence facilitating them to receive all the benefits of the subsidy while the poorest farmers continue to live in poverty goes against the basic objective of targeting for promoting equity and accelerating poverty reduction.

Holden and Lunduka (2010) in their study on the "Impacts of Fertilizer Subsidy Programme in Malawi: Targeting, Household Perceptions and Preference" employed descriptive statistics on a sample size of 376 respondents to analyze the extent to which poor rural households benefit from targeted fertilizer and seed subsidy programme by receiving coupons for seed and fertilizer that they were able to use to boost their farm production and enhance their food security, income and build up assets. Indicators they used for this analysis included; (a) percent of fertilizer coupons received, (b) average number of received coupons, (c) percentage of recipients that used all their coupons to obtain fertilizer, (d) percentage of households that received seed coupons and (e) amount (Kg) of maize seeds received for those who received. Their results revealed that the wealthier and better connected farmers were most likely to obtain fertilizer coupons than

the poorest farmers who were initially the primary beneficiaries. The study therefore recommended that fertilizer coupons should be clearly targeted towards households that are too poor to buy commercial fertilizer and towards geographical areas where commercial production of fertilizer is less developed.

2.6 Conceptual Framework

The utility theory purports that the utility an individual gets from a good or a service is a measure of the satisfaction that the consumer will derive from the consumption of that particular good or service (Aumann, 1962). Utility can further be defined as a measure of preferences over some set of goods and services (Fishburn, 1970). Maize smallholder farmers aim at maximizing the utility they get from the services provided to them through the delivery system of subsidized fertilizers. Bordley and Kirkwood (2004) expalined that the utility maximization model is built upon the assumption that consumers are rational and will try to get the most value for their money.

More often, consumers have a budget constraint because their income is limited and their individual resources are also limited. The theory assumes that consumers have a clear preferences for various goods and services, thus they know their marginal utility (MU) for each successive units of the product they consume. Also, every item has a price tag where consumers must choose among alternative goods with their limited incomes. According to Gilboa *et al.* (2009), the utility maximization rule states that consumers decide to allocate their cash incomes so that the last shilling spent on each product purchased yields the same amount of extra marginal utility across goods or services consumed. This study side with Rahm and Huffman (1984), and discuss further in section 3.4.2 whether or not a farmer is satisfied with the fertilizer delivery system

The causal relationships, transmission mechanisms and underlying factors defining the effectiveness of a delivery system for subsidized inputs is depicted using the conceptual framework shown in Fig. 1. The framework shows how farmer's satisfaction is affected by various factors that are necessary for an effective production process. For the fertilizer delivery system to be effective famers need to be aware of the system which provides them with services and also awareness on eligibility criteria that entitles them to enjoy benefits of the system. Moreover effective distribution of the inputs to farmers must be attained. Effective distribution will be achieved properly when; agricultural inputs are delivered on time to the targeted beneficiaries, easily accessible, available to farmers, high quality of the agricultural inputs so that farmers can enjoy the benefits from improved yields and lastly the expected quantity of subsidized fertilizer provided to the farmers by the government. When an effective distribution is operating, a farmer will be highly satisfied with the services provided by input suppliers.

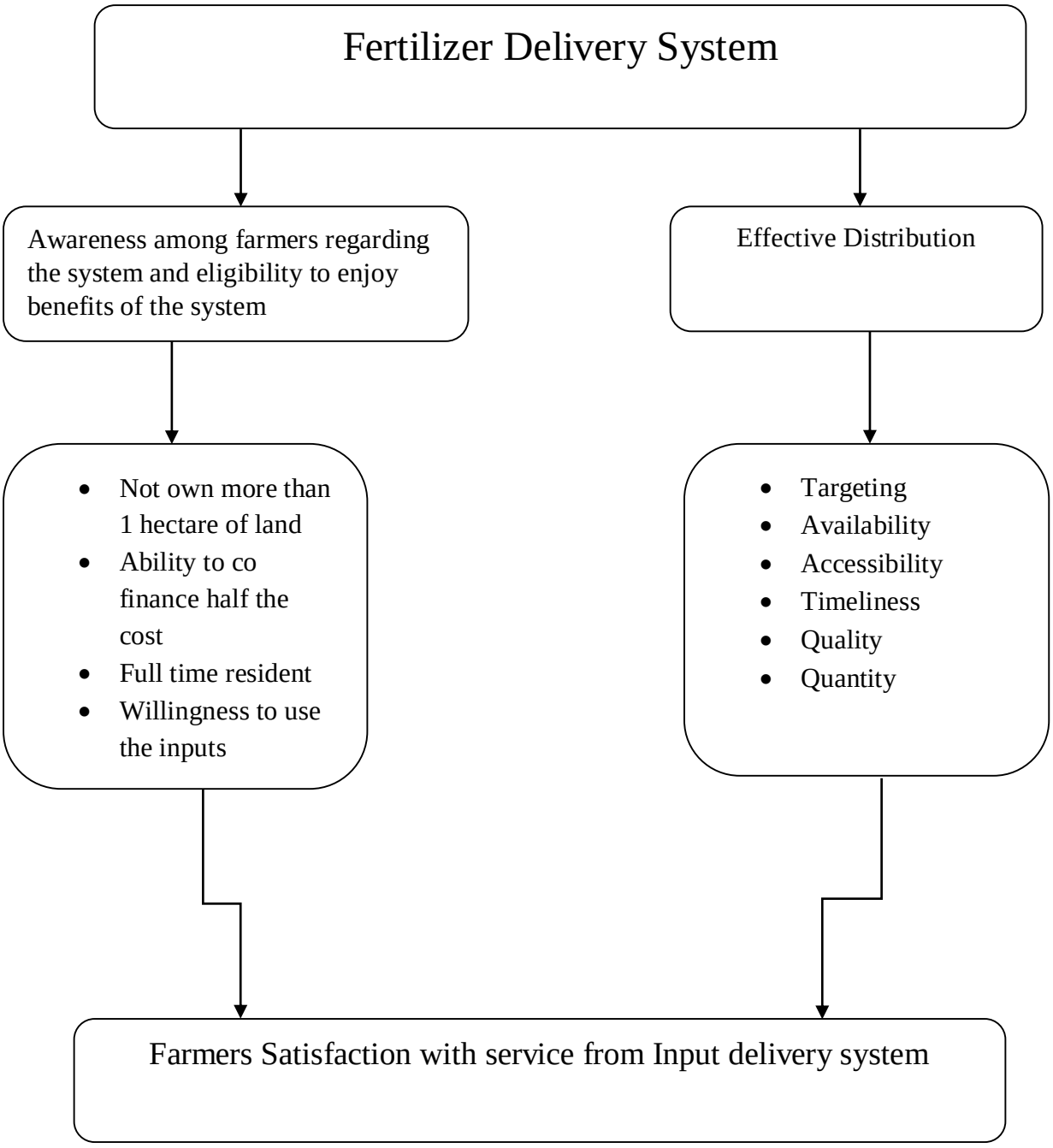

Figure 1: Conceptual framework

CHAPTER THREE

3.0 METHODOLOGY

3.1 Overview

This section describes the location of the study area; the study design, the sampling procedure; the instruments used for data collection and data collection processes. The last section discusses how data analysis was done.

3.2 Study Location

Geographical location

Njombe region is located in the Southern Highlands of Tanzania comprising of Ruvuma, Iringa, Mbeya, Katavi, and Rukwa regions. Njombe region lies between latitude 08º and 40' and 10º and 32' South of the Equator and between longitude 33º and 47' and 35º and 45' east of Greenwich. The region is divided into 4 districts namely Njombe, Makete, Ludewa and Wanging'ombe. It comprises of 18 divisions, 96 wards, 384 villages and 35 hamlets. The region covers 24 994 sq. km of which 21 172 sq. km (84.7%) is land and 3822 sq. km (15.3%) is covered by water. Njombe region is among six major maize producing regions in the country (URT, 2013), which also receive a significant share of subsidized fertilizer.

3.3 Study Design

The overall objective of this study as stated in section 1.4.1 was to assess whether targeting subsidized fertilizer to reach maize smallholder farmers was achieved in Njombe region as intended under the National Agricultural Input Subsidy Scheme (NAIVIS). A cross sectional research design was used to address this objective and related specific

objectives, where data from smallholder maize farmers and input dealers was collected at a single point in time, which is appropriate under limited time and resources (Kothari, 206). The study addressed three specific objectives as stated in section 1.4.2. In the next section the analytical tools used to address each specific objective is presented.

3.4Analytical Tools

Each of the study's specific objectives was addressed using a different tool as indicated in section 3.4.1 and 3.4.2 with a detailed summary in Table 2.

3.4.1 Descriptive analysis

The first objective sought to determine the level of awareness among respondents regarding criteria for their eligibility to receive subsidized fertilizer. Respondents were first asked if they are aware of the input subsidy programme in general and secondly, if they were aware of the criteria for eligibility to join the subsidy programme. The subsidy scheme (NAIVS) listed five criteria that a farmer had to meet. These were discussed in section 2.3.1 and are repeated here for convenience in relation to analytical tools;

(i) Willingness and ability to co-finance half of the cost of the voucher inputs.

(ii) Full time resident in the village.

(iii) Willingness to use the provided inputs.

(iv) Not own more than 1 hectare (2.5 acres) of land.

(v) Exiting the programme after 3 years

In an open ended question, respondents were asked to list criteria they personally were aware of. Their responses were recorded for analysis later.

The second objective intended to identify actors and distribution channels (supply chain) for subsidized fertilizers in the study area. The supply system for subsidized fertilizer in Njombe region was identified based on the supply chain framework. Information was collected (appendix 2) by discussing with input stockist and extension staff in the region and with farmers to develop a list of actors, those who sell and buy subsidized fertilizer. All this information was summarized in a supply map for subsidized fertilizer in Njombe region as presented in Figure 3.

3.4.2 Quantitative analysis

With regard to objective three, two analytical steps were preceded. Firstly to determine farmers' level of satisfaction with performance of the delivery system of subsidized inputs across farmers' socio-demographic characteristics, a Chi-square test was computed to check the significance of the variation of satisfaction among farmers.

Secondly factors affecting farmers' satisfaction with services of the delivery system for subsidized fertilizer in the study area were assessed. A Logit model was used to address this objective. The response whether a farmer was satisfied or not with the services of the subsidized input delivery system was analyzed as a dichotomous response variable where a farmer was either satisfied with services from the delivery system in the area or not satisfied. According to Green (2000) logit and probit models are appropriate tools in a situation where there is a dichotomous output that was thought to be influenced by different levels of some independent variables. An analytical model was developed for assessing how different factors influence a farmer's satisfaction with the delivery system. As such some of the factors that were identified to influence satisfaction include timely delivery of the subsidized fertilizer, quality of the fertilizer, accessibility, quantity received

and timely delivery of the inputs but also satisfaction depends upon personal characteristics of farmers, which include sex of the farmer, age, marital status, level of education among others.

The binary logistic model portrays a functional relationship between farmers' satisfaction and various explanatory variables. The model assumes that the individuals are faced with a choice between possible alternatives which are being satisfied or not satisfied. The model assumes that the chance of an individual making a given choice is a function of individual attributed (FC) as well as other factors (TA). Based on a review of the literatue, the utility function of a consumer in this case was specified as equation 1:

$\text{Max}(U) = U(FC_{ij}, TA_{is})$……..……...… (1)

Where $U =$ the non-observable utility for the ith farmer (respondent) that ranks their satisfaction of services delivering subsidized fertilizer; being 1 when the farmer is satisfied and 0 otherwise; for i= 1.2, …., n

FC_{ij}= thejth individual attribute influencing the utility of the ith farmer from the delivery system of subsidized fertilizer; for i = 1, 2, ., n and j = 1, 2, ., k

TA_{is}= the sth factor of the delivery system influencing the utility of the ith farmer from the delivery of subsidized fertilizer; for s = 1, 2, .., z

Some of the personal attributes and factors of the delivery system maybe unobserved to the analyst but observed and acted upon by the decision maker. Utility derived by the ith farmer from the receipt of subsidized fertilizer through the delivery system is a function of farmers attributes (FC), characteristics of the delivery system (TA) and a disturbance term with zero mean variance as presented in equation 2;

$U_i = f(FC_{ij}, TA_{is}) + e_i$……..……(2)

Where; U_{ij}, FC_{ij}, TA_{is} and e_i are as previously defined

Utility is not observed, what we observe is the farmers statement whether they were satisfied with the services or not. Satisfaction is influence by a number of factors including; timely delivery of the fertilizer, the relative availability (how easy or difficult it to access it), the quantity of fertilizer received compared to what was expected, the quality of the fertilizer.

Let Y_i* be the probability that the i^{th} farmer is satisfied or not with the delivery system. If $Y_i = 1$ the farmer is satisfied. If $Y_i = 0$ the farmer is not satisfied. The probability that Y_i is equal to one (Y_i*= 1 when Y_i*> 0) and Y_i*=0 when Y_i*≤0 implying that a farmer is satisfied with services delivered is a function of independent variables (personal attributed and characteristics of the delivery system) and is presented in equation 3, which is derived further through equation 6-8;

$Yi * = P(Yi = 1)$……(3)

$Yi = F(X_{ij}\beta) + \mu_i$……..…….... (4)

Where X is an$n \ x \ k$ matrix of the explanatory variables and $\beta$is a k x 1 vector of parameters to be estimated

Y_i* is a probability function, $\mu_i$is an error term following logistic distribution, and

$f(X_i\beta)$is the cumulative distribution function for μ_i evaluated at $X_i\beta$

The specification in Equation (4) indicates that the probability that a farmer was satisfied with the delivery system of subsidized fertilizer is a function of the vector of explanatory variables, unknown parameters, and the error term. However, the specification in equation (4) cannot be estimated directly unless the functional form of the function (f) and the distribution of the error term (μ_i) are known.

From equation (4), the regression model was specified according to Rahm and Hoffman (1984) as represented in equation 5.

$$P_i(Y_i = 1) = F(X_i\beta) = \frac{\exp(X_{ij}\beta)}{1+\exp(X_{ij}\beta)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$Pi = \frac{\exp(X_{ij}\beta)}{1+\exp(X_{ij}\beta)} = \frac{e^{Xij\beta}}{1+e^{Xij\beta}}$$

Where, P_i = the probatilty that a farmer is satisfied with the delivery system of subidized fertilizer

X_{ij} = A vector of personal atributes and delivery system charactristics

β =parameters to be estimated.

Hence , the probability that a farmer is not satisfied with the services of the input delivery system is given by equation 6.

$$1 - Pi = 1 - \frac{e^{Xij\beta}}{1+e^{Xij\beta}} = \frac{1}{1+ e^{Xij\beta}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Dividing equation (5) by (6)

$$\frac{Pi}{1-Pi} = \frac{e^{Xij\beta}}{1+e^{Xij\beta}} \Big/ \frac{1}{1+ e^{Xij\beta}} = e^{Xij\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Taking the natural logarithm both sides of equation (7)

$$\ln\left(\frac{Pi}{1-Pi}\right) = \ln(e^{Xij\beta}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$\ln\left(\frac{Pi}{1-Pi}\right) = Xij^{\beta} \ln e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$ln\left(\frac{Pi}{1-Pi}\right) = Xij^{\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

From equation (10) by MLE the general equation is expanded by adding the independent variables to give equation 11.

$$Logit(Pi) = \ln\left(Pi/_{1-Pi}\right) = \beta_0 + \beta_1\chi_{1i} + \beta_2\chi_{2i} + \beta_3\chi_{3i} + \beta_4\chi_{4i} + \beta_5\chi_{5i} + \beta_6\chi_{6i} + \varepsilon_i \ldots\ldots\ldots; \ i = 1,2,3, \ldots 120$$

observations (11)

Where;

$\ln\left(P_i / 1-P_i\right)$ = logit for farmers satisfaction

P_i = satisfied farmers

$1-P_i$ = unsatisfied farmers

$x_{a,\ a = 1,2,3,\ \ldots,6}$ the independent variables

$\beta_{a=0,1,2,,..6}$ = parameters to be estimated

ε = error term

Table 3: Analytical Framework

No	Objective	Research hypothesis	Analytical tool	Test statistic
1.	To determine the level of awareness among farmers regarding their eligibility to subsidized fertilizers in the study area.		**Frequency and percentages**	**Descriptive**
2.	To identify actors and distribution channels (supply chain) for subsidized fertilizers in the study area.		**Descriptive supply chain map**	
3	To determine farmers level of satisfaction and factors affecting farmers satisfaction with services of the delivery system for subsidized fertilizer in the study area	**Ho**: The input supply system characteristics and the farmers socio-demographic characteristics have no influence on a farmers level of satisfaction with the services from the input supply system	**Binary logit regression**	**F value, R^2, co-efficient of independent variables**

The list of variables and corresponding expected sign are presented in Table 3.

Table 4: List of variables

Variables	Description of Variables	Expected Sign
Dependent variable (P_i)	P_i = 1 if farmer is satisfied with delivery services, P_i = 0 otherwise	
X_1	Availability of subsidized fertilizer	+
X_2	Timely delivery of vouchers to farmers	+
X_3	Quality of the subsidized fertilizers	+
X_4	Quantity (representing number of subsidized fertilizer bags received in the previous season)	+
X_5	Accessibility of obtained subsidized fertilizers	+
X_6	No of vouchers received in previous season	+

3.5 Sampling Procedure

As stated earlier the study was conducted in Njombe region, one of the leading maize producing regions in the country. The population included all maize smallholder farmers located in Njombe region, which comprises of 4 administrative districts (Njombe, Ludewa, Makete and Wanging'ombe), 6 Local Government Authorities, 18 divisions, 96 wards, 384 villages and 35 hamlets, (URT, 2013). Purposive sampling was used to select 1 out of the 4 administrative districts. Thereafter stratified random sampling was used to select 2 wards and 2 villages' from Njombe district based on the distance from the district headquarters. Generally it is expected that villages that are close to the district headquarters are likely to get better input delivery services than distant villages. Lugenge ward located 13 Km from Njombe was chosen because it is distant from the district headquarters. Utalingolo ward located 8 Km from the district headquarters was chosen because it is near from the district headquarters. Lugenge ward had 5 villages, Kisilo

village was randomly selected for the study, meanwhile Utalingolo ward had 4 villages from which Ihalula village was randomly selected. The sampling frame at the village level for selecting respondents was all eligible beneficiaries of subsidized inputs as defined in section 2.3.1 which are repeated here, they include;

- Willingness and ability to co-finance half of the cost of the voucher inputs.
- Full time resident in the village.
- Willingness to use the provided inputs.
- Not own more than I hectare (2.5 acres) of land.
- Exit the programme after 3 years

A total sample of 123 respondents were interviewed whereby, from each village simple random sampling was employed to select smallholder maize farmers who were recipients of subsidized fertilizer, accounting for a total of 120 farmers that were selected and three agro-dealers who were key informants.

Table 5: Sampling methods employed at different levels

	District Level	**Village Level**	**Ward Level**	**Respondents**
Method	Purposive	Stratified- random	Stratified- random	Simple random

Actors for the inputs supply chain were identified by the snowball method, starting from the village, ward or division level suppliers up to the district level and up to the regional source.

3.6 Data Collection

A structured questionnaire was designed to capture both qualitative and quantitative data required in accomplishing the objectives of the study which consisted mainly of closed

ended questions and partially opened ended questions. The questionnaire contained four sections, where the first section was designed to obtain the information on the respondents characteristics, the second section consisted on the awareness of eligibility to the programme and eligibility criteria, third section contains farmers' satisfaction with the subsidized fertilizer delivery system and the fourth section comprises of statistics regarding fertilizer application. The full content of the questionnaire is presented in appendix 1. Key informant questionnaire as presented in appendix 2 was used to get information regarding the supply chain in Njombe.

3.7 Data Analysis

Once data were collected, they were edited, coded and summarized prior to analysis using Statistical Package for Social Sciences (SPSS) version 20 computer software in conformity with the specific objectives of the study. The analysis was conducted using analytical tools as described in section 3.4 above.

Descriptive analysis was employed for objective one; to determine level of awareness among farmers regarding their eligibility to subsidized fertilizers and characterizes the subsidized fertilizers within the study area. In the descriptive analysis means, medians, frequency distributions, variance, standard deviations, range, percentage, and skewness were computed from the data collected in this study (Green, 2000). For objective two a descriptive supply chain mapping was used to identify the actors and service providers for subsidized fertilizer in the study area.

Objective three employed quantitative analysis where farmers level of satisfaction with performance of the delivery system of subsidized input across farmers socio-demographic

characteristics was computed by cross tabulating the variables via a Chi-square test. The binary logit model was used to assess the factors affecting farmers' satisfaction with the delivery services of subsidized inputs. Results of all these analyses are presented in the next chapter.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

Findings obtained from the formal survey conducted in Njombe district are presented in this chapter. A total of 120 smallholder maize farmers were interviewed from Kisilo and Ihalula villages. Social-demographic characteristics of the respondents are shown as follows

4.1.1 Sex

From Table 6 results for the whole sample revealed that female respondents comprised of 35.8% while men were 64.2%. From Kisilo men accounted for 76.7% sample while women represented 23.3%. In Ihalula village the proportion of female respondents was higher (40%) while men respondents accounted for 60 % of the village sample. This is consistent with the dominance of male headed households in Tanzania, where female headed households in the Southern Highland in rural areas constitute about 65 % (Osorio *et al*., 2014).

Table 6: Sex of the respondents

	Female		**Male**	
Village	F	%	F	%
Kisilo (n=30)	7	23.3	23	76.7
Ihalula (n=90)	36	40	54	60
Sample total (n=120)	43	35.8	77	64.2

F= Frequency, %= Percentage

4.1.2 Age

Age affects experience, wealth and decision making (Omari, 2013). Table 6 shows that the respondents' age ranged from 20 to 61 years and above. Most of the respondents were in the active working age, dominated by the age group between 41 and 60 years (46.6%) followed the age group from 20 – 40 years (42.5%). The elderly who were above 60 years old only accounted for 10.8% of the sample.

Table 7: Age of the respondents

	20- 40 years		**41- 60 years**		**> 61years**	
Village	F	%	F	%	F	%
Kisilo (n=30)	6	20	20	66.7	4	13.3
Ihalula (n=90)	45	50	36	40	9	10
Sample total (n=120)	51	42.5	56	46.6	13	10.8

F= Frequency, %= Percentage

4.1.2 Marital Status

With regards to marital status, Table 8 shows that 84.2% of the sampled households were married couples while 15.8% were single. This reveals typical characteristics of many rural areas in Tanzania. The proportion of married couples was higher at Kisilo (93.3%) compare to Ihalula (81.1%).

Table 8: Marital Status

	Married		**Single**	
	F	**%**	**F**	**%**
Kisilo (n=30)	28	93.3	2	6.7
Ihalula (n=90)	73	81.1	17	18.9
Sample Total (n=120)	101	84.2	19	15.8

F= Frequency, %= Percentage

4.1.3 Education Level

The findings in Table 9 show that 71.7% of the households attended primary education, while 20% received secondary education and above (certificate, diploma and university), but 8.3% have never been to school. In Tanzania primary educations is mandatory and free (Hakielimu, 2017). In most rural areas, primary education is the highest level of education attained by many people due to lack of opportunities for further education but sometimes also out of choice. Some of the rural community members feel that primary education is enough for them to make a living as farmers or pursuing other rural economic activities such as fishing, carpentry, construction and others. Secondary schooling is still a challenge to rural families because it is considered to be expensive. Mng'olage (2008) argues that one of the determinants of technology adoption is education.

Table 9: Level of education

	Not gone to school		**Primary**		**Secondary and above**	
Village	F	%	F	%	F	%
Kisilo (n=30)	1	3.3	25	83.3	4	13.3
Ihalula (n=90)	9	8.4	61	67.8	20	22.2
Sample Total (n=120)	10	8.3	86	71.7	24	20

F= Frequency, %= Percentage

The proportion of respondents who attained primary education was higher at Kisilo (83.3%) compared Ihalula (67.8%) and the difference is significant (t-values 28.571 and 36.117 are highly significant at 0.05 confidence level). Ihalula had the highest percent of respondents with secondary education (22.2%) but it also had the highest percent of respondents with no formal education at 10% compared to only 3.3% at Kisilo. Kisilo and Ihalula are located about 14 and 8 kilometers respectively from Njombe town.

4.1.4 Economic Activity

Njombe region is characterized by two main economic activities which are crop production (food and cash crops) and livestock development**.** The region is among the largest producers of maize, Irish potatoes and partly beans (URT, 2013). The study found that agriculture was an activity that was practiced by everyone in Ihalula and Kisilo village by 100%, where as in livestock keeping activity only 35.8% of the respondents practiced it. Fewer people were in involved in businesses (5.8%) and only 4.2% were formally employed in different sectors as shown in Fig. 2.

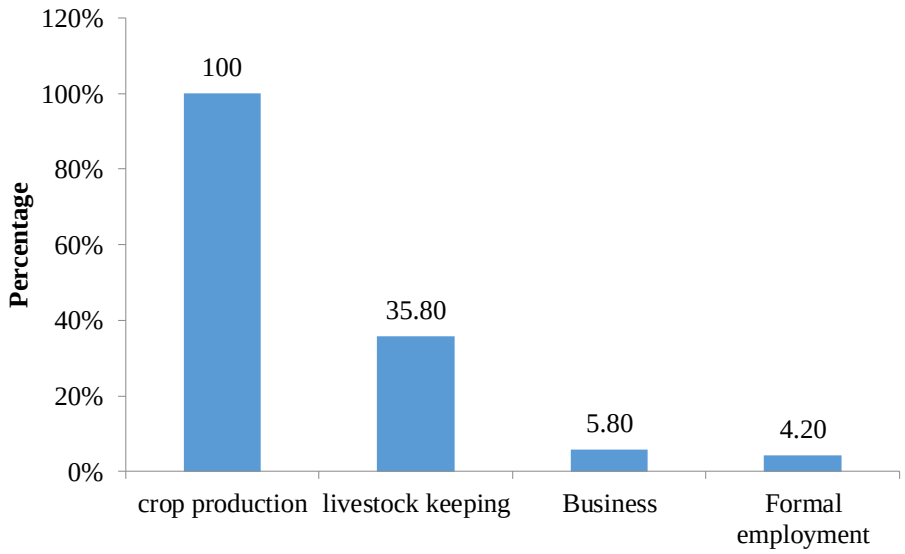

Figure 2: Economic activities

4.1.5 Access to extension services

Extension services are important to farmers, in raising awareness about the subsidized inputs. Extension services acts as a bridge between farmers and the government through provision of technical advice, information and training, knowledge on adopting new technologies, and without extension services the ability to adopt new technologies will be low. Findings show that 74.2% of the respondents had access to and received extension

services while 25.8% did not have access to extension services. Furthermore findings show that Ihalula village had more access to extension services by 90% whereas Kisilo village had lesser access by 26.7% probably due to long distance of the village from the district headquarters where extension agents are located. Ihalula village under Utalingolo ward is located 8 Km from the district headquarters while Kisilo village under Lugenge ward is located 14 Km from district headquarters.

Table 10: Access to extension services

Village	**Access to extension services**			
	Yes		**No**	
	F	**%**	**F**	**%**
Kisilo (n=30)	8	26.7	22	73.3
Ihalula (n=90)	81	90	9	10
Sample Total (n=120)	89	74.2	31	25.8

F= Frequency, %= Percentage

4.3 Awareness among Farmers Regarding their Eligibility to Subsidized Inputs and NAIVS

Njombe region (previously part of Iringa) is among regions in the Southern Highlands which have received subsidized inputs since 2008/09 when NAIVS was re-introduced by the government of Tanzania. The study revealed that majority of farmers (81.7%) were aware about the National Agricultural Input Voucher Scheme in their area and only 18.3% were not aware. Moreover results show that awareness was high in Ihalula village compared to Kisilo village by 88.9% to 60% respectively, and this was probably due to low extension services in Kisilo village. From a sex point of view, results show that males had the highest level of awareness about the NAIVS programme in both villages (46.7%

and 54.4%).This implies that male sex had more access to information about the program because men have various sources of getting information through newspapers, televisions, neigbours and drinking places, while women are mostly at home doing family chores. A study by Malhotra (2013) had similar findings, whereby 93% of the survey respondents were aware of the NAIVS programme. Howale *et al*., (2015) also found that 73% of the surveyed farmers were aware about subsidies provided to them by their government in Maharashtra India.

Table 11: Awareness on NAIVS

Village	**Aware**						**Not Aware**					
	Fe		**M**		**Total**		**Fe**		**M**		**Total**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Kisilo (n=30)	4	13.3	14	46.7	18	60	3	10	9	30	12	40
Ihalula (n=90)	31	34.4	49	54.4	80	88.9	5	5.6	5	5.6	10	11.1
Sample Total (n=120)				81.7						18.3		

Fe= Female, M= Male, F= Frequency, %= Percentage

Regarding eligibility criteria, Table 12 shows that 51.7% (more than half) of the farmers were aware of the eligibility criteria implying that the other half were not aware and due to this, targeting cannot be effectively achieved because the program's objective is to help a farmer with an intention of graduating after three years with enough knowledge to continue on their own so that other poor farmers can also enjoy the benefit of the program. Findings by Malhotra (2013) indicate that 50% of the respondents did not know the eligibility criteria and were unaware if they were eligible to receive vouchers. Isinika and Msuya (2016) citing Patel (2011) and URT (2013) also reported higher levels of awareness among respondents about the NAIVS programme in the Southern highlands,

but low level of awareness regarding eligibility where only 43% were aware of the targeting criteria.

Table 12: Awareness on eligibility criteria

	Aware		Not Aware		No idea	
Village	**F**	**%**	**F**	**%**	**F**	**%**
Kisilo (n=30)	19	63.3	5	16.6	6	20
Ihalula (n=90)	43	47.8	30	33.4	17	18.9
Sample total (n=120)	62	51.7	35	29.2	23	19.1

F= Frequency, %= Percentage

Regarding the eligibility criteria, respondents were asked to list the criteria that they personally were aware of and results revealed that 5% were aware of the farm size criteria, 40% were aware of the residency criteria, 33 % were aware on the willingness to use the input criteria, 52% were aware on the co-financing criteria and 81% were not aware of the exit mechanism criteria as shown in Fig. 3. This indicates that some farmers were in the program for a prolonged period and making it difficult for other farmers to enjoy the benefits of the program. Results align with findings by Malhotra (2013) whereby there was low awareness about the exit mechanism of input subsidy in the study area (Ruvuma, Rukwa, Morogoro, Arusha and Iringa). Nearly half of the respondents were not aware of the exact exit strategy while 28 % knew they were eligible to receive vouchers for three years and 19 % believed that they were suppose to keep receiving vouchers each year on continuation from the first three years.

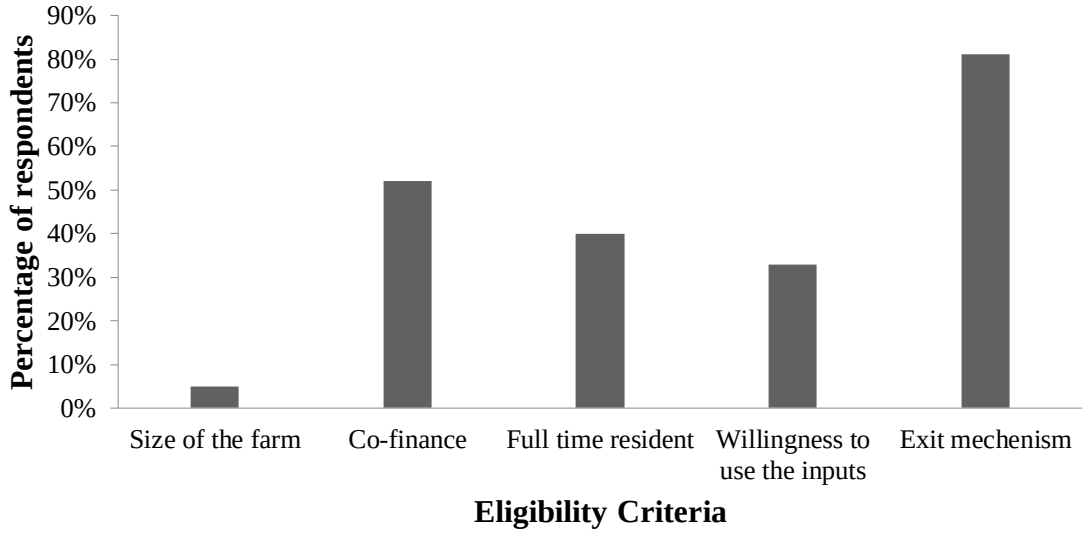

Figure 3: Awareness on eligibility criteria

4.4 Supply Chain of Subsidized Fertilizer in Njombe District

As the government decided to revert to the voucher system in 2015/16 after failure of the loan system in 2014/15, Njombe region was among the selected 24 regions which received vouchers (78 000) and subsidized fertilizer. The government of Tanzania authorized three distributers/ suppliers namely Mexon Investments, Mtewele General Traders and Mwakilavile Investments to serve households in Njombe region with subsidized fertilizers. Mexon Investments and Mtewele General Traders are major players in the fertilizer business in Njombe district. According to descriptive data provided by key informants, the supply chain of subsidized fertilizer in Njombe district starts at the port of Dar es Salaam where fertilizer is imported by big companies as indicated in Table 2. Inspection by Tanzania Bureau of Standards (TBS) is followed to ensure the quality of the imported fertilized is of good standards. Initially small companies submit tenders to big companies so that they could supply them with fertilizer after importation. Tenders are reviewed by big companies and if they meet all the necessary requirements, a contract is issued to the small companies. After inspection fertilizer is transported by private transportation to

storage facilities either importers depots or to distributors depots within the region (Njombe). At the regional level fertilizer is inspected again by Tanzania Pesticides Regulatory Authority (TPRA) for quality standards, meanwhile the Voucher Committee at the regional level submits a list of voucher allocation to distributors/suppliers in areas where they will distribute the subsidized fertilizer. Transportation of the fertilizer takes place to areas they will serve, at the village levels distribution of subsidized fertilizer takes place only to beneficiaries who are registered and have obtained vouchers. Vouchers are given to distributors so that a farmer can obtain subsidized fertilizer and after distribution in all the required areas that they were to serve, the distributor is required to prepare a list of all household names with specific number of vouchers received per each household and the type of subsidized fertilizer that was acquired. The VVC cross checks the list for consistency before submitting it to the DAICO. The distributor is required to submit all vouchers obtained together with and agriculture voucher deposit form from National Microfinance Bank (NMB) for cross checking before final payments are done.

The supply chain in Njombe district to some extent proved to be effective although several setbacks have been established by distributors like poor infrastructures in remote areas when distributing the fertilizer especially during the rainy season, late delivery of the fertilizer was another setback whereby farmers obtain fertilizer when planting season has already taken place therefore the basal fertilizer obtained is either sold back to the distributor or to other farmers. Late delivery of payments by the government to distributor has been a major setback where the government has delayed payments for the services rendered to them by distributors and therefore these companies lose trust in serving again for the next season.

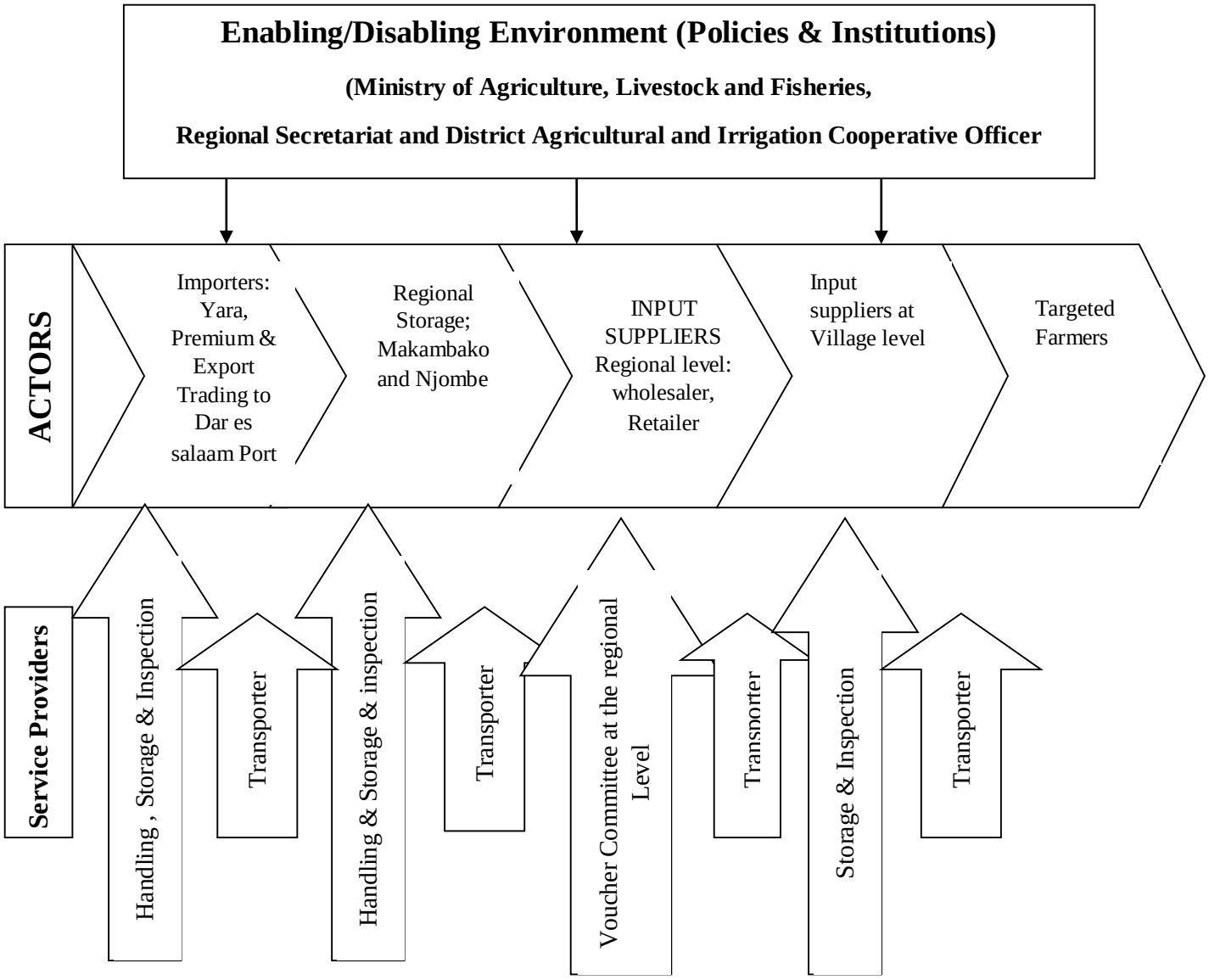

Figure 4: Supply chain of subsidized fertilizer in Njombe region

4.5 Farmers' Level of Satisfaction with Fertilizer Delivery System

Cross tabulation analysis was conducted to establish if there was any relationship between the level of satisfaction among farmers regarding performance of the delivery system of subsidized inputs and their social-demographic characteristics. Among all socio-demographic characteristics that were tested only sex of the farmer had a statistically significant relationship with the level of satisfaction among farmers. The remaining characteristics (age, marital status and education level) had no significant influence on farmers' level of satisfaction regarding the delivery system and its performance.

Results from Table 13 show that sex had a significant influence on the level of satisfaction of a farmer with services of the delivery system with p-value ($p \leq 0.05$). Moreover findings reveal that women were more satisfied with performance of the delivery system compared to men by 74.4%. Earlier results from Table 10 show that men had more awareness regarding the programme and this was because they had more access to information, therefore this is likely to indicate that the more the awareness the higher the expectation and standard of the services delivered. Therefore women are not much sophisticated and are portrayed to have a lower expectation which leads to being easily satisfied.

A study by Almsalam (2014) on the "Effects of customer expectation and perceived service quality on customer satisfaction" argues that it is very crucial for marketers to find out about their customers' expectations in advance because failure to meet or exceed the expectations could lead to dissatisfaction. The author further explains that in some cases customers have well formed expectations and in return expect the best service quality. Angelova and Zekiri (2011) found that the service quality in delivering services (to customers in the Macedonian Mobile Telecommunication markets) perceived by the

customers was not satisfactory, because customers' expectations were higher than perceptions and thus lead to customers not being satisfied with the services.

Table 13: Farmers level of satisfaction across their socio-demographic characteristics

		Satisfied		Not satisfied		Total	χ^2 (p-value)
		F	%	F	%	%	
Sex	Female	32	74.4	11	25.6	100	0.040**
	Male	56	72.7	21	27.3	100	
Age	20-40 years	40	78.4	11	21.6	100	1.038
	41-60 years	36	64.3	20	35.7	100	
	>61 years	12	92.3	1	7.7	100	
Marital status	Married	72	81.8	29	9.6	100	1.366
	Single	16	18.2	3	9.4	100	
Education	Note gone to school	9	90	1	10	100	1.709
	Primary	61	70.9	25	29.1	100	
	Secondary/ above education	18	75	6	25	100	

The binary logistic regression was used to estimate factors affecting farmers' satisfaction with services of delivery system of subsidized fertilizer. The regression was used to establish which independent variables are significantly influential to the dependent variable. The model was statistically significant at ($\rho<0.05$) with entered variables, availability, accessibility, timely delivery, quantity of fertilizer and amount of vouchers received as depend variable and level of satisfaction as independent variable.

Table 14: Binary Logistic Regression (n=120)

Variable	B	SE	Wald	Df	Sig	Exp (B)
Availability of subsidized fertilizer	1.521	0.642	5.609	1	0.018**	4.575
Timely delivery of voucher to farmers	1.063	0.708	2.255	1	0.133	2.896
Quality of subsidized fertilizer	0.943	1.221	0.596	1	0.440	2.567
Quantity (representing number of subsidized fertilizer bags received in the previous season)	0.044	0.316	0.020	1	0.888	1.045
Accessibility of obtained subsidized fertilizer	0.541	0.537	1.015	1	0.314	1.717
Number of voucher received in previous season	0.196	0.252	0.603	1	0.438	1.216

2log likelihood = 139.180, Cox and Snell R Square = 0.177, Nagelkerke R Square = 0.257

**Significance at 5%

Table 15: Test Statistics

Tests	χ^2	Df	P-value
Model evaluation (overall):			
Likelihood ratio test (Omnibus Tests of Model Coefficients)	23.317	6	0.001
Goodness-of-fit test:			
H-L test	6.557	7	0.954
Percentage Accuracy in Classification: Null model = 56.8; Model with predictors = 67.4			
Cox & Snell R^2 = 0.177			
Negelkerke R^2 = 0.257			

The model fits very well as indicated by Omnibus Test of model coefficients being below 0.05 (p=0.001) and Hosmer and Lemeshow Test being above 0.05 (p=0.954) (Table 15.).

Results from the binary logistic equation indicate that the variables affecting farmers' satisfaction with the services of delivery system of subsidized fertilizer contributed by 17.7% and 25.7% as explained by Cox and Snell R square and Nagelkerke R square values above. Kothari (2006) reported that the smaller the summary statistic value the better the model. Availability of subsidized fertilizer contributed uniquely to farmers satisfaction with delivery services because its p-values is below 0.05 (0.018). All the other predictors contributed equally to the model because they had probabilities greater than 0.05.

Table 15 shows that Wald statistics are non-zero values, which implies that there is interaction between the dependent and independent variables. According to Norusis (1990) and Powers and Xie (2000), the non-zero Wald statistic values indicate the presence of relationships between the dependent and explanatory variables. Thus, on the basis of the results of this study the null hypothesis was rejected in favour of the alternative hypothesis that factors affecting farmers' level of satisfaction significantly influence delivery system of subsidized inputs at 5% level of significance.

Results from Table 14 imply that availability of subsidized fertilizer was positively related to farmers' satisfaction and statistically significant at ($\rho<0.05$). The positive log odd of 1.521 with odd ratio of 4.575 (Exp B) has a direct relationship with farmers satisfaction. Availability of fertilizers was significant because farmers reported that, before the introduction of the National Agricultural Input Voucher Scheme in their areas, there was unavailability of fertilizer and it was difficult to obtain the fertilizer.

Ekanayake (2006) found that, in the incident where fertilizers are unavailable, farmers tend to apply/ use fertilizers without considering any constrains facing them ahead to

ensure there is optimum level of yields as outcome. Non-availability of farm inputs especially fertilizer leads to low level of production attributed mainly to frequent use of inferior agricultural implements (Nguruse, 2008). The author further explains that various benefits can be cited in justifying input subsidies whereas they bring economic benefit to the society. Therefore from the above justification, it is right to say availability of fertilizer is a crucial factor because if subsidized fertilizers are available in the community farmers' satisfaction will increase from the services received by them from the delivery system. Moreover, Edward (2013) reported that availability of inputs is crucial so as to sustain production and benefit resource poor farmers.

Timely delivery of vouchers has a positive regression coefficient (B) of 1.063 and the odds ratio (Exp B) of 2.896 as shown above in Table 14. This implies that a unit increase in this variable, which was statistically insignificant at probability of 5%, increases a farmer's level of satisfaction with delivery services of subsidized fertilizers. Timely delivery of vouchers to smallholder farmers makes the farmers access the inputs early and at the appropriate time for cropping. This enables the farmers to have all the necessary inputs needed during the cropping season mostly the basal fertilizers.

Quality of subsidized fertilizer has a positive regression coefficient (B) of 0.943 and the odds ratio (B) of 2.2567 implying that an increase in quality of subsidized fertilizer increases farmers' level of satisfaction. This variable was statistically insignificant at probability 5%. Quality of fertilizer is important in production so as to ensure that germination of crops takes place correctly and increase in output can be seen. By observation in the field, farmers had different ways of identifying the quality of the subsidized fertilizer such as, through expiration dates, physical appearance of the packing,

certification stamp and from the output of production (increase in output implied best quality of fertilizer).

Quantity of subsidized fertilizer received also showed a positive regression coefficient (B) of 0.044 and odds ratio (Exp B) of 1.l045 but at the probability of 5% this variable was statistically insignificant. A unit increase in the quantity of subsidized fertilizer received increases the level of satisfaction attained by a farmer in terms of services from the delivery system by input suppliers.

Accessibility of inputs has a positive regression coefficient (B) of 0.541 and the odds ratio (Exp B) of 1.717 table7 implying that a unit increase in the variable which was statistically insignificant at probability 5% increases accessibility of subsidized fertilizer by a factor of 1.717. Farmers need easy access to subsidized fertilizers so that they can effectively utilize the fertilizers. It was observed that access to inputs has been constrained with several factors like, corruption/favoritism, unavailability of agro-dealers, late supply of subsidized fertilizers, poor quality of subsidized fertilizer, less vouchers received, and high price of co-financing.

Amount of voucher received by farmers has a positive regression coefficient (B) of 1.216 and the odds ratio (Exp B) of 1.216 (Table 14) implying that a unit increase in this variable, which was statistically insignificant at probability of 5%, increases farmers level of satisfaction by a factor of 1.216. Amount of vouchers received by a farmer increases his/her satisfaction only when the farmer receive the exact number of vouchers he is eligible to because with voucher, a farmer is now able to get the subsidized fertilizer and use it effectively.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Generally the study aimed at assessing the effectiveness of subsidized fertilizer delivery system in Njombe region, Tanzania. Achievement of this aim was addressed by several activities including assessing the level of awareness among farmers regarding eligibility to subsidized fertilizer, identifying actors and distribution channels for subsidized fertilizer within the study area and assessing farmers' level of satisfaction and factors affecting farmers' satisfaction with services of the delivery system for subsidized fertilizer in the study area.

The study found that male respondents were high in number compared to when by 76.6%. Most of the smallholder farmers in Njombe region were married couples accounting for 84.2% of the total sampled population. Forty six percent of the respondents were aged between 41 to 60 years which is considered the most active working class in the study area. Furthermore results indicated that about 71.7% of the respondents received primary education, while 20 % received secondary education and higher education levels while only 8.3% never attended school. Findings also showed that several economic activities were practiced in the study area and some respondents practice more than one economic activity so as to generate more income and improve better living standards for their families. Economic activities included crop production, live stocking keeping, business and formal employment. Results also indicated that about 74.2% of the respondents had access to and received extension services, whereby extension agents play an important role in imparting knowledge to farmers and in this study regarding awareness of the subsidy programme.

Regarding awareness, the study found that 81.7% of the respondents were aware about the NAIVS program in their study area. In both villages surveyed awareness was found to be high amongst men by 46.7% and 54.4% and this was because men had more access to information from various sources compared to women. On the other hand awareness on eligibility criteria was high by 51.7%, but there was low awareness regarding the exit mechanism criteria by 81% and this led to farmers been in the programme for more than three years and making it impossible for other poor resource farmers to enjoy the benefits of the programme and also making it difficult for targeting to be effectively achieved.

The study identified the reliable distribution channel of subsidized fertilizer to the farmers which was through the government authorized suppliers/ distributors. Although this channel to some extent proved to be effective complains about late delivery of vouchers, made the suppliers to make a late delivery of the subsidy to the farmers, also suppliers encountered several problems like poor infrastructures to some remote areas where they had to make deliveries and late payments by the government.

Cross tabulation was employed to establish a relationship between farmers' level of satisfaction with the services and performance of the delivery system across their social demographic characteristics. Among all socio-demographic characteristics that were tested only sex of the respondents was statistically significant at p-value 0.040 (5% confidence level). This implies that women in the surveyed area were satisfied with delivery services of the delivery system in Njombe region than men. Furthermore the binary logistic regression was used to assess factors affecting the level of satisfaction among farmers with delivery services from service providers. Factors like timely delivery of vouchers, quality of the fertilizer, availability of fertilizer, accessibility of fertilizer and amount of vouchers

received by the farmers were all contributing variables to farmers' level of satisfaction by services from the delivery system but only availability of subsidized fertilizer was the only variable that was statistically significant at p=0.05.

5.2 Recommendations

In relevance of the discussions above, the following recommendations could be drawn from this study to policy makers in future pursue of similar programmes to NAIVS in attaining better targeting of the subsidized fertilizer;

(i) The government should have strong emphasis regarding awareness creation to intended group beneficiaries because awareness is of paramount importance so as to allow targeted goals to be achieved. If awareness is created among intended groups then benefits of such programs can be shared equally among members of the community for instance the exit programme criterion, if all members are fully aware that after exactly three years a subsidy member is to exit the programme and allow other members to enjoy the benefits then through this the objective of NAIVS which is reaching the poorest farmers will be achieved.

(ii) There is a need of the government to monitor and evaluate all procedures of the delivery system whereby the government may be compelled to introduce implementation control system. By monitoring and evaluating all the procedures of the delivery system this will help in effectively delivering the services to targeted members whereas timely delivery of inputs will be improved, the right quantity will be provided to the recipients, excellent quality of fertilizers will be received and making sure that the services provided by the delivery system are easily accessible and this will lead to a higher satisfaction among subsidy recipients.

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APPENDICES

Appendix 1: Farmers questionnaire

QUESTIONNAIRE

Individual Questionnaire

Name of the respondent……..……

Name of enumerator……..……..

Date of interview ……..…….

Division …… District ……..……..

Village ……

Ward……..……

Time started……..…….. Time finished...……..……..……

Variable code	Question or variable	Coding key	Skip rule
A: PERSONAL CHARACTERISTICS			
A001	Name of the respondent	……..…… ……..……	
A002	Sex of respondent	1= Male 2= Female	
A003	Age	1=20 to 40 years ( ) 2= 41 to 60 years ( ) 3= 61 and above years ( )	
A004	Education	1= Not gone to school ( ) 2= Adult education ( ) 3=Primary Education ( ) 4=Secondary education ( ) 5= Certificate education ( ) 6.= Diploma ( ) 7=University education ( )	
A005	Marital status	1 = Married 2 = Cohabiting 3 = Single never married 4 = Widow 5 = Divorced 6 = Other Specify ……..	
A006	What is the size of your family?	1 = Members of age > 18 years old 2 = Members of age 10- 18 years old 3 = Members of age < 10 years old	
A007	What is your major economic activity?	1= Crop production 2= Livestock keeping 3= Business 4= Formal employment 5= Others Specify……	
A008	How many years of farming	……..…	

Variable code	Question or variable	Coding key	Skip rule
	experience do you have?		
A009	How many plots of land did you cultivate last year?	1 = less than 2 2 = more than 2	
A010	Of this how many did you plant maize?	……	
A011	What is the area planted in acres (according to acres in the plot)		
A012	Do you have an extension worker in this area?	1 = Yes 2 = No	
B: AWARENESS AMONG FARMERS REGARDING ELIGIBILITY			
B001	Are you aware of a programme in your village that provides farmers with vouchers to buy subsidized fertilizer?	1= Yes 2= No	
B002	If Yes, where did you get this information?	1 = Leaflet/ Broachers 2 = Radio 3 = Television 4 = Village Meeting 5= Campaign by VVC 6= Extension agent 7 = Agro-dealer 8. = Neighbour 9.= Others Specify……	
B003	Did you use subsidized fertilizer for maize production last year	1. = Yes 2. = No	
B004	If yes, who selected you to be a beneficiary/participant of the subsidy programme	1=Village Voucher Committee 2=Village chairman, 3=VEO 4.=Other…..	
B005	If no were you on the subsidy programme before?	1= Yes 2= No	
B006	Why were you not on the program last year	1= I had exited 2=I was not eligible anymore 3=I don't know	
B007	Did they use any criteria for you to be on the subsidy programme	1 = Yes 2 = No 3= I don't know	
B008	Are you aware of the eligibility criteria for participation under the programme?	1= Yes 2= No 3= I don't know	
B009	If yes please mention them i. Size of farm<2.5 and head of house hold ii. A farmer should be willing and able to cofinance half the cost of the voucher inputs	Tick for answer (i) …… (ii) …….. iii) ……..	

Variable code	Question or variable	Coding key	Skip rule
	iii. Full time residents in the village iv. Willing to use provided inputs v. Exit strategy i.e. after 3 years	iv) …… v) ……..	
B010	Are other people in the village also aware about the eligibility criteria?	1 = Yes 2 = No 3 = I don't know	
B011	Did you purchase unsubsidized fertilizer for maize production last year	1= Yes 2= No	
B012	Did you receive fertilizer as a gift for use on your maize farm last year	1. Yes 2. No	
C: DISTRIBUTION CHANNELS			
C001	Where did you buy your subsidized fertilizer from	1 = Local Shop 2 =Town Shop 3 = Cooperatives 4 = Village Office 5 = Others, specify…….	
C002	How far is it from your house to where you purchase the subsidized fertilizer?	1 = < Km 2 = 1 Km 3 = 2 Km 4 = 3 Km 5= Others, specify…….	
C003	Which means of transport did you use to carry the subsidized fertilizer to your home/farm?	1 = Public transport 2 = Bicycle 3 = Motorcycle 4 = On foot 5 = Others, ……	
C004	Did you get voucher for subsidized fertilizer last year?	1= Yes 2 = N	
C005	How many vouchers did you get?	1 = 3 2 = More than 3 3 = Less than 3	
C006	Where did you obtain the voucher from?	1 = Village Voucher Committee 2 = Village Office 3 = Local Shop 4 = Agro dealers 5 = Others, specify……	

Variable code	Question or variable	Coding key	Skip rule
C007	Were the vouchers delivered on time in your village?	1 = Yes 2 = No	
C008	If No, why	…….……	
C009	How many agro-input suppliers are in your village?	……..……..	
C010	Under the latest input subsidy program, when did you receive voucher for the first time (year) for fertilizer subsidy	……..	
C011	When was the last time you received vouchers for fertilizer subsidy	…….…….	
C012	Do you know you will exit the subsidy programme after 3 years?	1. = Yes 2. = No	
C013	How will you meet your fertilizer needs after you exit the subsidy programme	1. = Purchased unsubsidized fertilizer 2. = Used organic manure 3. = Composite manure Others……	
C014	Did you face challenges in accessing subsidized fertilizer last year	1. = Yes 2. = No	
C015	If yes what are the challenges	1 = High transport cost due to distance from agro dealer 2 = corruption (favoritism) 2 = Unavailability of agro dealer or supplier 3 = late supply 4 = poor quality of fertilizer (specify how) 5 Other ……..	
C016	Did you sell you fertilizer voucher to anybody?	1. = Yes 2. = No	
C017	If yes why To whom did you sell	1. = Fellow farmer 2. = Agro dealer 3. -= VVC 4. =Others……	
D: FARMERS' SATISFACTION			
D001	Did you use subsidized fertilizer in the previous season 2014/2015?	1 = Yes 2 = No	
D002	How many bags of subsidized fertilizer did you buy last year (List by type)	1= UREA 2 = DAP 3 = SA 4 =CAN 5= FSP 6= NPKS	
D003	For each type of fertilizer, how	1= UREA……	

Variable code	Question or variable	Coding key	Skip rule
	many bags were you eligible?	2 = DAP……... 3 = SA…….. 4 =CAN…… 5= FSP…….. 6= NPKS……..	
D004	If there was a deficit, why did it occur?	……..	
D005	Was the fertilizer under the subsidy program enough for your needs for maize production?	1 = Yes 2 = No	
D006	If no, how did you feel the gap?	1= Purchased unsubsidized fertilizer 2 = Used organic manure 3= Composite manure others……	
D007	Is fertilizer more available now than before NAIVS was introduced?	1 = Yes 2 = No	
D008	Is the fertilizer under the subsidy program delivered on time?	1 = Yes 2 = No	
D009	If No, why?	1 = Late delivery of voucher 2 = Not accessible 3 = Others……	
D010	What is your level of satisfaction with the delivery system for subsidized fertilizer/inputs?	1 = Very satisfied 2 = Moderate satisfied 3 = Not satisfied	
D011	How do you rate the quality of subsidized fertilizer you received from your source (agro dealer/village)	= Very Good 2 = Good 3 = Poor 4 = Others	
D012	How do you identify the quality of fertilizers?	1 = Physical appearance 2 = Certification 3 = Expiry Date 4 = Others, specify……	
E: Fertilizer application			
E001	Out of the subsidized fertilizer you received, how many bags of each fertilizer type were used for maize production	1= UREA…….. 2 = DAP…… 3 = SA……. 4 =CAN……. 5= FSP……. 6= NPKS……..	
E002	During the year before the subsidy programme, how many acres of maize did you plant	……..	
E003	How many bag or kg of subsidized fertilizer did you use on maize	……..	
E004	During first year under the subsidy programme, how many acres of	……..	

Variable code	Question or variable	Coding key	Skip rule
	maize did you plant		
E005	How many bag or kg of subsidized fertilizer did you use on maize	…….	
E006	During second year under the subsidy programme, how many acres of maize did you plant	…….	
E007	How many bag or kg of subsidized fertilizer did you use on maize	…….	
E008	During third year under the subsidy programme, how many acres of maize did you plant	…….	
E009	How many bag or kg of subsidized fertilizer did you use on maize	…….	
E010	During fourth year under the subsidy programme, how many acres of maize did you plant	…….	
E011	Did you receive subsidized fertilizer during the fourth year since you joined the subsidy programme	1. = Yes 2. = No	

Appendix 2: Key Informant Checklist

Check List for Key Informants

Name of the respondent……

Name of Enumerator……

Date of interview…….

Division……District……

Village……...Ward……

Time started…….. Time finished……

Variable Code	Question or Variable	Coding Key	Skip rule
K001	Who selects a farmer to be a NAIVS beneficiary?		
K002	What are the criteria for a smallholder farmer to receive subsidized fertilizer?		
K003	How many farmers are under the NAIVS program?		
K004	Is the fertilizer under NAIVS delivered on time	1. Yes 2. No	
K005	How is the subsidized fertilizer delivered?		
K006	Are there any challenges regarding the delivery system of subsidized fertilizer?	1. Yes 2. No	
K007	If yes, what are the challenges?		