THE INFLUENCE OF AGRO-DEALERS ON FARMERS' USE OF AGRICULTURAL INPUTS IN KILOMBERO DISTRICT

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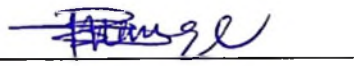
ABSTRACT

Agro-dealers, the retail distributors of agricultural inputs such as seeds, equipment, pesticides, and fertilizers have an important role in raising agricultural productivity of rural households. This study examines the influence of agro-dealers on farmers' use of improved agricultural inputs. Specifically, the study aimed at; identifying methods used by agro-dealers in stimulating agricultural input use among farmers, examining the effectiveness of agro-dealers in service provision to farmers in the study area and determining factors influencing farmers' use of inputs in Kilombero District. The study adopted cross-sectional research design whereby data were collected from 100 randomly selected respondents from Ifakara, Kiberege and Kisawasawa villages using a structured questionnaire. The villages were purposively selected. In addition, in-depth interviews were also conducted with agro-dealers to determine how they were influencing households' use of improved inputs. Quantitative data were analyzed using SPSS whereby descriptive statistics were determined. A logistic regression model was also used to determine factors influencing farm households' use of improved agricultural inputs. Results show that, provision of credit by agro-dealers, the number of agro-dealers and provision of extension services by the same had a likelihood of influencing a household's purchase and use of improved inputs. The time required to reach the agro-shop also influenced use of inputs (fertilizer). Based on these findings, it is suggested that for effective uptake of technology by farmers, agro-dealers need to be well equipped with knowledge of the agricultural inputs they sell to farm households as well as having entrepreneurial skills that may increase their sales and raise uptake of technologies to farmers.

DECLARATION

I RICHARD JOHANNES, 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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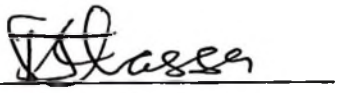

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DEDICATION

I dedicate this dissertation to my mother Mariam Range, my fiancee Flora Mbala and my co-worker Nadejda Mocanu for their affection and love in my academic success.

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LIST OF ABREVIATIONS

AATF	African Agriculture Technology Foundation
ACT	Agriculture Council of Tanzania
AGRA	Alliance for Green Revolution in Africa
CIMMYT	International Maize and Wheat Improvement Centre
CNFA	Citizens Network for Foreign Affairs
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FFS	Farmer Field School
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
MOFA	Ministry of Food and Agriculture Ghana
NAIVS	National Agricultural Input Voucher Scheme
NMB	National Microfinance Bank
RLDC	Rural Livelihood Development Company
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SPSS	Statistical Package for Social Sciences
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
URT	United Republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Tanzania's economy has for a long time relied on the agriculture as the leading sector in the economy, but the contribution of agriculture has been declining. The Economic Survey report of 2008 shows that the sector's contribution to the Gross Domestic Product (GDP) had declined to 26% in 2010 (URT, 2011) compared the (50%) contribution in 2002 (Keenja, 2004). The overall contribution of the sector to the country's GDP is estimated to be about 24 % (WITS, 2012 as cited by URT, 2012). Nonetheless, the agricultural Sector remains an important employer of more than 70% of Tanzania's (URT, 2010).

The decline in the sector's contribution to the country's GDP is a result of a multitude of factors. Whereas the changing economic landscape could be one of the reasons, globalization on the other hand has led to an inflow of Foreign Direct Investment (FDIs) which has enabled growth of other sectors such as mining, fish industry, and tourism hence raising their contribution to the country's GDP. In addition, the performance of the agricultural sector has not been good in recent years, the sector continues to rely on outdated technologies such as use of the hand hoe in land preparation, low yielding seed varieties, poor spacing, poor storage techniques to mention but a few. For example, the 2007/08 National Agriculture Sample Census has shown that 14.4 % of households use ox-plough as compared to only 0.8 who use tractors in land preparation (URT, 2010).

The 2007/08 National Agriculture Sample Census has further shown that inorganic fertilizer was applied in only 7.2% of the total area planted with annual crops during the

long rainy season. Moreover, despite the proportion of crop farming households using improved seeds increasing from 18% in 2002/03 to 24% in 2007/08, this proportion is still low to allow a meaningful transformation of the Agricultural sector and hence more contribution to the GDP and households well-being (URT, 2010). The report also shows that the use of irrigated farming dropped by one percent between 2002/03 and 2007/08 something that should not have happened given the unreliability of rainfall in most parts of Tanzania.

High yielding varieties of seeds, use of chemical fertilizers, pesticides, irrigation, improved planting, and weeding practices provide higher yields than conventional technologies (UNCTAD, 2010). Before market liberalization, the import and distribution of inputs were both state controlled whereby prices of fertilizer and other inputs was highly subsidized. The use of improved technologies was expected to have improved following the economic liberalization of input and output markets since the mid-1980s, based on the assumption that efficient markets would entice more farmers to emulate the success of early adopters of using improved farm technologies (Minot, 2009). This, in turn, resulted in an agricultural depression. Production of the main food crops dropped by 3.3% and agricultural GDP rose by only 0.5% (Delgado and Minot, 2000).

Following market liberalization input prices were decontrolled and subsidies were phased out (World Bank, 2003; Isinika *et al.*, 2003, cited by Isinika and Msuya, 2011). The removal of input subsidies greatly increased the price of inputs and consequently led to reduced use of fertilizers particularly on food crops (Delgado and Minot, 2000). Overtime, the government has employed various means to stimulate demand for inputs, including distributing subsidized inputs to rural based agro-dealers.

Generally, it is expected that, availability and affordability of inputs should influence their use among farmers and hence raise productivity. According to the World Bank (2003), demonstration plots and inputs promotion through agro-dealers (stockiest) stimulates demand for inputs. Agro-dealers' services are critical to farmers' access to appropriate farm inputs in their local environment (Chianu *et al.*, 2008; AATF, 2008). In Tanzania, agro-dealers are currently important actors in distributing agricultural inputs to farmers through the National Agricultural Input Voucher Scheme (NAIVS) (Minot, 2009; Cagley, 2009). This has led to a rapid increase in the number of agro-dealers in different parts of the country. It is on basis of the above that this study was undertaken to determine the role of agro-dealers in influencing farmers' use of improved agricultural inputs.

1.2 Problem Statement and Justification for the Study

Despite the rapid increase in the number of agro-dealers who are supplying improved agricultural inputs to farmers, there is still low usage of these inputs in Tanzania. Tanzania uses about 9kg of fertilizer per hectare on average, which is far below corresponding figures for other countries such as Malawi (27kg), South Africa (50kg), Latin America (73kg), South Asia (100kg) and South East Asia (135kg) (Policy Forum, 2010). In addition, URT (2010) shows that only 10% of Tanzanian farmers use improved seeds. As a result, URT (2007) argues that, the average food crop productivity of 1.7 tonnes per hectare could be improved by good management and optimal use of improved inputs, thus enabling yields of 3.5 - 4.0 tonnes per hectare. A study by ACT (2007), revealed that farmers in Kilombero are harvesting 5 – 8 bags of paddy per acre as a result of using poor technology, whereby good agronomy practices (including using improved seeds, fertilizer, agro-chemicals) could lead to harvests of 25 – 40 bags.

The importance of agro-dealers in the provision of agricultural inputs is crucial for farmers living in and around the majority of rural villages (Douwe, 2009). Being important actors in the Agricultural input sector, the Government of Tanzania through Tanzania National Agricultural Inputs Voucher Scheme (NAIVS) uses agro-dealers in distributing inputs as well as collecting input vouchers from the farmers for reimbursement. The program seeks to strengthen agro-dealers in the program areas as well as the input market in Tanzania (Benson *et al.*, 2012). Although they (agro-dealers) are key actors in distributing inputs to rural areas, but still, their role of agro-dealers in influencing farmers' use of improved agricultural inputs remains unknown. Available literature (Douwe, 2009; Okado, 2001; Krausova and Banful, 2010; Kibaara, 2006) concentrates on the importance of agro-dealers in supplying inputs while neglecting how they influence input use among farmers. This evoked interest to conduct a study assessing the role of agro-dealers in influencing farmers' to use improved agricultural inputs in Kilombero District, Morogoro Region.

1. 3 Objectives of the Study

1.3.1 Overall objective

The overall objective of this study was to assess the influence of agro-dealers on farmers' use of improved inputs for increased agricultural productivity.

1.3.2 Specific objectives

Specifically, this study aimed at:

i) Identifying methods used by agro-dealers in stimulating input use among farmers.

ii) Determining factors influencing farmers' input use in the study area.

iii) Assessing effectiveness of agro-dealers in service provision to farmers in the study area.

1.4 Research Questions

i) Which methods do agro-dealers use to stimulate smallholder farmers' use of improved farm inputs?

ii) To what extent are agro-dealers effective in delivering various services (training, advice and others) to smallholder farmers?

iii) What are the factors influencing farmers input use in the study area?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of Terms

2.1.1 Agricultural inputs

Agricultural inputs are materials such as seeds, fertilizers, agricultural chemicals or plant support used for the primary production (AATF, 2008). Urassa (2010) argues that improved agricultural inputs are important ingredients for higher output and production per unit of labour and/or land.

2.1.2 Agro-dealers

According to AATF (2008) agro-dealers or stockists are the retail distributors of agricultural inputs such as seeds, tools, pesticides, and fertilizers. AGRA (2009) defines agro-dealers as small farm retailers or trained and certified "stockiest", to whom farm inputs such as seeds, fertilizers and knowledge about their safe and efficient use are channelled to smallholder farmers. According to Krausova and Banful (2010) an input dealer (agro-dealer) is any establishment that sells any type of agricultural input.

2.2 Methods for Influencing Input Use

These are various ways of creating awareness of input use by farmers. Generally, this is done through extension methods (AGRA, 2009). According to Urassa (2010) the importance of agricultural extension services in raising agricultural productivity of smallholder farmers cannot be overstated. A study done in Northern Tanzania by SAA (2007) cited by Urassa (2010), revealed that, promotion of input use for example use of chemical fertilizers through using extension methods such as field days and demonstration plots was able to raise small-holder's maize productivity. Therefore, if

agro-dealers could use the extension methods mentioned above, there is a great possibility of increasing input use among farm households and hence their agricultural productivity (Odame and Muange, 2010).

2.2.1 Promotional materials

Lutkamu *et al.* (2005) argue that, leaflets/brochures, radio programmes and posters, newsletters, scientific meetings and conferences help in reaching a wide range of target end-users. AGRA (2011) argues that, agro-input suppliers can facilitate market information between identified buyers and smallholder farmers through mobile phones, village notice boards and market exchange visits.

2.2.2 Field days

Farmer Field Schools (FFS) are traditionally an adult education approach method to assist farmers learn in an informal setting within their own environment and hence this is a participatory method of learning, technology development, and dissemination (FAO, 2001 cited by IFPRI, 2010). FFS are based on experiential learning and demonstration and their main focus is to allow low-literacy farmers to actively participate and learn on good husbandry practices (IFPRI, 2010).

2.2.3 Demonstration plots

This is one of the commonest extension methodologies used by extension workers to disseminate information and message on agricultural technologies to farmers. According to Tollefson (1995) cited by Tomo (2010) farmers tend to believe in on-farm demonstration trials with direct benefits to them. Therefore, this suggests that use of demonstration plots creates greater influence on the use of agricultural inputs among farmers.

2.2.4 Inputs credit

Credit can be in the form of inputs provided to farmers or as cash or in-kind advances, based either on repayment at harvest or on agreed purchase (Shepherd, 2003). According to Pearce (2003) traders, processors, agro-dealers, and exporters are the primary source of credit to poor agriculture-dependent households by linking credit to the provision of inputs such as fertilizer and seeds in many rural areas where financial markets are shallow and poorly developed.

2. 3 Factors Influencing Adoption of Improved Agricultural Inputs: Empirical Findings of Related Studies

2.3.1 Farmer's education

Low education levels of small scale farmers, especially women who form the large per cent the agricultural labour force has remained a major constraint to the adoption of modern farming techniques and the ability to access other inputs necessary for increased productivity in the agricultural sector (Ukeje, 2004). Studies done by Teferi (2003) on factors influencing fertilizer consumption in Ada wereda (East Shewa, Ethiopia) found out that education has a significant influence on improved fertilizer consumption. Therefore, this implies that low level of education among farmers in rural Tanzania limits the use of improved agricultural inputs.

2.3.2 Farmer's age

Age is an important factor in farm household use of inputs. Farmers' age can generate or erode confidence and hence they become more or less risk averse to new technology (Kaliba *et al.*, 2000). The influence of age on input use has also been reported by Teferi (2003) on identifying the determinants of adoption and intensity of fertilizer use in Ejere District in West Shewa, Ethiopia whereby he found age as one of the factors influencing

the use of improved fertilizer. The above suggests that older farmers are less likely to invest in improved agricultural activities compared to active age group of farmers.

2.3.3 Farm size

Farm households land size has been shown to have an influence on improved input use. Cultivated land size has been regarded as one of the determinants of improved agricultural input use. For example Akililu (1975) using discriminant analysis, concluded that improved fertilizer use was among other factors influenced by farm size. According to Tesfaye (1975) the probability of adoption of improved varieties and fertilizer increases with farm size. This suggests that farmers with big land will tend to shy away using improved agricultural inputs due to cost implication as compared to those with small land.

2.3.4 Access to credit

Affordability of farm inputs is a major concern to many rural households in developing countries. According to Lelisa (1998) access to credit is among the factors influencing improved fertilizer adoption. Teferi (2003) also argues that credit access is one of the factors influencing improved fertilizer use. A study by Getahun (2004) also showed that access to credit influenced the probability of adoption and intensity of improved wheat varieties. Another study conducted by Asmerom *et al.* (1994) has shown that access to credit has a positive and significant influence on use and adoption of improved technologies by farmers.

2.3.5 Distance to input supplier (agro-shops)

Distance between farms and input centres are important when it comes to input use by farm households. For example, Teferi (2003) showed that distance from the road was

among factors determining the use of improved fertilizer. Moreover, Lelisa (1998) found that distance from fertilizer marketing centres has a negative and significant influence on the intensity of fertilizer use, implying that a unit increase in a distance from the road reduces the probability of individual farmers' use of improved inputs.

2.3.6 Income

Farm household's income is an important determinant of use or non-use of improved inputs. According Getahun (2004) off-farm income and gross farm income have a significant influence on improved fertilizer consumption. This suggests that farmers with relatively higher level of income have more potential to buy improved agricultural inputs and practice new technologies as they can afford the costs involved than farmers with the low income level.

2.4 The Status of Input Usage in Tanzania

Agricultural input intensity is very low in Tanzania, farmers use on average 8 kg/ha of fertilizers (below SSA average), and only 5.7% of rice farmers and 0.7% of maize farmers use improved seed varieties together with fertilizers (URT, 2007). Agricultural productivity in Tanzania is low by international standards relatively to her own potential as measured by research field tests and on-farm trials (World Bank, 2009 cited by Baltzer and Hansen, 2012). The low use of agricultural inputs has resulted to low production of food crops for an average of 1.7 tonnes per hectare (URT, 2007; ACT, 2007). And the above has led to National Agricultural Input Voucher Scheme (NAIVS) (for details see sub-section 2.5.2) and *Kilimo Kwanza* (see sub-section 2.5.3) initiative of 2009 (Benson *et al.*, 2012; Christiaensen and Pan, 2011).

2.5 Efforts by the Tanzanian Government to Increase Input Usage in the Country

A number of initiatives aimed at improving the performance of the agriculture sector in the country have been implemented over the past years. These include; The Iringa Declaration of *Siasa ni Kilimo* (Literally known as Agriculture is Politics), *Kilimo cha Kufa na Kupona* (Agriculture for life and death), *Kilimo cha Kisasa* (Modern Agriculture) (Ngaiza, 2012). Due to low production of various crops, the government of Tanzania argued that the best way to improve national food security in the face of high international food prices was to promote the use of agricultural inputs to raise productivity (Baltzer and Hansen, 2012).

2.5.1 Agro-dealer development

Understanding agro-dealers as important actors in the agricultural inputs value chain, Tanzania has continued cooperation with private sector to implement development programs targeting agro-dealers with the aim of strengthening their capacity in supplying inputs as well as providing advisory services to farmers. Developing agro-dealers' technical capacity allows them to provide high-quality advisory services to farmers, accelerates the introduction of technology, and enhances the potential economic returns for farmers who invest in yield-improving technologies (Allgood, 2011). In 2007- 2010, an NGO called Citizens Network for Foreign Affairs (CNFA) implemented a program which provided business and management training to agro-dealers so as to equip them with skills needed in their business and increase supply of agricultural inputs whereby some of the modules offered were focused on facilitating inputs demand creation activities such as conducting demonstration plots and field days, managing business relationships and better linkage to financial services (Baltzer and Hansen, 2012). Certification from CNFA has continued to be one of the criteria for the agro-dealer to be selected to distribute agricultural inputs through NAIVS program.

2.5.2 National agricultural input voucher scheme

Following the 2007/8 food crisis, the Government of Tanzania launched the National Agricultural Input Voucher Scheme (NAIVS), an input voucher program to increase the production of two of its major staple crops (maize and rice) and enhance its national food security whereby the program was geographically targeted to areas most suitable for maize and paddy/rice production (Christiaensen and Pan, 2011). Through this program, the government of Tanzania is expecting to increase access to modern inputs among poor and vulnerable smallholders as well as increasing overall maize and rice output (Benson *et al.*, 2012; Christiaensen and Pan, 2011). NAIVS is also seeking to strengthen agricultural input dealers in the program areas as well as the input market in Tanzania more generally (Benson *et al.*, 2012). Through NAIVS, agro-dealers are the important actors in the distribution of agricultural inputs (mainly fertilizer and seeds) whereby farmers take the vouchers to local agro-dealers to acquire the inputs. The agro-dealers then take the redeemed vouchers for reimbursement to a branch of the National Microfinance Bank (NMB), which was contracted to manage voucher redemptions.

2.5.3 *Kilimo Kwanza* initiative

Recognizing that the agriculture sector has direct impact on about 80% of Tanzanians who depend on it for their livelihood, the government of Tanzania launched the '*Kilimo Kwanza*' initiative in 2009 which aims to transform agriculture by enhancing its financing so as to improve technology, increase industrialization on and ultimately boost productivity (Policy Forum, 2010). *Kilimo Kwanza* is a Private Public Initiative where the private sector is the engine of economic growth mandated to be the lead implementing agent (Ngaiza, 2012).

This study is in line with *Kilimo Kwanza* pillar number seven (7) which is emphasizes on "improving distribution system to provide quality agricultural inputs timely". *Kilimo Kwanza* has ten pillars which are; (i) Political will to push our agricultural transformation, (ii) Enhanced financing for agriculture, (iii) Institutional reorganization and management of agriculture, (iv) Paradigm shift to strategic agricultural production, (v) Land availability for agriculture, (vi) Incentives to stimulate investments in agriculture, (vii) Industrialization for agricultural transformation, (viii) Science, technology and human resources to support agricultural transformation, (ix) Infrastructure Development to support agricultural transformation and (x) Mobilization of Tanzanians to support and participate in the implementation of *Kilimo Kwanza* (Policy Forum, 2010).

2.6 Theoretical Framework

The current study is informed by the Diffusion of Innovations theory (Rogers, 1995) as well with Adoption theory (Rogers and Shoemaker (1995). Diffusion is defined as "the process by which an innovation is communicated through certain channels over time among members of a social system" (Rogers, 1995).The theory focuses on the uptake of agricultural innovations such as herbicides, seeds and fertilizers (Rogers, 1995). Generally, for the technology not to be adopted and used by farmers, there are several factors (forces) that may limit farmers' ability in adopting a certain technology. Albrecht *et al.* (1989) identified inhibiting factors which include; lack of subsidies, limited liquidity (for buying herbicide, seeds, fertilizer, lack of machinery, and limited knowledge. According to Hoffmann (2005), once such forces are identified in the farmers' decision making process, the chances of diffusion can be estimated and consequences for promotion programs can be concluded.

New technology is easy to be adopted if it has the potential to contribute to economic growth and poverty alleviation amongst the poor. According to Rogers and Shoemaker (1995) adoption is a decision to make full use of new ideas as the best course of action available. The decision of whether or not to adopt a new technology hinges upon a careful evaluation of a large number of technical, economic and social factors.

2.7 Conceptual Framework

The study's conceptual framework (Fig. 1) assumes that the presence of agro-dealers directly stimulates smallholder farmers to use improved agricultural inputs such as seeds, fertilizer and pesticides. The agro-dealers' provision of inputs on credit and advice on how to apply the inputs can encourage more farmers to use improved inputs. Background information such as age, sex, level of education, marital status and level of income are expected to have influence on farmers' use of improved inputs. Nonetheless, some of these characteristics (e.g. age, sex, education level) could also be an obstacle, limiting the agro-dealers' ability to influence input use among farmers (Fig. 1). Generally, easy access to input credit and low input prices can encourage farmers to use more improved agro-inputs.

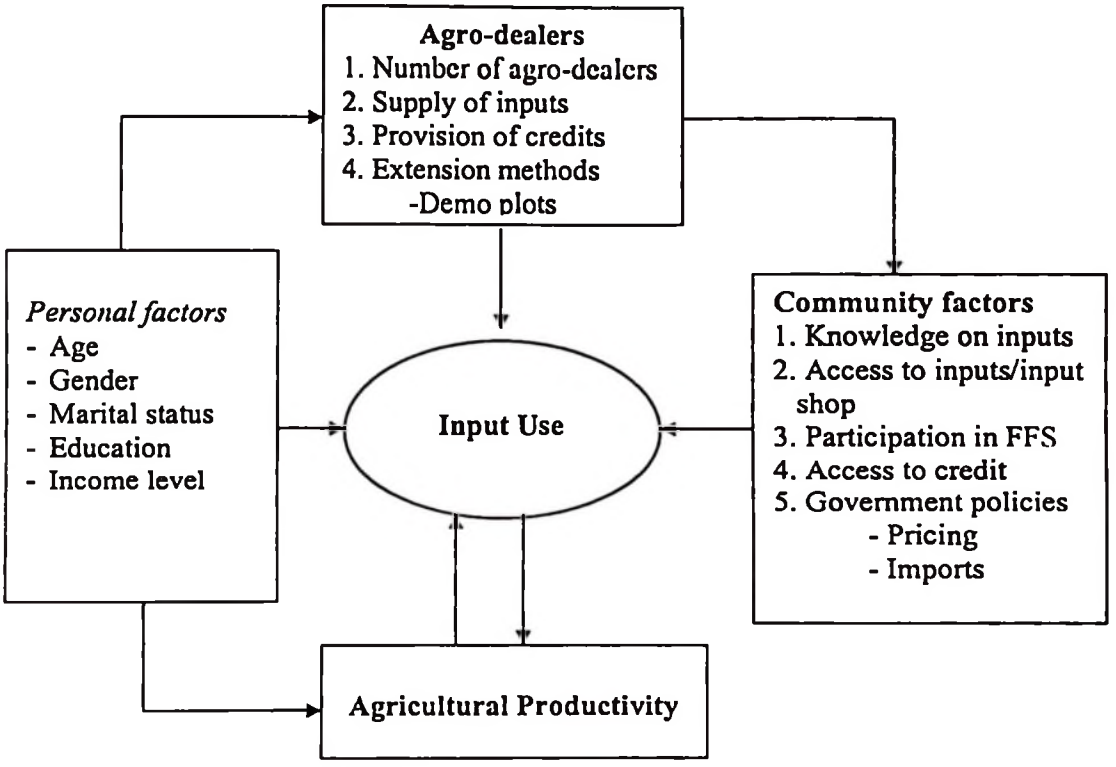

Figure 1: Conceptual framework for farmers' agricultural input use for higher agricultural productivity

2.8 Conclusions From the Literature Review

The chapter has tried to define some of the key concepts of the study such as agricultural inputs and agro-dealers. The chapter has also reviewed some literature on the methods for influencing input use which include promotional materials, field days, demonstration plots and provision of inputs credit. Empirical findings of related studies on the factors influencing improved input use have also been reviewed whereby it has been shown that there are various factors that can influence farm households to use or not to use improved agricultural inputs; these include farmers education level, farm sizes, limited access to inputs credit, distance to input supplier (agro-shops) and access to agricultural extension services.

To conclude, the literature has shown that improved agricultural input usage in Tanzania is very low compared to other countries and it has resulted to low agricultural productivity. The chapter also concludes that due to low production of various crops, the government of Tanzania has introduced various initiatives including agro-dealer development, National Agricultural Input Voucher Scheme (NAIVS) and *Kilimo Kwanza* in order to improve the use of agricultural inputs to raise agricultural productivity in Tanzania, thus ensuring food security and poverty reduction.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

Kilombero District was selected for this study because of its high potential for growing grains (rice and maize). About half of the production of rice in Tanzania is concentrated in the regions of Morogoro, Shinyanga, and Mwanza (Minot, 2010). According to URT (2006) cited by RLDC (2009), data shows that Morogoro has larger area under rice production as compared to leading rice production regions in Tanzania whereby it coveres 19.7% of the total area under rice production in Tanzania, followed by Shinyanga (18.5%), Mwanza (13.6%), Tabora (10.2%) and Mbeya (8.5%). Grains are the national focus for the inputs subsidy programme (NAIVS) (Christiaensen and Pan, 2011). Moreover, Kilombero is one of the areas prioritized by the government of Tanzania as a National Granary for Food Production (Costa *et al.*, 2013).

Kilombero District also falls within the target area for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) whose aim is to foster inclusive commercially successful agribusiness that will benefit the region's small scale farmers and in so doing improve food security, reduce poverty and ensure environment sustainability (URT, 2012). The district is one among the six districts in Morogoro Region. Other districts include Kilosa, Ulanga and Mvomero, Gairo and Morogoro Municipality. Kilombero District lies west of Morogoro Municipality, which is the regional headquarters. Ifakara, the district headquarters is located 230 km from Morogoro Municipality. The district boarders Kilosa and Morogoro District to the north, Ulanga, Songea and Njombe to the south, Liwale District to the east and Iringa to the west (URT, 2007).

(a) Climate

The climate of Kilombero District is considered tropical sub humid, with annual rainfall between 1200 mm to 1400 mm falling between December and June. The district has a bimodal rainfall, short rains fall in November to January and long rains start in March to June (URT, 2007). The annual average temperature in Kilombero District ranges between 26°C and 32°C. The air humidity is high and relatively constant during the wet season in the range of 70% to 90% but it may drop to 25% during dry season (URT, 2007).

(b) Soil

The greater part of the Kilombero District consists of large alluvial plains which are divided into alluvial lowlands and the alluvial uplands. The alluvial lowland is covered mostly by heavy clay soils which are a result of periodical/permanent flooding. The alluvial uplands, on the other hand are covered by soil of silt-clay sand (URT, 2007).

(c) Economic activities

The main economic activity of the district is agriculture and major food crops grown are rice and maize. The district has all the advantages for future agricultural development. It has fertile land, which is also suitable for growing maize, coffee and oil seeds (URT, 2007). Kilombero District has a large potential area for the production of rice and many people living in the district depend on rice production for their livelihood. Paddy (rice) is planted from December to February and harvested between May to June. The average paddy production per acre ranges between 15 bags and 30 bags (URT, 2007).

3.2 Research Design

The study used a cross-sectional research design, which allows data to be collected at one point in time for descriptive purposes and for determining of relationship between and

among variables (Saunders, 2007). Cross-sectional research design gives a snapshot of a sample of a population at a single point in time and does not require measuring social characteristic changes over time in a single study unlike other designs such as longitudinal research design. The method was selected due to its ability to meet the objectives of the study and also due to limited resources in terms of time and budget.

3.3 Sample Size and Sampling Technique

Purposive sampling was used to select four villages of Kisawasawa, Kiberege, Mwaya and Ifakara; these villages were purposively selected based on the criteria of having higher concentration of agro-dealers in the district. Simple random sampling was used to select 100 respondents for interviews because farmers were assumed to be homogenous in as far as use of improved inputs were concerned. According to Matata (2001) having 80-120 respondents is adequate for social-economic studies in sub-Saharan African households'. In addition, 15 agro-dealers were purposively selected and interviewed as key informants. Information from the key informants was used to verify what was reported by the farmers involved in the survey.

3.4 Data Collection

Data collection is the process of collecting and measuring information on variables in an established systematic manner that will enable one to answer stated research questions and evaluate outcomes (Dodge, 2003). Both Primary and Secondary data were collected for this study. In addressing the objectives of the study, qualitative and quantitative data were also collected. A combination of both qualitative and quantitative data was used in this study in order to improve an evaluation by ensuring that the limitations of one type of data are balanced by the strength of another (Saunders, 2007).

3.4.1 Primary data

Primary data are the data observed or collected directly from first-hand experience (Dodge, 2003). It was necessary to collect primary data from the field in order to get an accurate account from the grassroots level as well as to compliment the secondary data from various sources. A structured questionnaire with close and open-ended questions was designed and used for this study to collect primary data from the respondents. A checklist was used to get information from key informants among the agro-dealers.

3.4.2 Secondary data

Secondary data are the data collected by someone other than the current for some other purposes (Dodge, 2003). The study collected Secondary data such as past records for input usage in Tanzania and production level in Kilombero through reviewing literatures from various sources such as journals, books and internet. Secondary data were needed in order to compare results from previous studies with primary data as well as getting information on the past and current situation.

3.5 Data Collection Tools

3.5.1 Questionnaire

Dodge (2003) defines a questionnaire as a collection of questions either closed or open-ended that needs to be answered by the respondents during a research. A structured questionnaire with close and open-ended questions was designed and used for this study to collect both quantitative data from the respondents. Information collected includes the methods used by agro-dealers to influence more input use among farmers. Other information sought included; factors influencing farmers' input use, effectiveness of agro-dealers in service provision to farmers and other basic information from the respondents.

3.5.2 Checklist

In-depth interviews were conducted to 15 key informants using a checklist for qualitative data in order to get information from key informants among the agro-dealers who were purposively selected. In-depth interview is the method of qualitative research in which the researcher asks open-ended questions orally and records the respondent's answers (Saunders, 2007). According to Dodge (2003) Key informants are those whose social positions in a research setting give them specialist knowledge about other people, processes or happenings that is more extensive and who are particularly valuable sources of information to a researcher in the early stage of the study. Key informants were very crucial for this study in order to verify information that was reported by the farmers involved in the survey.

3.6 Data Processing and Analysis

Data analysis is the process of evaluating data using analytical and logical reasoning to examine each component of the data provided (Dodge, 2003). Both descriptive and regression analyses were carried out.

3.6.1 Descriptive analysis

Descriptive statistics were computed using Statistical Package for Social Sciences (SPSS). Descriptive statistics were needed in this study because it is an efficient way of computing and displaying summary statistics for several variables in a single table. The computed statistics included; means, percentages and frequencies in relation to methods used by agro-dealers in stimulating input use among farmers. The effectiveness of agro-dealers was assessed based on their frequency of providing services such as supplying of farm inputs to farmers, training and giving advice.

3.6.2 Regression analysis

A logistic regression analysis (Equation 1) was used to determine factors influencing individual farmer's use of improved farm inputs. The model was selected because it is very useful in analyzing the relationship between multiple independent variables. The model used is as shown in Equation 1;

$$\ln (P_i/1-P_i) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \varepsilon \quad \text{.....(1)}$$

Where;

P_i= Probability of the i^{th} farmer to use fertilizers/improved seeds $1-P_i$ = Probability of the i^{th} farmer not using fertilizers or improved seeds or pesticides, B_0= constant(Y-intercept), β_1, β_2, β_3... β_7 = slope coefficients of independent variables; $X_i = X_1, X_2, X_3$ .....X_8.

Where;

X_1 = Marital status; X_2= Household heads Sex; X_3 = Amount of land cultivated by household; X_4 = Provision of extension services by agro-dealers; X_5 = Availability of credit from agro-dealers; X_6 = Number of Agro-dealers in area covered, X_7 = Time required by households to reach agro-dealer's shop and X_8= Household experience of buying fake/below standard inputs in the past, and ε= Error term.

3.7 Hypothesized Outcome for Independent Variables

Marital status (X_1): It is represented by 1 if the farmer is married, 0 if otherwise, 3 if the household is divorce and 4 if widow. It is assumed that married men and women can handle and manage their overall livelihood (social duties and farm activities) better than households who divorce, widowed, or single. Therefore, it is assumed that married respondents use more improved agricultural inputs compared to divorced, widowed and

single respondents. A study by Uttaro (2002) argues that, that married women access inorganic fertilizer at a higher rate than single women.

Household Head Sex (X_2): Male and female respondents' probability of using the improved farm inputs is expected to be relatively equal if both have equal access to inputs. An important theme is that, given equal access to fertilizer (controlling for other inputs and background factors), female farmers adopt fertilizer at the same rate as male farmers (IFPRI, 2010). According to Stephens (1992), although most technologies are considered gender neutral, they are often gender biased during their introduction and use by societies. Moreover, there is a possibility that a household head's sex can influence the use of improved agricultural inputs.

Cultivated land (X_3): This refers to the total cultivated land holding by a household. According to Kibaara (2006), a larger farm area implies more resources and greater capacity to invest in farm land, purchase inputs like fertilizer, improved seeds and the likes as well as increased readiness to taking risk. Hence, this variable is hypothesized to have a positive impact on use of improved inputs.

Provision of extension service (X_4): This is a dummy variable, which takes a value 1 if the agro-dealer provides extension service to farmers and 0 otherwise. Extension services as a source of information has influence on farm households' technology adoption decision (Nkonya *et al.*, 1997). Therefore, it is hypothesized that this variable influences improved inputs use positively.

Availability of input credit (X_5): This is a dummy variable, which takes a value 1 if the household receives input credit for the agro-dealers and 0 otherwise. The variable

representing input credit as the factor which has influence on farm households' technology adoption decision. Availability of input credit influences farmer's use and adoption of new technologies (Lelisa, 1998; Teferi, 2003; Getahum, 2004).

Number of Agro-dealers (X_6): Number of agro-dealers in the area is likely to increase the probability of individual farmers' use of improved agricultural inputs. Hence, it is expected to have a positive sign. According to Kelly *et al.* (2003), agro-dealer networks increase input availability and technical knowledge of inputs among farmers.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-demographic Characteristics of Respondents

The demographic structure of the respondents was such that in Ifakara and Kiberege villages, more male (52.6%) than female (47.4%) respondents were interviewed as shown in Table 1. The Table also shows that about three quarters (75.3%) of the surveyed households were headed by men, which is quite in line with the national demographic figures. According to the World Bank (2012) cited by Trading Economics (2013), female headed households constitute 24.4% of all households in Tanzania. However, literature shows that the sex of a household does not necessarily influence use of improved agricultural inputs. For example, Freeman and Omiti (2003) found that the gender of respondents had no significant effect on use of fertilizer. Horrell and Krishnan (2007) also found no significant difference in improved fertilizer usage by female and male household heads in Zimbabwe. Although most technologies are considered gender neutral, they are often gender biased during their introduction and use by societies whereby men have greater access to technologies than women (Stephens, 1992). Generally, when both men and women have equal opportunities, inputs utilization would be the same regardless of one's sex. However, literature shows that women have less access to technologies and they are less likely to adopt or use fewer amounts of improved inputs compared to men (IFPRI, 2012; Stephens, 1992).

Table 1 further shows that most (68%) of the respondents were married. According to Uttaro (2002), married individuals are more likely to access fertilizers relative to those who are not married. Moreover, Dessalegn (2008) showed that married respondents, as did those with many relatives and friends had relatively more networks, better access to,

and use of new technologies than unmarried, divorced or widowed farmers. The implication here is that married respondents could easily influence each other with regard to accessing improved inputs more than unmarried respondents. The Marital status of respondents represents some level of family responsibility; the need to grow more crops to feed more members of the family would influence them to use more inputs, hence raising factor demand.

As regards to education level of the respondents, results in Table 1 show that, three quarters (75.4%) of the respondents only had primary school level education, which could be a limiting factor in their understanding of technical information on improved inputs use, leading to low usage. The study results are consistent with what on Tanzania by CIMMYT (1993) most farmers have primary education level and that rely on traditional farming practices. Small-scale farmers' low level of education is a major constraint towards the adoption of improved farming techniques and the farmers' ability to access other inputs necessary for increasing productivity (Ukeje, 2004; Uematsu and Mishra, 2010).

Results in Table 1 also show that the majority (87.6%) of households surveyed relied on crop production as their main source of income. The remaining households also earned some income from other activities such as livestock keeping, carpentry, employment, petty trade, bicycle repair and monthly pension. This reflects what has been reported to be the norm in many areas of the developing world. For example, Chambers (1997) and Barret *et al.* (2001:1) have argued that diversification is the norm in most of the developing countries. They observed that; *"Very few people collect all their income from any one source, hold all their wealth in the form of any single asset or use their assets in just one activity"*.

Multiple motives prompt households and individuals to diversify assets, incomes and activities. Diversification is sought for food security, cash income and risk aversion. For these reasons, some households grew a number of crops, dominated by paddy and maize. Paddy is a high value crop and households producing the crop commercially may stand to earn substantial income relative to other crops, maize included.

Table 1: Socio-economic characteristics of households (n=97)

Characteristic		Ifakara	Kiberege	Kisawasawa	Mwaya	Total
Respondents' Sex	Male	14(58.3)	17(73.9)	11(44.0)	9(36.0)	51(52.6)
	Female	12(41.7)	6(26.1)	14(56.0)	16(64.0)	46(47.4)
Household heads' sex	Male	19(79.2)	21 (91.3)	13(52.0)	20(80.0)	73 (75.3)
	Female	5 (20.8)	2 (8.7)	12(48.0)	5 (20.0)	24 (24.7)
Marital status	Not in a marriage	6(25.0)	2(8.7)	14(56.0)	9(36.0)	31(32)
	In a marriage	17(70.0)	21(91.3)	11(44.0)	16(64.0)	65(67)
	Missing	1(4.2)	0(0)	0(0)	0(0)	0(0)
Respondents' education level	Primary	19(79.2)	22(95.7)	21(84.0)	19(76.0)	81 (83.5)
	Secondary and above	5(20.8)	1(4.3)	3(12.0)	4(16.0)	13(13.4)
	Missing	0(0)	0(0)	1(4.0)	2(8.0)	3(3.1)
Respondents' Age	Mean	43.7	48.4	40.9	44.0	44.2
	Minimum	29	32	27	31	27
	Maximum	73	72	60	63	73
Respondents' source of income	Crop production only	20(83.3)	20(87.0)	20(80.0)	25(100)	85(87.6)
	Crop production and other sources[1]	4(46.7)	3(13.0)	5(20.0)	0(0)	12(12.4)

Note: Numbers in brackets indicate percentage

4.2 Socio-economic Characteristics of Agro-Dealers in the Study Area

The socio-economic characteristics of agro-dealers in the study area are as shown in Table 2. Their average age was 32.2 years. Being relatively young, therefore more active and energetic they are able to run agricultural input business more easily. They can use modern information communication technologies (ICT). They can also be involved in more networks which is necessary for agro-business operations.

[1] These include; livestock, off farm employment, petty trade, bicycle repair.

Education is an important factor for running agricultural input business. Results from the study (Table 2) show that less than half (46.7%) of agro-dealers had secondary school education while the rest (over 50%) had primary school education, which might limit their ability to understand some technical aspects of the products they are selling since most products are labeled in English. Although Tanzanian laws do not limit the level of education for a person to qualify as an ago-dealer, the guidelines from the Ministry of Agriculture, nonetheless, require a person to undergo some training, which normally comprises of technical terminologies that may become difficult for someone with a low level of education (Chriaensen and Pan, 2011). According to Nkonya and Kato (2001), formal education is an important requirement in the agricultural input business because agro-dealers have to read and understand labels on agricultural inputs in order to be able to give potential customers directions on use and application of agricultural inputs.

Results in Table 2 also show that most (86.7%) of the agro-dealers are engaged in the sale of inputs all year round. This suggests that inputs are available to farmers throughout the year. Agro-dealers are key actors on supplying and influencing the availability of inputs to farmers within their vicinity, and consequently the use of input they stock. Ownership of the input business in all villages was found to be mostly (80%) sole proprietorship, but only two fifths (40%) of respondents owned the premises where their business were located, mostly at trading centres and markets. A study conducted by Nkonya *et al.* (2001) in Uganda, found out that 12% of retailers used their permanent residence for trading purchased inputs because the renting cost was so high which forced them to raise the price of inputs to cover the renting cost.

Table 2: Socio-economic Characteristics of Agro-dealers (n=15)

Characteristic		Ifakara	Kiberege	Kisawasawa	Mwaya	Total
Nature of business	permanent	4(80.0)	3(100.0)	3(75.0)	2(66.7)	12(86.7)
	Seasonal	1(20.0)	0(0.0)	1(25.0)	1(33.3)	3(13.3)
Ownership of business	Personal	4(80.0)	3(100.0)	3(75.0)	2(66.7)	12(80.0)
	Company	1(20.0)	0(0.0)	0(0.0)	1(33.3)	2(13.3)
	Agent	0(0.0)	0(0.0)	1(25)	0(0.0)	1(6.67)
Business premises	Own	2(40.0)	2(66.7)	1(25.0)	1(33.3)	6(40.0)
	Rent	3(60.0)	1(33.3)	3(75.0)	2(67.7)	9(60.0)
Age of respondent	Mean	30.6	33.2	31.87	34.49	32.2
Education level	Primary	3(60.0)	2(66.7)	2(50.0)	1(33.3)	8(53.3)
	Secondary	2(40.0)	1(33.0)	2(50.0)	2(66.7)	7(46.7)
Sex of respondents	Male	4(80.0)	3(100.0)	4(100.0)	2(66.7)	13(86.7)
	Female	1(20.0)	0(0.0)	0(0.0)	1(33.3)	2(13.3)
Trained on input use and application	Yes	3(60.0)	2(66.7)	2(50.0)	2(66.7)	9(60.0)
	No	2(40.0)	1(33.3)	2(50.0)	1(33.3)	6(40.0)

Note: Numbers in brackets indicate percentage

4.3 Methods Used by Agro-Dealers in Stimulating Input Use among Farmers

The effectiveness of the extension approach used by agro-dealers to enhance adoption of improved agricultural technologies and ultimately improved agricultural output depends on a number of key factors related to; the extension method used institutional governance, and the capacity and management structures of the extension approach (MOFA, 2011). In addition to supplying agricultural inputs, agro-dealers are considered as providers of basic extension services to farmers, creating an important source of knowledge and advice (AGRA, 2009). Agro-dealers also play a key role in linking smallholder farmers to input and output markets (Krausova and Banful, 2010). Due to the limited presence of government extension workers, agro-dealers are farmers' primary points of contact for agricultural inputs and technical information. Their presence close to farmers reduces the distance farmers in rural areas must travel to purchase inputs and hence create influence on the use of improved agricultural inputs.

Comparing the study's findings in Table 3 and 4 provides some interesting observations. First, whereas most (66.7%) of the agro-dealers reported to be offering training to farmers, Table 4 shows that very few farmers (18.6%) information on input from the agro-dealers. According to Table 4, majority of agro-dealers are more concerned with supplying farm inputs without making any efforts to create opportunities for expanding the demand for inputs they sell, which increase usage, hence expand their business.

Effective dissemination of agricultural technologies requires use of strategic training approaches (Dorward, 2009). While some agro-dealers reported use of various methods (field days, demonstration plots and promotional materials) to attract more farmers to use improved inputs, the effectiveness of such efforts seems questionable. The observation and lack of efforts to influence farmers' use of improved inputs through extension methods may in some way be explained by Chinsinga (2011:13) who observed that in western Kenya some agro-dealers object to the idea of providing extension services to farmers, arguing that, "farmers are already knowledgeable about farming; we simply handle issues on the marketing side of things". It has been observed however that the lack of knowledge about inputs and their application leads to inappropriate utilization among many farmers (Dorward, 2009).

Table 3: Methods used by agro-dealers in stimulating inputs use (n=15)

Characteristic		Ifakara	Kiberege	Kisawasawa	Mwaya	Total
Method used	Exhibition	2(33.3)	1(50.0)	3(75.0)	1(33.3)	7(46.7)
	Demonstration plots	1(16.7)	0(0)	1(25.0)	0(0)	2(13.3)
	Field days	2(33.3)	0(0)	0(0)	0(0)	2(20.0)
	Brochures	1(16.7)	0(0)	0(0)	0(0)	1(6.7)
	None	0(0)	1(50.0)	0(0)	2(66.7)	3(20.0)
Does Agro-dealers train farmers on input use	Yes	4(66.7)	1(50.0)	4(100.0)	3(100)	10(66.7)
	No	2(33.3)	1(50.0)	0(0)	0(0)	5(33.3)
Availability of Input credit	Yes	3(50.0)	2(100)	3(75.0)	1(33.3)	9(60.0)
	No	3(50.0)	0(0)	1(25.0)	2(66.7)	6(40.0)

Note: Numbers in brackets indicate percentage

4.4 Agro-dealers' Effectiveness in Service Provision to Farmers

Agro-dealers are a critical link in the agricultural input distribution chain and play an important role in supporting smallholder farmers on agricultural inputs information (Dorward, 2009). In addition to supplying inputs as reported by 48.5% of the respondents in Table 4, 18.6% also recognized the agro-dealers for providing information on input use and technical advice (12.4%). This suggests that if they had adequate knowledge and extension skills, agro-dealers could be very instrumental in facilitating better use of improved inputs and other technologies among farmers thereby contribute to improved agricultural productivity. This in turn would influence more farmers to demand inputs for application in their farms. Proper engagement between farmers and agro-dealers may therefore contribute to transforming subsistence agricultural production thereby reducing income and food poverty. Similar findings have been reported in Kenya where Chianu *et al.* (2008) pointed out that information on inputs was among the services provided by agro-dealers in Western Kenya. During the survey of this study, it was found that some of the agro-dealers' shops were managed by employees (counter sellers) who lacked knowledge on the use of inputs. Therefore, there is a possibility that, farmers could be

misled or fail to get the advice they may need. This in turn would discourage agricultural productivity and poverty reduction.

Provision of input credit to farmers, is among the services provided by agro-dealers (Chianu *et al.*, 2008). Results from this study show that few (6.2%) of the respondents received input credit from the agro-dealers. Results in Table 5 further show that a few (8%) of the respondents lacked information on input credit availability for acquiring inputs. Upon probing, agro-dealers pointed out that, in most cases they do not offer farm inputs on credit due to dishonesty of some farmers and the risk associated with agricultural production. The following quote from one agro-dealer shows this hesitance;

"*When there is a drought and farmers are unable to service their loans, then we incur losses as there is no insurance to cover the risk*" (Cyprian Haule, an agro-dealer from Mwaya, 22/12/2011).

Dorward (2009) argues that farmers' inability to obtain the necessary funding (credit) limits their ability to make an otherwise profitable investment in agricultural inputs, which could transform their production and possibly their living standards. Dorward's argument, which is also supported by observations from this study, suggests the need for credit provision in order to encourage farmers to apply more improved agro inputs. However, credit conditions should be such that the providers are shielded from the risks of none payment by borrowers.

Table 4: Services provided by agro-dealers according to the respondents (n=97)

Characteristic	Ifakara	Kiberege	Kisawasawa	Mwaya	Total
Technical advice	2(8.3)	5(21.7)	3 (12.0)	2(8.0)	12(12.4)
Information on input use	10(41.7)	2(8.7)	4(16.0)	2(8.0)	18(18.6)
Distribution of inputs	11(45.8)	9(39.1)	13(52.0)	14(56.0)	47(48.5)
Sharing experience	0(0)	0(0)	1(4.0)	0(0)	1(1.0)
Provides input use information and distribution of agro-inputs	0(0)	0(0)	1(4.0)	0(0)	1(1.0)
None	1(4.2)	5(21.7)	1(4.0)	6(24.0)	13(13.4)
Missing	0(0)	2(8.7)	2(8.0)	1(4.0)	5(5.2)

Note: Numbers in brackets indicate percentage

4.5 The Influence of Agro-dealers on Use of Agricultural Inputs

As discussed earlier, 66.7% of the agro-dealers interviewed reported that they train farmers on the proper usage of agricultural inputs. However, findings in Table 3 show that very few agro-dealers used extension approaches to influence agricultural inputs, which suggests that agro-dealers in the study area are lacking entrepreneurial knowledge and skills in the input business. Less than half of the agro-dealers reported using extension methods such as demonstration plots (13.3%), exhibition (46.7%) and farmer's field days (20%) for influencing the use of improved inputs.

Apart from selling inputs and providing information as alluded to earlier, agro-dealers also provide credit to farmers (Chianu *et al.*, 2008). Increasing farmers' access to credit should be considered an important strategy to improve factor demand. Findings from this study (Table 5) show that only 6.2% the respondents received credit from the agro-dealers for purchasing agricultural inputs. Meanwhile, more than three quarters (77%) of the respondents mentioned lack of credit for inputs to be an important factor that limited their ability to improve and expand farm production.

Table 5: Respondents' access to credit from agro-dealers (n=97)

Characteristic		Ifakara	Kiberege	Kisawasawa	Mwaya	Total
Availability of inputs on credit	Yes	6(25)	1(4.3)	2(8.0)	1(4.0)	10(10.3)
	No	18(75)	23(95.7)	23(92.0)	24(96)	87(89.7)
Households acquisition of input credit from agro-dealers	Yes	1(4.0)	1(4.3)	4(16.70	0(0)	6(6.2)
	No	24(96.0)	22(95.7)	20(83.3)	25(100)	91(93.8)

Note: Numbers in brackets indicate percentage

4.6 Factors Influencing the Use of Improved Inputs

To assess further the interaction between input use among farmers and the role of agro-dealers, a binary logistic regression model (Equation 1) was used to determine factors that influence farm household use or none use of improved inputs or technologies, the study mainly focused on fertilizers, improved seeds and pesticides.

Results from the binary logistic regression analysis of the three models (for fertilizer, seeds and pesticides) as presented in Table 6 show that, all the intercepts were negative. The coefficient for the respondents' marital status was negative in relation to fertilizer and pesticide purchase and use, implying that unmarried respondents were less likely relative to their married counterparts to purchase fertilizer and pesticides. This is consistent with findings discussed earlier (Section 4.1) showing that married individuals were more likely to access fertilizer (Utarro, 2002), have more networks (Dessalegn, 2008), and influence each other to use improved inputs to fulfill their joint responsibility to grow enough crops to feed their families.

Table 6: Binary logistic regression results for Households purchase of fertilizers, improved seeds and pesticides (n=97)

Characteristic	Households purchase of fertilizers B (S.E.)[a]	Households purchase of improved seeds B (S.E.)[b]	Households Use of pesticides B (S.E.)[c]
Intercept	-1.061(0.721)	-	-
Marital Status	-1.249 (0.918)	0.045 (0.822)	-0.779 (0.860)
Household head's sex	0.888 (0.980)	0.475 (0.913)	0.902 (0.960)
Area cultivated by household	0.124 (0.104)	-	0.085(0.117)
Availability of credit from agro-dealers	1.408 (0.887)	1.122 (0.785)	0.740 (0.771)
Number of Agro-dealers in area covered	0.325* (0.192)	0.132 (0.133)	0.247* (0.144)
Distance to agro-dealer's shop	0.406 (0.493)	0.273 (0.472)	-0.546 (0.505)
Past experience of buying fake/below standard inputs	0.362 (0.493)	0.143 (0.473)	0.338 (0.499)
Nagelkerke R^2	0.156	0.078	0.104
Cox & Snell R2	0.117	0.058	0.076
Model X2 (7)	10.654	5.135	6.730

Note: **Significant at 5% (0.05) and * Significant at 10% (0.1) level;

The coefficient for the distance from the farmer's house to the agro-dealer's shop was negative in relation to pesticide use, but positive for fertilizer and pesticides. These findings are consistent with Teferi (2003) and Lelisa (1998) who argue that distance from the farmers to the agro-shops are among the factors determining the use of improved fertilizer whereby farmers close to the agro-shop are more likely to purchase fertilizer. The coefficient for the amount of land cultivated in relation to purchase of improved seed was also negative, implying that famers who cultivate small areas are more likely to use improved seeds whereby it was observed that most of the surveyed households were involved in paddy production as compared to maize and hence recycle paddy harvested from the previous season therefore not requiring to buy seeds from the agro-dealers. According to these results, only the coefficient for the number of agro-dealers in the study area was slightly significantly (at α=0.1) in relation to using fertilizers and pesticides which is consistent with Kelly *et al.* (2003), who argues that agro-dealer network increase input availability and technical knowledge of inputs among farmers.

Despite an insignificant coefficient of determination, the farmers' probability of purchasing fertilizer was positively influenced by; sex of the household head (being male), area cultivated, availability of credit from agro-dealers, and the past experience of having purchased fake of below standard inputs. Availability of inputs on credit though not significantly associated with a household's use of improved inputs, results show households were more likely to use inputs when they were available on credit. Input credit has been regarded as one of the important factors which has influence on farmers use and adoption of new technologies (Lelisa, 1998; Teferi, 2003; Getahum, 2004).

Purchase of improved seeds was similarly positively influenced by respondents' marital status, sex of household head, availability of credit, number of agro-dealers in the area, distance to the agro-dealer's shop, and the past experience of purchasing fake or below standard inputs. Paddy producers in the study area often recycle paddy harvested from the previous season and therefore do not require to purchase seeds from the agro-dealers. Findings by Isinika and Msuya (2011) show that the number of households using improved seeds in Morogoro region and Kilombero District was less than 5%. Similarly, the 2007/08 Sample Census of Agriculture which shows that the use of improved seeds in the region increased only slightly from 15% in 2002/03 to 16% in the 2007/08. Government records also show that the proportion of crop farming households using improved seeds increased only marginally from 18% in 2002/03 to 24% in 2007/08 (URT, 2010).

The use of pesticides was positively influenced by; the sex of the household head, area cultivated credit from agro-dealers, number of agro-dealers, and past experience of buying fake or below standard inputs. As pointed out earlier, the coefficient for distance to the agro-dealer's shop was negative, implying that farmers who are close to the source of inputs are more likely to purchase and use inputs (Teferi, 2003; Lelisa, 1998). As most

of agro-shops are located in urban district, smallholder farmers have to bear high transportation costs or walk long distances in order to purchase agricultural inputs. When the agro-dealer's shop is close to the farmers, it allows farmers to access improved agricultural inputs at fair prices that will enable them to increase their production.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study aimed at assessing the role of agro-dealers in influencing farmers' use of improved agricultural inputs. Based on the observations and discussion presented, it can be concluded that agro-dealers are important actors in supplying inputs to smallholder farmers. In addition, their number and being located close to farming households can have a significant positive effect on farmers to use improved agricultural inputs.

It is also concluded that, agro-dealers provide critical services to the farmers. Those services include information on input use. Such a role is very important to farmers especially to those areas that cannot be reached by the government extension workers.

It is further concluded that, although they play a major role in distributing inputs to farmers, agro-dealers in the study area are lacking an adequate knowledge and skills which could be used to influence input use among farmers such as demonstration plots, exhibition and field days.

Lastly, it is concluded that, the use of improved inputs in the study area is very low due to several factors including lack of input credit whereby very few agro-dealers in the study area provided this service to farmers.

5.2 Recommendations

Based on the study findings and the conclusion above, the following are recommended;

i) Agro-dealers need some extra technical and entrepreneurial training in order to raise farmers' use of improved technologies they (agro-dealers) stock. They need to be equipped with extension methods that will help to influence farmers use improved inputs. Such a move has the potential of raising farm households' agricultural productivity and ensuring food security in the rural areas especially for those growing food crops.

ii) Since the use of improved agricultural inputs in the study area is very low, local authorities through the Village/Ward Extension staff should train farmers regarding the importance of using the whole range of improved agricultural technologies in order to raise productivity hence, food security and increased household income.

iii) Further research is required to establish why despite many efforts by the government to provide extension services to farmers, this has not improved farmers level of using improved technologies such as seeds and herbicides, as it has been demonstrated in this study.

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APPENDICES

SOKOINE UNIVERSITY OF AGRICULTURE

THE ROLE OF AGRO-DEALERS IN INFLUENCING FARMHOUSEHOLD USE OF AGRICULTURAL INPUTS

Appendix 1: Household survey questionnaire

A. Background information

1. Respondent's name _____
2. Respondent's sex 1. Male 2. Female
3. Respondent's year of birth _____
4. Respondent's marital status 1. Single 2. Married 3. Divorced 4.Widowed 5. Separated
5. Respondent's education level 1. Primary school 2. Secondary school 4. University 5. Other specify
6. Do you own land? 1. Yes 2. No
7. If YES to question 6, how many acres? _____
8. How much of the land is under crop cultivation? _____
9. Do you rent land for crop production? 1. Yes 2. No
10. If YES to question 9, how much land do you rent per season? _____
11. What are the major sources of family income? 1. Crop production 2. Livestock keeping 3. Non-farming activities 4. Others specify
12. How many traders in this area supply agricultural inputs? _____
13. What type of inputs you purchased last year? 1. Seed 2. Seedling 3. Fertilizer 4. Farm tools 5. Pesticides 6. Others specify_____

B. Methods used by agro-dealers in stimulating input use

14. Are there agro-dealers who provide input on credit in your area? 1. Yes 2. No
15. If YES to question 14, have you ever used credit from the agro-dealer? 1. Yes 2. No
16. If your answer is NO to question 14, what is the source of your money to purchase inputs? 1. From own farm income 2.Borrowed from neighbors 3.Gift from relatives
17. What problem do you encounter in relation to input credit?

    _____

    _____

18. What types of services mostly provided agro-dealers in your area? 1. Technical support 2.Theoretical information 3. Input supply 4. Experience sharing 5. Others specify_____
19. If you access your inputs from Input traders. How are they obtained? 1. Purchase with own cash 2. Obtain loans to buy 3.Obtain on credit 4. Others specify_____
20. Do agro-dealers in your area conduct any extension training? 1. Yes 2. No
21. If YES to question 20, in what areas?

    _____

    _____

22. If YES to question 20, did the training contribute to your use of improved agricultural inputs? 1. Yes 2. No
23. If YES to question 22, which inputs are you currently using as a result of the training?

    (1) _____

    (2) _____

24. Are there any demonstration plots in your area established by agro-dealers?

    1. Yes 2. No

C. Effectiveness of agro-dealers in service provision

25. Do you have easy access to inputs in your area? 1. Yes 2. No

26. Do you receive inputs from the agro-dealers timely during the season?

    1. Yes 2. No

27. If YES to 26, do you get all the inputs required? 1. Yes 2. No

28. If NO to 26, what is/are the main constraint (s) regarding access to inputs? 1. Long distance to input shop 2. Unable to get required inputs 3. Lack of means of transportation 4. High input price 5. Others, specify_____

29. Have you ever face problem of purchasing poor quality inputs? 1. Yes 2. No

30. Do agro-dealers in your area provide advice on input use? 1. Yes 2. No

31. If YES to 30, on which areas in particular?

    (1). _____

    (2). _____

    (3). _____

32. Is the advice offered before purchase or after purchase? 1. after purchase 2. Before purchase

33. Is the advice given on request or without request? 1. on request 2. Without request

D. Factors limiting access of household to improved inputs

34. Is the price of inputs affordable? 1. Yes 2.No

35. If your answer is NO to 34, what was its impact on you in the use of improved crop inputs? 1. using below recommended level 2. Use less than the recommended amount 3. I do not use 4.Others (specify)_____

36. How many hours do you spend to reach your nearest input shop from your home?

    _____

37. Does the distance from home to the input shop have negative effect on you on agricultural inputs use? 1. Yes 2. No

38. If your answer is YES, what needs to be done?

_____

_____

_____

THANK YOU FOR YOU COOPERATION

Appendix 2: Agro-dealers Survey check-list

SOKOINE UNIVERISTY OF AGRICULTUTRE

THE ROLE OF AGRO-DEALERS IN INFLUENCING FARMERS' USE OF AGRICULTURAL INPUTS

A. Background Information

1. Name of the respondent _____

2. Sex _____

3. Age of respondent 1). 18-25 [ ] 2). 25-35 [ ] 3). 35-45 [ ] 4). 45+ [ ]

4. Marital status 1).Single [ ] 2). Married [ ] 3). Divorced [ ] 4).Widowed [ ]

5. Education level 1).Primary school (Std1-7) [ ] 2). Secondary school (Form 1-4) [ ] 3). Advanced Level (Form 5-6) [ ] 4). University level

6. How long have you been in the input trading business? _____

7. What is the type of your business? 1). Retail [ ] 2). Whole sale [ ] 3). Both [ ]

8. Nature of business? 1). Permanent [ ] . Seasonal [ ]

B. Socio Economic Characteristics

9. What was your main financial source for starting your business?

1) Relatives [ ] 2) MFIs institution [ ] 3) Bank [ ] 4) NGO [ ]

5) Other specify _____

10. What position do you hold in the agro-input business? 1) Owner [ ]

2) Manager [ ] 3) Sales representative [ ] 4) Other specify.....

11. Do you rent or own the premises of your agro-input business? 1). Own [ ] 2). Rent [ ]

12. How far is your business premise from the road? _____

13. How many agro-dealers are in this area? _____

14. What are the reasons for locating your business in this area?

.....

.....

15. What is your most important source of finance for purchasing agro-inputs?

1) Agro-input business [ ] 2) Relatives [ ] 3) Micro finance institution [ ]

4) Bank [ ] 5) other(s) specify_____

16. Is the price of inputs affordable by farmers? 1. Yes [ ] 2).No [ ]

17. Do you have access to credit? 1) Yes [ ] 2) No [ ]

18. If Yes, what was the source of credit? 1) Relatives [ ] 2) Micro Finance Institution [ ]

3) Bank [ ] 4) NGOs [ ] 5) other (s) specify_____

19. Among the inputs traded or sold which ones are mostly demanded by farmers?

.....

20. Have you undergone any training in the use and application of agro chemicals?

1) Yes [ ] 2) No [ ]

21. Do you train farmers in the use and application of agro-inputs?

1) Yes [ ] 2) No [ ]

22. Do you provide credit to farmers who purchase from you agro-inputs?

1) Yes [ ] 2) No [ ]

23. If Yes. How much is given and what are the terms for provision of credit?

.....

.....

4. Apart from selling agro-inputs what other services do you offer?

.....

.....

25. What problems are you facing in your agro input trading business?

.....

.....

26. Suggest ways in which these problems can be solved?

.....

.....

"THANK YOU FOR YOUR COOPERATION"