

**ROLE OF AGRO-DEALERS IN INPUTS DISTRIBUTION AND THE
COUNTERFEIT CHALLENGES TO SMALLHOLDER FARMERS IN
TANZANIA**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
AGRICULTURAL EDUCATION AND EXTENSION OF SOKOINE UNIVERSITY
OF AGRICULTURE. MOROGORO, TANZANIA.**

ABSTRACT

Despite Government efforts to invest in and modernize the agricultural inputs sector, smallholder farmers still encounter counterfeit inputs, particularly maize seeds. The study aimed at analyzing the role of agro-dealers in inputs distribution and the counterfeit challenges to smallholder farmers: A case of maize seeds, in Maswa District specifically (i) to determine demographic characteristics of agro-dealers in the study area (ii) to determine the distribution chain of improved maize seeds from agro-dealers to smallholder farmers, (iii) to examine regulations which guarantee good distribution of improved maize seeds in the district (iv) to determine challenges facing agro-dealers in selling improved maize seeds in the study area and (v) analyze agro-input dealers' characteristics in relation to distribution of improved maize seeds in the district. The study population included all agro-dealers in the district with 51 respondents. Questionnaire, focus group discussions (FGD) and key informants interviews were used to collect data. Descriptive statistics such as frequencies, and percentages were computed to facilitate analysis of quantitative data. The study found that, most of the agro dealers have no demonstration plots, there is uneven distribution of agro dealers' in the district and most of the agro shops were not regularly inspected by government officials. The study established further that there is the problem of counterfeit agro inputs and the methods used in verifying the genuineness of the maize seeds seems to be helpless. Agro dealers shared good agronomic practices to smallholder farmers. This study recommended Maswa District council to ensure authorized distributors of inputs, agro dealers establish demonstration plots, plan and establish regular farmers' forum. Lastly, it recommends the use of mobile phones technology to verify the genuineness of the maize seeds.

DECLARATION

I, REMIGIUS MANFRED KAHWILI, do hereby declare to the senate of the Sokoine University of Agriculture that this dissertation is my original work, done within the period of registration and that it has neither been submitted nor been concurrently submitted for a higher degree award in any other Institution.

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(MSc. Student)

Date

The above declaration is confirmed by;

Dr. S. Y. Nyamba

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Date

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ACKNOWLEDGEMENTS

I would like to thank my almighty God for the health, knowledge, insight and wisdom in this work. My sincere gratitude goes to my supervisor Dr. S. Y. Nyamba for his effective supervision, generous guidance, constructive ideas and indeed his tireless encouragement that shaped this dissertation. I thank all staff members in the Department of Agricultural Extension and Community Development for their encouragement and positive criticisms during all stages of proposal and research development.

I would also like to thank the Maswa District Executive Director's Office particularly the Agricultural Department staff, smallholder farmers and village leaders in the study area. Lastly, many thanks go to my wonderful family in particular my lovely wife Neema together with our beloved sons (Alfred, Albert and Allen) for their care, love, patience and prayers.

DEDICATION

I dedicate this work to my beloved parents Manfred and Angelina Kahwili for their encouragement and constant support in laying down the foundation for my education.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACB	African Centre for Biodiversity
ACT	Agricultural Council of Tanzania
ASA	Agriculture Seed Agency
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CNFA	Citizen Network for Foreign Affairs
CTI	Confederation of Tanzania Industries
DAICO	District Agricultural, Irrigation and Cooperative Officer
DTO	District Trade Officer
FAO	Food and Agriculture Organization
FGD	Focus Group Discussions
GAP	Good Agronomic Practices
ISSD	Integrated Seed Sector Development Programme
LGA	Local Government Authority
MAFC	Ministry of Agriculture Food and Cooperation
MDC	Maswa District Council
MT	Metric Tons
NGO	Non-governmental organization
SMS	Subject Matter specialists
TAGMARK	Tanzania Agricultural Market Development Trust
TBS	Tanzania Bureau of Standards
TFDA	Tanzania Food and Drugs Authority
TOSCI	Tanzania Official Seed Certification Institute
TRA	Tanzania Revenue Authority
URT	United Republic of Tanzania
USA	United States of America
USAID	United States Agency of International Development
WAEO	Ward Agriculture Extension Officer

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

While small-scale farmers produce over 70% of the world's food needs (Wolfenson, 2013), at least 75 percent of the entire Tanzanian population depends on small-scale farming (CTI, 2017). Improving agriculture productivity for smallholder farmers is, therefore, essential to reduce poverty rates and improving food security (Ashour *et al.*, 2017). According to the National Agriculture Policy of 2013, Tanzania Government acknowledges that increased use of modern inputs (i.e. improved maize seed) is a pre-requisite for achieving sufficient agricultural production. This is enhanced by the policy statements of enforcing laws and regulations to safeguards farmers from the supply of substandard inputs, and to promote input production, procurement and distribution while involving public and private sector in domestic production, multiplication and distribution of agricultural inputs and supporting farmers to access modern inputs (URT, 2013).

According to Abebe (2017), seeds are the key inputs for improving agricultural production and productivity. He maintains that increasing the quality of seeds can increase the yielding potential of the crop by significant folds. Similarly, Adetumbi (2014) concludes that seeds are crucial in the production cycle because they are the only biological input upon which all other components are applied. Adetumbi further pointed out that, the direct contribution of quality seed alone to the total production is estimated at 15 % -20 % depending on the crop type and it can be raised further to 45% with efficient management of the other inputs.

Moreover, Etwire *et al.* (2016) and Kumar (2011) uphold that without the use of quality seeds of superior crop varieties, farmers cannot get the expected yields. Thus, improved

seed could be considered as the most important technology that substantially contributes toward crop productivity irrespective of other inputs. On the other hand, counterfeit of agro-inputs is a global problem facing both developing and developed countries, in particular, Tanzania is suffering from the problem of counterfeit in its domestic input market of seeds, and the situation is challenging whereby about 40% of the agro-inputs (seeds, fertilizers, and pesticides) are reported to be counterfeited (CTI, 2008; Shao and Edward, 2014). The use of counterfeit agricultural inputs results in several negative impacts including low agricultural productivity, low income for farmers, land degradation and health effect (Dohmen, 2010). Furthermore, smallholder farmers incur a loss and cannot afford and/or may not trust to purchase certified seeds in the subsequent cropping season (USAID, 2017). Also, farmers are unable to assess whether seeds are counterfeited due to limited knowledge on how to test them before utilization (ACT, 2012). While counterfeit being common in almost all kinds of agricultural inputs such as seeds, fertilizers, and some agrochemicals, the problem is more serious in maize seeds (ACT, 2016a).

According to USAID (2010, as cited in Suleiman and Rosentrater, 2015), of all staple and cash crops cultivated in Tanzania, maize is the major staple crop. This is similar to Gates (2014) observation that maize takes about 60% of cultivated food crops. Specifically, maize production in Tanzania is dominated by smallholder farmers who produce about 85% of total production (Suleiman and Rosentrater, 2015). It is also estimated that over 70 000 MT (metric tons) of maize seed is used each year in Tanzania while in Maswa District alone maize seed demand is estimated to be 470.7 MT per year. Of this, about 80 % is the seed recycled from the previous harvest, approximately 12 percent are hybrids and 8 percent are non-hybrid seeds purchased by farmers mainly from local sources (Wilson and Lewis, 2015; MDC, 2017).

In Tanzania, there are people involved in the retail selling of certified seeds produced by various seed companies (ASARECA, 2014; Etyang *et al.*, 2014). For instance, a study by Etyang *et al.* (2014) shows that agro-dealers play a major role in ensuring that farmers access some of the important agricultural inputs required to improve agricultural productivity in their respective farms.

Furthermore, according to Chinsinga (2011), a critically important role for agro-dealers would be to serve as a referral point in case of problems and challenges that would arise for farmers. They put into practice new agricultural methods/technologies or plant new seed varieties and hence it was thought that agro-dealers would provide backup extension services to farmers, especially in light of the government's thin cadre of extension staff.

In addition, Maswa Agriculture Annual Progressive Reports (2017) revealed that the number of Agro - dealers involved in selling of maize seeds increased in the whole district from 13 in 2012 up to 40 registered Agro-dealers in 2017. The district has 120 villages and the agro-dealers are estimated to serve about 57 354 households. However, despite the increase number of Agro-dealers, farmers still complain about the issue of counterfeit and low production.

Also, based on the Maswa Strategic planning report of 2017, more than 92% of its residents are practicing agriculture. Maize is the most widely grown staple food crop in the district. However, according to Maswa Agriculture Annual Progressive reports, the production of maize declined from 45 045 tons in 2015/2016 to 26 488.5 tons in 2016/2017. The reasons for the decline included the supply of counterfeit maize seeds to smallholder farmers which are becoming common in developing countries (Shao and Edward, 2014). Therefore, the study aimed to assess the role of Agro-dealers in input

distribution and the counterfeit challenges of maize seeds to smallholder farmers in Maswa District.

1.2 Problem Statement and Justification

1.2.1 Problem statement

Despite the effort made by the Government of Tanzania to establish seeds act in 2003 and its amendment in 2007 to protect seed buyers and producers and ensure that seed meets minimum standards of quality, counterfeit seeds are still existing in the market (Kombe *et al.*, 2017). In the financial year 2015/2016, the government engaged some agro-dealers in the input subsidy program in Maswa District to increase maize production for the smallholder farmers. The government provided 20 740 tons of maize seeds to 2 074 households in 20 villages of the district (Maswa District Council, 2017). Still, the counterfeit problem in maize seeds to smallholder farmers persists, and the consequences include devastating economic situation of poor farmers as well as possibilities of food insecurity (CTI, 2017).

So far, it is not well understood as to why these agro-dealers in Tanzania and Maswa District, in particular, have not participated effectively in addressing the challenge of counterfeit seeds to smallholder maize farmers since early 1990's when they started operating in the district. Having realized the importance of these suppliers in Tanzania and their contribution to save seeds, it is therefore imperative to study the reason for this low response.

Studies on counterfeit agro-inputs have been conducted in different places. For example Karingu and Karanja (2013) explored the determinations of the infiltration of counterfeit agro-based products in Kenya while Shao and Edward (2014) studied the magnitude of

counterfeit agro-inputs in Tanzania. The study proposed a mobile-based solution system that helps farmers to authenticate agro-inputs in Tanzania. There is limited evidence of studies conducted to assess the roles of agro-dealers in inputs distribution and the counterfeit challenge of maize seeds to smallholder farmers in Tanzania particularly in Maswa District. This study, therefore, intended to determine the roles of agro-dealers in inputs distribution and the counterfeit challenges of maize seeds to smallholder farmers in Maswa district.

1.2.3 Justification of the study

The findings from this study generates the knowledge which contributes to reviewing the future ministerial and NGOs' plans of delivering agricultural inputs as well as dealing with counterfeit seeds to farmers. Besides, it provides lessons to smallholder farmers, planners, researchers, national and international organizations, authorities, policymakers and other relevant key players for sustainable agricultural development and the improvement of inputs sectors.

Therefore, this study, expected to generate findings that would shed light on the production and productivity of smallholder farmers, efficient and effective inputs service delivery systems within the public and private sectors.

1.3 Objectives of the study

1.3.1 Overall objective

The overall objective of the study was to document the role of agro-input business in increasing or decreasing accessibility and supply of improved maize seeds in Maswa District.

1.3.2 Specific objectives

- i. To determine demographic characteristics of agro-dealers in the study area,
- ii. To determine the distribution chain of improved maize seeds from agro-dealers to smallholder farmers,
- iii. To examine regulations which guarantee good distribution of improved maize seeds in the district,
- iv. To determine challenges facing agro-dealers in selling improved maize seeds in the study area,
- v. To analyze agro-input dealers' characteristics in relation to distribution of improved maize seeds in the district.

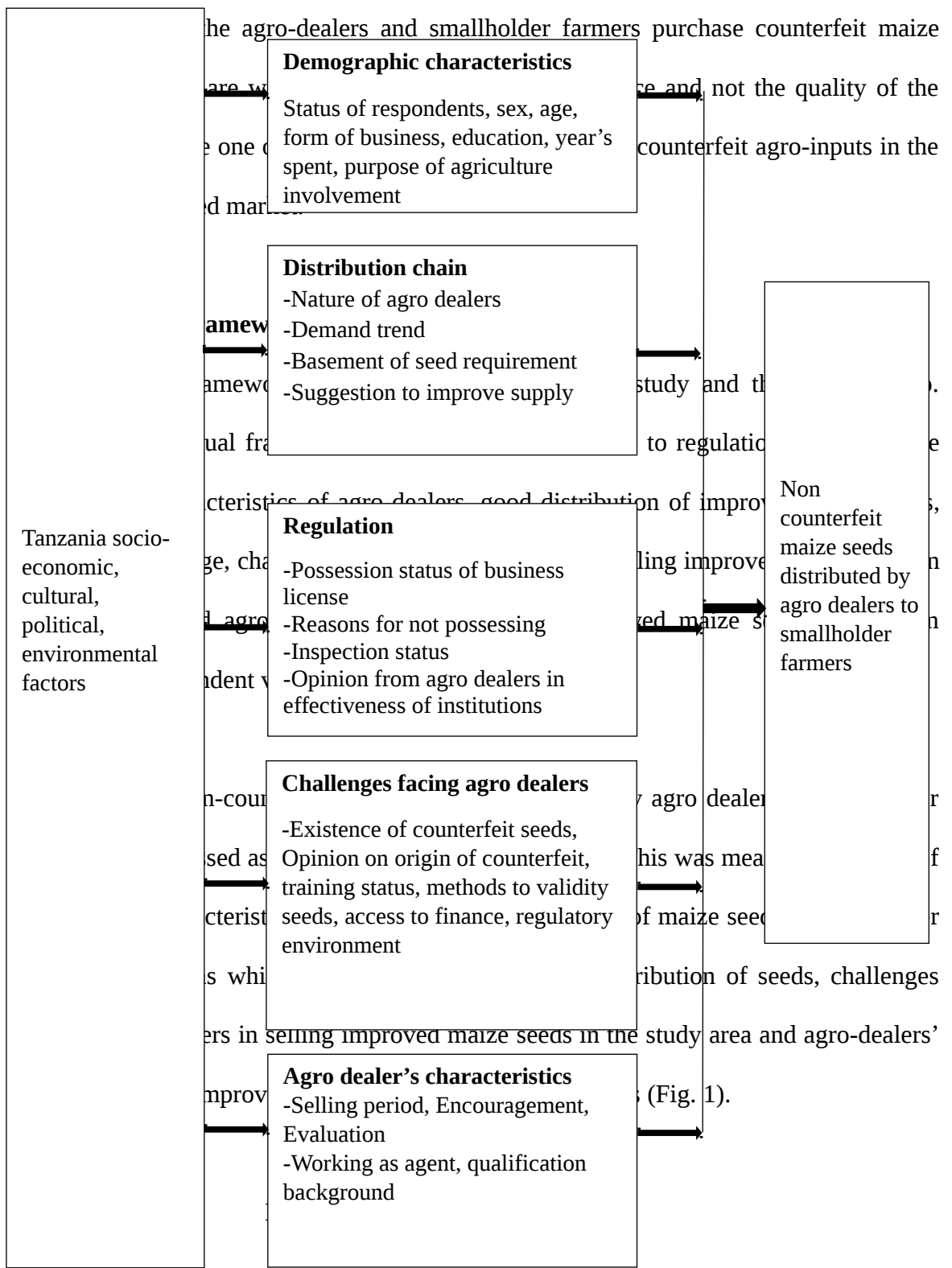
1.4 Research Questions

- i. What are the demographic characteristics of agro-dealers in the study area?
- ii. What is the distribution chain of improved maize seeds from Agro-dealers to smallholder farmers?
- iii. Are there regulations which guarantee good distribution of improved maize seeds?
- iv. What are the challenges faced by Agro-dealers in selling improved maize seeds in the study area?
- v. How the characteristics of different input dealers influence improved maize seeds distribution in the District?

1.5 Theoretical Framework

This study employs one theory which is the willingness to pay theory. Willingness to pay is defined as the maximum price a buyer accepts to pay for a given quantity of goods or services (Marine, 2009). According to Akerlof's (1970) as cited by Ashour *et al.* (2017), consumer who cannot observe the quality of a specific item but believes that a fraction of products in the market are low quality (or counterfeit) will have lower willingness to pay for the product. This leads to depressing prices and as the results of missing information problem, producers of higher quality products may be unable to remain in the market as

the bad products drive out good, driving down average quality in the market. If consumers beliefs are well informed about average product quality then would pay a price that better reflect true average products quality leading to more efficient markets than would exist if consumers were uninformed. The value of goods to those who ultimately consume them is reflected in the prices purchasers are willing to pay. This theory is relevant to this study



Dependent

Figure 1: Conceptual framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Concepts and Definitions of Key Terminology

2.1.1 Counterfeit

It can be defined as an unauthorized representation of a registered trademark carried on goods identical or similar to goods for which the trademark is registered, to deceive the purchaser into believing that he/she is buying the original goods (Spink *et al.*, 2013). Therefore, in this study, counterfeit maize seeds refer to any outdated maize seed, seeds un-allowed in the country and fake maize seeds packed in bags with labels of the allowed companies (bags stolen from the companies or copied) which do not perform as expected by users while other factors are constant (ACT, 2012).

2.1.2 Smallholder farmer

A smallholder farmer is generally defined as farmer farming seven or less, hectares. This size however may differ per crop and country (The Sustainable Trade Initiative, 2015). In Tanzania, for example, a smallholder farmer is a farmer operating between 0.2 and 2 hectares and this farmer is characterized by cultivating mostly in subsistence agriculture. Thus smallholder farmers are unable to produce according to prevailing market signals (URT, 2013).

2.1.3 Agro-dealers

Agro - dealer is defined as a single person or a group of people who supply agricultural input in rural areas at a retail price. I.e. an entrepreneur who purchases inputs from wholesalers or importers and sells them to smallholder farmers at retail prices and therefore agro-dealers connect poor farmers to the input supply market (Ndanzi, 2012).

2.1.4 Improved seeds

Improved seeds can be defined as seeds that aim at increasing the quality and production of crops by having characteristics such as drought tolerance, high yielding and early maturity (FAO, 2009).

2.1.5 Tanzania seed system

Tanzania seed system is dominated by the informal seed system whereby farmers use seeds saved from previous seasons. The formal seed system is where seed breeding, production, and marketing is highly regulated (ACB, 2015' USAID, 2013).

2.1.6 Seed quality

According to ISSD (2015), seed quality is a technical parameter that includes several seed attributes such as germination, physical purity, seed health and for some crops varietal purity

2.2 Demographic Characteristics

According Ogunlade *et al.* (2012), the capacity of agro-input dealers in advisory service delivery to maize farmers include, level of education, membership in agricultural groups, and level of business operation that contributes 75% to agro-input dealers' technical capacity. The study recommended that the education and size of agro-input businesses be considered for effective program development on advisory delivery by agro-input dealers. Also, Etyang (2014) observes that agro-input dealers found with post-secondary education are more efficiency in service delivery. Further, Misiko (2012) maintain that agro-dealers with high level of education have positive influence due to their good management skills. Likewise, Adetumbi *et al.* (2014) who examined the spatial distribution of agro-dealers in Peri-urban area of Ibadan and its implication on seed distribution system found that most

of the business centers (55.2%) were in the medium category and (80%) of the dealers have spent less than five years in the business with large proportion (51.2 %) spending less than one year. This suggests that most of the agro-dealers are new entrants and this indicates very little experience. However, it signifies gradual recognition of the importance of the sector in agricultural development.

Furthermore, Gerstenmier (2015) studied Agricultural Input Supply and found that agro shops were generally located in rural areas and were increasingly important sources of agricultural extension to farmers. Agro dealers have established a demonstration near their shops that showcase the benefits of using improved seeds. The demonstrations are important learning points for farmers. As observed by Okello *et al.* (2015), demonstration plots are often organized jointly by agro-dealers, farmers and input supply companies. The input suppliers generally facilitate the sessions while agro-dealers display goods and services, help mobilize farmers to attend and either own or co-own the demonstration plot. Training/technical assistance provided to customers in shops or directly on their farms, these brief training sessions help farmers follow the instructions to properly utilize new inputs. This is also reflected in Nagarajani's (2015) assessment of the effectiveness of agro dealer development activities, where the study found that only 3% of the agro-shops belong to associations, 2% are owned in partnership while 95% are individually owned. Usually, members assist the owner-managed shops on a part-time basis.

2.3 Distribution of Improved Maize Seeds from Agro Dealers to Smallholder

Farmers

Roekel *et al.* (2010) look a supply chains as forms of industrial organizations which allow buyers and sellers who are separated by time and space to progressively add and accumulate value as products pass from one member of the chain to the next. Maize seeds

pass different channels from producer, agro dealers to smallholder farmers. According Kumar *et al.* (2012), wholesalers at the district level buy seeds from the government and other private players in the nearby cities. They supply inputs to village stockiest/retailers. Some of the wholesalers also supply seeds directly to large farmers as well as to small retailers. According to FAO (2013), the public partner of the Tanzania agro dealer support program is MAFC, on behalf of the government. MAFC operates through the regional and district administrative secretariats to ensure that inputs (fertilizers and seeds) under the programme reach the targeted beneficiaries (farmers).

Marechera *et al.* (2016) uphold that availability of good quality seed is important for increasing crop production. Thus, the lack of proper functioning formal seed system undermines the goal of increased agricultural productivity which is expected to induce agriculture-lead economic development. However, Gerstenmier (2015) observes that getting improved seeds from the research stations to the hands of farmers is a complex challenge fraught with potential barriers to success. This echoes, Agriculture Council of Tanzania (2012) in distribution, access and application of agricultural inputs that inputs have weak distribution system and porous enough to allow influx of counterfeits, inputs reach farmers mainly through agro dealers. The council urges the distribution of inputs that is geared towards finding ways of improving efficiencies and cost effectiveness of delivering inputs to many farmers as possible. The main actors in the input supply chain include manufacturers, importers, primary (wholesalers) and secondary (sub-wholesalers) distributors and agro-dealers. Other secondary actors include NGOs and other non-state actors who promote or influence distribution systems and usage of inputs.

Similarly, Chianu *et al.* (2008) point out that the services of agro inputs dealers are critical to farmers' access to affordable quantities of appropriate farm inputs in their local

environment. In order to improve supply system of agro inputs, Goni (2018) reports high taxation as the main constraints affecting agro inputs business. Moreover, Nagarajani (2015) adds that poor linkage also affects the business as he argues that most retailers are either small or medium sized with or without a micro retailer's network.

Wageningen (2016) on the other hand insists on awareness creation as he observes that if farmers are convinced of the usefulness of quality seeds or certified seeds, they may not be in a position to purchase the seeds. He notes that the cost of the seeds, and the time of delivery is always inconvenient to farmers (before the agricultural season, farmers are often cash short). On the same note, Anderson (2016) and Lyimo (2014) report high input prices as the most important constraints for maize production. The high cost of improved seed is among the reasons why farmers don't use improved seed. The major strategies farmers use to obtain improved seed were purchase from agro dealers, recycling of their own seed and smallholder farmers in Tanzania face a range of challenges including obtaining and paying for quality seeds.

Further, Verhagen (2016) accentuates that quality seeds of improved varieties can not only help farmers to increase their yields. They are also critical for what is often described as sustainable intensification, combining high yields with sustainable use of other agricultural inputs, such as water, fertilizers and crop protection products.

2.4 Regulation which Ensure Good Distribution of Inputs

USAID (2017) maintain that a number of specific laws and regulations apply to the seed and inputs sectors and cover a wide range of areas related to ensuring that quality inputs are available in the markets, these laws and regulations lay out the process that needs to be followed to get seeds into the market. Laws set forth rules that regulate behavior while

regulations provide more specific provisions on how to implement and enforce the laws. According to USAID (2015), Seed laws are not intended to prohibit the sale of uncertified seed by farmers and traders. However, seed laws are sometimes interpreted incorrectly and are used to discourage the sale of farmers' seed and prevent the emergence of new seed enterprises. USAID (2013) reveals that TOSCI uses the International Seed Testing Association rules. And USAID (2017) maintains that TOSCI is the main regulatory agency responsible for regulating seed quality under the seeds act of 2003. According to TOSCI (2019), Tanzania has made great progress towards developing a comprehensive framework governing seeds and related inputs, and the focus is shifting now towards refining and implementing these laws and regulations.

As reported by ACT (2016b), the agro-dealers and smallholder farmers are guided by regulations which ensure efficiency and quality distribution of inputs and there is several regulatory public organizations that deal with day to day enforcement of legislation and regulations. All these are semi-autonomous but are answerable to the respective ministries. However, ASARECA (2014) observes that TOSCI's seed inspection services are considered inadequate in some of the more remote zones. Similarly, Elliot (2016) observes that the sale of counterfeit, expired or substandard agro-inputs is common in Tanzania. Unethical agro-dealers, sometimes in collusion with importers, re-package fake materials and sell it to farmers.

Also, Gerstenmier (2015) argues that one of the challenges facing the development of seed system is weak quality control systems which leads to a proliferation of fake seed which is hurting both farmers and the growth of the seed industry overall. FAO (2011) subscribes that normal procedures for seeds quality checks are possible for the true seeds. And that inspection or verification in the agro shops is an important means of checking on seed quality.

Odame and Muange (2011) look at the delay of issuing licenses to agro-dealers as one of the challenges. They argue that agro-dealers are required to obtain a trade license from local authorities; however the process takes number of years to approve while the business had been in operation. On the other hand, USAID (2015) exhorts that country seed laws are intended to protect consumers from fraudulent seed, the seed that is packed, priced and mislabel as certified seed. Moreover, USAID (2017) stated that the benefits of ensuring access to improved seed could be exponential and addressing the legal and regulatory challenges facing many of these crops will help bring prices down and help ensure that quality seed is more readily available to farmers.

2.5 Challenges Faced by Agro -Dealers in Selling Maize Seeds

Agro dealers in counterfeit seed take advantage of the fact that the demand for quality seeds surpasses the ability of researchers to produce them. Fake seeds dealers often operate by using names of brands that are trusted by farmers and pack the fake seeds in bags bearing the logo of genuine seed companies (USAID, 2017).

According to Chianu *et al.* (2008), most of the agro-inputs dealers still travel long distances to source different agro-inputs, a situation that has continued to result in high prices for farm inputs. Moreover, Kissinga (2007) and Mtisi (2017) maintain that most of agro-dealers lack training and skills, which becomes a major problem to access to finance as they are considered high-risk ventures by financial institutions. As a result, banks pitch the requirements for funding agro-dealers. Training and levels of skills had an impact on firm growth where firms run by people with training grew faster than those without such training. Kissinga (2007) subscribes that lack of capacity building for the majority of farmers imply their poor ability to provide efficient and quality services.

Additionally, Goni (2018) report lack of mobility as constrains affecting agro-inputs business while Odame and Muange (2011) found that regulatory enforcement is a major

constraint in the seed trade, leaving trading loopholes that allow ‘fake’ and poor quality seeds and unlicensed agro-dealers to infiltrate the system. Unless synergies are developed among agencies in charge of regulating agro dealership, illegal agro-dealers and the proliferation of poor quality, adulterated and counterfeit inputs will continue to flourish.

On a similar note, Ene and Mihaescu (2014) argue that in the past the most common counterfeit products were luxury goods, but at present, counterfeiting has grown alarmingly, covering almost all categories of goods and affecting economies throughout the entire world. The most important effects on the economy include effects on industries that compete directly with those counterfeiting their products, effects on innovation and economic growth, effects on companies involved in the production and sale of genuine legal products, investment effects, and effects on governments. Shao and Edward (2014) assert that lack of technology-based tool to verify agro-inputs products in Tanzania is a source of persistence of these fake products. USAID (2017) on the other hand holds that applying for an innovative “scratch card” approach to address the counterfeit seed challenge that could significantly contribute to the effective regulation of counterfeit seeds. Before buying a product, a consumer scratches a special security label to reveal a unique, one-use code. This code is then sent by mobile phone text to a secure number that is provided on the product package. Within the seconds, the user is notified via mobile phone text of the result.

2.6 Agro- Dealers’ Characteristics on Maize Seeds Distribution and Counterfeit

Challenge

According to Nagarajani (2015), a major reason that can be attributed to the seasonal nature of the trained agro-dealers is the diversified nature of business operations which includes engagement in-out trading and sales of other items in their shop premises. He maintains that trained agro-dealers who receive a certificate linked to a national

accreditation program that would allow them to participate in selling agriculture inputs have the capacity of selling agro-inputs in efficiency way than others. Moreover, Etyang (2013) reveal that apart from selling inputs, the agro-dealers also provided additional services to farmers. The three important services provided to farmers include; information on agronomic practices for seeds, information on agronomic practices for pesticides and information on agronomic practices for fertilizers. Borchers *et al.* (2012) observe that current and potential new customers make purchasing decisions based on particular interest to agricultural inputs and customer satisfaction.

Further, URT (2015) report that the government of Tanzania came with different interventions like facilitating private traders and agro-dealers to enhance the business network so that access to input by smallholders is improved in the rural areas as well as strengthening the national seed system that includes all the stakeholders. According to Etyang (2013), since 2006, the role of agro-input dealers and agro-input dealer business started receiving some attention as the likely channels for disseminating agricultural information. Chinsinga (2011) upholds since the concept of agro dealership is reflected in the business model of the permanent agro-dealers, successful agro-dealers have to have a diversified business portfolio. This means that agro-dealers have no choice but to diversify their business portfolio to smooth their flow of income since the demand for agro-inputs is extremely low during the off-season.

2.7 Seed Sector in Tanzania

Formal seed systems in Tanzania date back to 1973 and were initially based on public seed programs. Since then, there has been an ever-increasing move toward active participation of the private sector. Before 2000s, Tanzania seed sector was publicly dominated mainly by the government parastatal organization then known as TANSEED, which produced, marketed, and distributed seed (USAID, 2017).

At the most basic level, the farmer saved system is the major source of seed for producers in Tanzania. Farmers multiply and exchange seeds from important local crops and varieties. Another important source of seed for Tanzanian farmers is the local seed business system through which seed of most crops is produced. The public seed system is another important source of seed in Tanzania whose main players are public research institutes and the Agricultural Seed Agency (ASA), which produces seed at certified seed level. Parallel to the public seed system is the private seed company system in which private enterprises performs the production, marketing and distribution function (USAID, 2016).

However, in Tanzania, the use of quality seed remains lower than expectations. The reasons for this low quality are varied, including a limited growth of the private seed sector in the country and a prevalence of fake seeds that could have a major impact (USAID, 2013). Tanzania Official Seed Certification Agency (TOSCI) certifies the quality of seed before it is released into the market for grain crops but standards for vegetative propagated crops like potatoes and cassava are still under development (USAID, 2017). According to ASARECA (2014) a closer analysis showed that certified seed is only used for maize, sorghum, sunflower and to a lesser extent wheat. For all other crops, including some that are priority for food security and nutrition such as grain legumes, millets, cassava and sweet potatoes, farmers rely on informed sources for their seed.

In general, the main players of seed industries are individuals, farmers' groups, community based associations and or NGOs who multiply seed in a semi controlled manner for their own needs and sell the surplus to the local markets for profits. The farmer saved seed and local seed business constitute the informal seed sector and accounts

for about 75% of the seeds available in Tanzania while the formal sector contributes only 25% (USAID, 2016).

2.8 Summary of Literature Review

Literature shows that the certification process of agro-dealers to the authorized institutions is required to know if those agro-dealers have a legal mandate to operate the business. The literature also has demonstrated weak distribution systems of inputs though they did not indicate entirely the source of weakness that allows an influx of counterfeits to smallholder farmers. Further, the review illustrated that the available literature mentioned only the main actors in the input supply chain without considering their roles. Moreover, it was shown that despite much focus on seeds inspection done by TOSCI and the use of local government officers to reduce the gap of seed inspectors, the inspection methods and technologies are not yet known. In addition, the reviews highlight the lack of training and skills of the agro-dealers but they did not specifying the types of skills and training which are missing to the agro-dealers. Lastly, we saw that even though the roles of agro-dealers in inputs distribution and the counterfeit challenges of maize seeds to smallholder farmers have been studied, the roles of these agro-dealers in inputs distribution and the counterfeit challenges of maize seeds to smallholder farmers have not been adequately established.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1 Geographical location

The study was conducted in Maswa District in the Simiyu Region. The district lies between 1200 m and 1300 m above the sea level and it lies between the latitudes 2.45' and 3.15' South of Equator and between the longitudes of 33.0' and 34.1' east of the Greenwich meridian. The district is one of the six districts in the Simiyu Region. It is boarded by Meatu District in the East, Bariadi in the North and Northwest, Kishapu in the South and Southwest and Kwimba District in the west. Administratively the district has 3 divisions namely Mwangala, Sengerema and Nung'hu, with 36 wards and 120 registered villages (Fig. 2).

3.1.2 Climatic condition, soil and rainfall pattern

Maswa district has a semi-arid climate with a bimodal rainfall pattern of between 450 and 1000 mm with an annual average of 750 mm. The average rainfall decreases from north to south and from west to east. The short rains start in mid-November to mid-January and the long rains start early March up to mid-May. Both rainfall patterns are suitable for maize production. The average temperature is 26°C. Large parts of the district have hard and vegetative cover and the soil fertility in large tracks of the district is medium to the poor (Maswa Strategic plan, 2017). The district was purposively selected because it has high prevalence of food insecurity among its population and has consistently been confronted by low food security (Vitatu *et al.*, 2011; Gyunda, 2012).

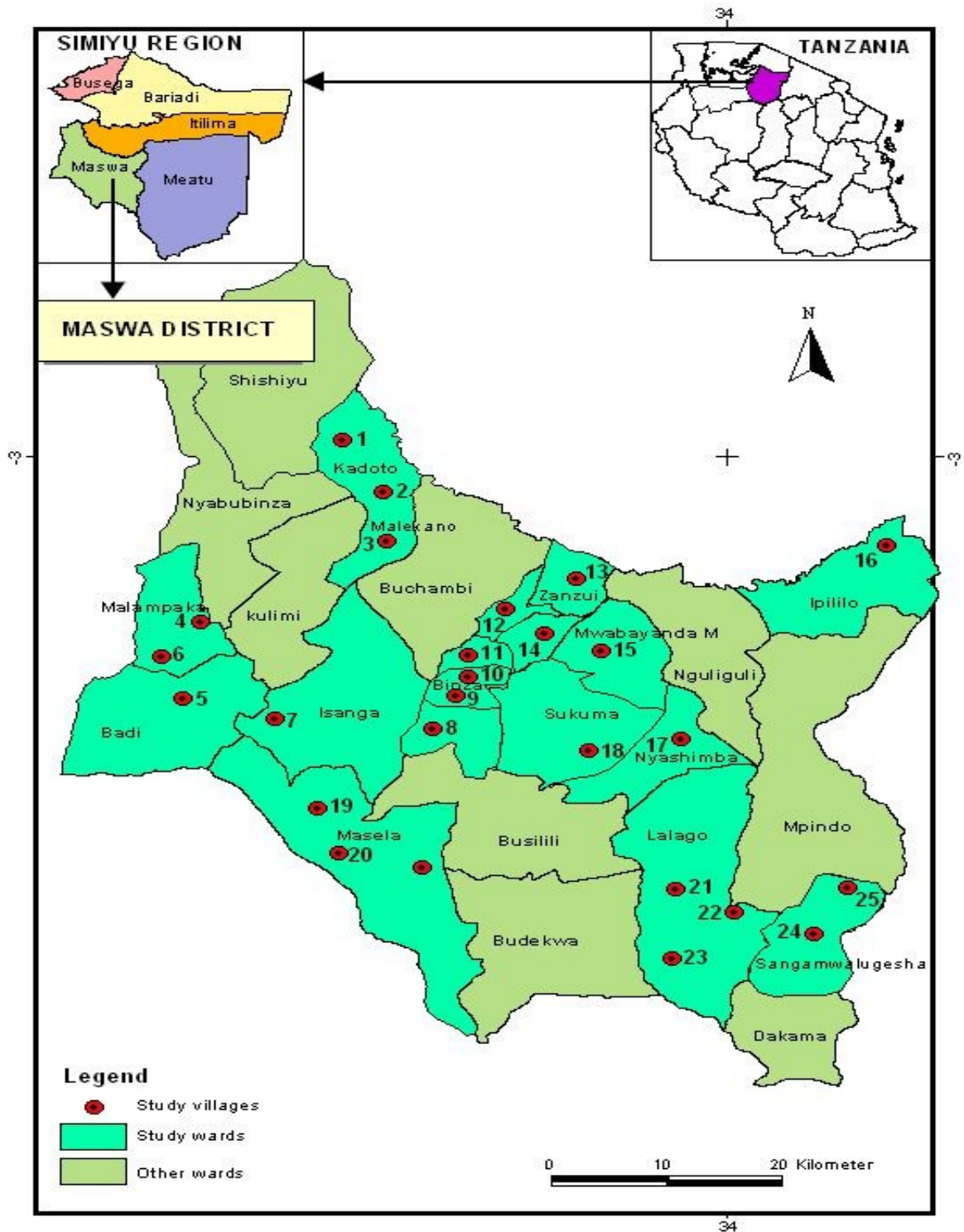


Figure 2: Map showing location of the study area

3.1.3 Population and land

According to National population and housing census (URT, 2012), Maswa District has a population of 344 125 of whom 167 382 female and 176 723 male. The district has a total

of 3398 square km of which 2475 square km are suitable for agriculture and livestock keeping, 77 square km is forest reserve and 846 square km are mountainous with slight bushes and shrubs (Maswa Strategic Planning, 2017).

3.1.4 Economic activities

Maswa District council has an area of 339 800 ha but currently the land under cultivation is 274 500 ha whereby the average 221 241 ha are cultivated yearly equal to 89% of the total area suitable for cultivation. About 57 354 household are fully engaged in agriculture activities which are about 95%. The Main crops grown include maize, paddy, sorghum, sweet potatoes and cassava as food crops and cotton as a cash crop. The sector contributes highly to the economic development of the district (Maswa Strategic Planning, 2017).

3.2 Research Design

A cross-sectional research design was used whereby data were collected at a single point in time. This study design was preferred because of its advantages in terms of generally being quick, easy, and cheap to perform. According to Sedgwick (2014), this design saves time and resources during fieldwork and gives an option to study a phenomenon across a wide area for general impression. Also, in cross-sectional research design, data on the variables of interest are collected more or less simultaneously (Bryman, 2012).

3.3 Study Population

The study populations were all agro dealers and smallholder farmers in Maswa District. Besides, 20 local government officers were contacted (i.e. District Agriculture, Irrigation and Cooperative Officer, District Trade Officer, District Seed Inspector, and 16 Ward Agriculture Extension Officers) and one officer from Tanzania Official Seed Certification Institute (TOSCI) was included in the study as the key informants.

3.4 Sample Size and Sampling Procedure

Total population sampling technique was used to source fifty-one (51) agro-dealers from the existing district agro-dealers' records list. In this method the entire populations that meet the criteria were included in the research (Etikan *et al.*, 2016). Therefore, a total of 51 agro-dealers in the district from the three divisions; Mwangala, Sengerema, and Nunghu with a total of sixteen (16) wards and twenty-five (25) villages were used as the main respondents. However, as observed by McKenna (2013), key informants (KI) are unquestionably important in community-based research, providing information about the community and helping the researcher to make additional contacts. To obtain detailed information concerning suppliers of agricultural inputs in addressing challenges of counterfeit agricultural inputs among smallholder maize farmers in Maswa District, the researcher selected 20 key informants. These were purposively selected due to their intensive knowledge of agro-inputs distribution and counterfeit issues. The KI included 16 WEO's of the selected wards, one District Trade Officer (DTO), one TOSCI Officer, and one District Seed Inspector together with the DAICO for Maswa District Council. In addition, the study involved 40 smallholder farmers who were randomly selected from five villages namely; Isagen'he, Mwabayanda (M), Nyashimba, Njiapanda and Malekano. . Eight farmers per village were to form a focus group discussion (FGD) whose input consolidated primary data.

3.5 Data Collection Methods

Both quantitative and qualitative data collection methods were used to obtain primary data. Quantitative data were collected from agro-dealers by using semi-structured questionnaire. In qualitative data collection, both Focus Group Discussion (FGDs) and Key informant interviews were conducted. A total number of five FGD with eight participants in each were done, and key informants include District Agriculture Irrigation Cooperative Officer, District trade officer, TOSCI officer, District seed inspector and sixteen WAEOs from the study area were interviewed using key informants checklists.

3.6 Data Analysis

Quantitative data were analyzed descriptively with the help of Statistical Package for Social Science (SPSS) and presented in frequency and percentage. Qualitative data from the FGD and in-depth interviews with KI were analyzed through content analysis by coding responses given and assessing them for differences and similarities. The results were interpreted in comparison with the results obtained from agro-dealers' questionnaire with questions acquired from the topics and questions discussed as supporting information on the study.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Demographic Characteristics of the Agro Dealers

This section presents and discusses demographic characteristic of agro-shop dealers in Maswa District. The characteristics include; business ownership, gender, age, forms of business, duration in business and education level whose results are presented in Table 1.

As presented in Table 1, most of the respondents (51.0 %) did not own the shops instead were employed to run the shops. This implies that agro-shops created opportunities for employment and self-help in the study area. However, during the FGD in Nyashimba village participants complained of the poor service received from shop attendants especially when the attendant is a family member of the shop owner as they point out that:

Some agro dealers tend to use their family members who are incompetent to sales in the agro-shops during their absence. These family members seem to lack enough experience and technical knowledge on maize seeds and agriculture inputs at large to satisfy our needs and hence they offer us a poor quality of services. (FGD Nyashimba, 22 April 2019)

Also, it is illustrated that the economic activity of agro-dealers' business in Maswa is male-dominated as majority (78.4%) of the shops were run by males. The bigger percentage of males than females implies that female is less engaged in agro shops business than males.

The study, as demonstrated in Table 1, found that relatively low number (33.4 %) of the shop attendants had no professional qualification; they possessed only either primary and

or secondary education. However, this low percentage have a greater impact on the side of the farmers as they lack proper guidance from professionals and as a result they end up using inappropriate product, which affect them both their crop yield and financial gain. Also, although the study found that most of the shop attendant had post-secondary education, it was established that not all of them had trained in agriculture related disciplines. This means the challenge of guiding farmers would still be high as it would be paramount for the agro-shop should be attended by a professional in agriculture for the better results to farmers. On the other hand however, this study concurs with Etyang *et al.* (2014) and Ogunlade *et al.* (2012) who uphold that the level of education affected awareness of integrated seed and management technologies and if the level of literacy is high to the agro-dealers, they could read and correctly interprets manufacturer's instructions and precautions easily in the English language.

In terms of age, only 17% of the respondent were aged above 40 years, the remaining percentage comprise of the energetic and productive age group of 18-39 years. This implies that first agro-business needs energetic personnel to run but also need the productive group that are flexible and easy to train in case of any technological changes or product change. Most of the businesses in the area were sole properties. The sole proprietor system was dominant in the study area probably due to the reason that it used to reduce businesses misunderstanding whereby a single person is involved in decision making of the business. Nagarajani (2015) on his study shows that almost all the shops 95% were owner managed, 3% of the shops belong to associations and the rest are owned through partnership.

Experience in seed business influenced the performance of the agro shop. Longer period in seed business operation created a strong relationship between agro-dealers and

smallholder farmer's hence the bigger capacity of maize seed technology. Most (76.3 %) of the seed business personnel in the district had 1-5 years' experience in the business. Holding other factors constant, increasing the number of years of engaging in agro business increased the chance of agro dealer's awareness of maize seed business. The results are similar to those by Adetumbi *et al.* (2014) and Nagarajan (2015) found that 80% of the dealers had spent less than five years in the business

The study further wanted to establish if the agro-dealers had demonstration farmers as it was revealed in literature. It was found most (51%) of the agro-dealers had no demonstration plots around their agro shops where they could demonstrate the performance of improved maize seed from supply companies. Those plots could have been used to test maize seeds which were not of good quality. This study echoes Gerstenmier's (2015) observation that agro shops are generally located in rural areas and are increasingly important sources of agricultural extension to farmers. Agro dealers have established a demonstration near their shops that showcase the benefits of using improved seeds.

Table 1: Respondents characteristics (n=51)

Status of respondent	Frequency	Percentage
Owner of the shop	16	31.4
Employee	26	51.0
District focal person	4	7.8
Family member	5	9.8
Total	51	100
Gender of respondent		
Male	40	78.4
Female	11	21.6
Total	51	100
Age of respondent (in years)		
18-28	18	35.5
29-39	24	47.0
40-50	9	17.7
Total	51	100
Form of business		
Sole proprietor	40	78.4
Partnership	6	11.8
Family	5	9.8
Total	51	100
Owner's education level		
University	6	11.8
Diploma	12	23.5
Certificate	16	31.4
Secondary	6	11.8
Primary	11	21.6
Total	51	100
Years spent in seeds business		
1-5	39	76.3
6-10	7	13.7
11-15	3	6.0
16-20	2	4.0
Total	51	100
Farming purpose		
For farmers demonstration and family use	21	41.2
Farmers demonstration and selling	4	7.8
Not involved in farming	26	51.0
Total	51	100

4.2 Distribution Chain of Improved Maize Seeds from Agro Dealers to Smallholder

Farmers

4.2.1 Mode of input supply

Three categories of maize seed traders were identified in the study area namely; wholesalers, middlemen, and retailers. Among these categories of agro-dealers, majorities

(92.0 %) were retailers followed by middlemen (5.9 %) and wholesalers fell into the least category (2.0 %) (Table 2). Retailers usually buy maize seeds from wholesalers who are found in nearby regional centers like Mwanza, Simiyu and Shinyanga.

The big number of retailers implies the inability of the majority of maize seeds traders to make large purchases of maize seeds probably due to the low financial capability of the agro-dealers in the study area. It was found that the agro-dealers wholesalers were also seed agent by maize seed companies. Through selling maize seeds as agent reduces the possibilities of counterfeiting inputs since seeds are coming directly from seed companies and then direct to the agro shop. These results are similar to that of Kumar *et al.* (2012) established that input wholesalers at the district level buy seeds from the government and other private players in the nearby cities. They supply inputs to village retailers.

Some of the wholesalers also supply pesticides, fertilizers along with seeds directly to large farmers as well as the small retailers while input retailers operate small shops in the village. They buy seeds and other inputs from the private wholesalers and sell several maize varieties produced by different manufacturers.

Table 2: Mode of input supply (n=51)

Mode of input supply	Frequency	Percentage
Retailers sells to farmers only	47	92.2
Retailers sells to farmers directly and micro retailers	3	5.9
Whole sellers sells to other retailers and farmers	1	2.0
Total	51	100

4.2.2 Demand trend of improved maize seed in the study area

The findings, as illustrated in Table 3, indicate that farmers are moving from the use of local varieties of seeds to improved one. This is evidenced by 76.4% of the respondents who belief the demand range from moderate to high. In addition, during key informant interviews from Sukuma ward one extension officer said that: '*Improved maize variety*

seed like SC 403 has got high demand in the ward by the smallholder farmers for its high adaptability and yield potential. However, exploration on the statistics of selling improved seeds refutes this fact. The results indicate that the selling trend of improved maize seed is not low. This was also revealed during FGD in Mwabayanda village where farmers confirmed that the demand for improved maize seed is low in the village. The reason given is that farmers are worried to purchase improved seeds which mostly were counterfeited. These findings are similar to those of USAID (2013) which reported that use of quality seed remains lower than was expected with varieties of reasons including limited growth of private sector and prevalence of fake seeds and lack of follow up on key policies that could have a major impact.

Table 3: Trend of improve maize demand (n=51)

Trend of improved maize seed demand	Frequency	Percentage
Low	12	23.5
Moderate	22	43.1
Increasing	17	33.3
Total	51	100

4.2.3 Involvement of other stakeholders in preparation of requirement of improved maize seeds by agro dealers

When respondents were asked to provide information regarding involving other stakeholders in the preparation of smallholder farmers' maize seeds requirements, the findings in Table 4 indicated that only a few (7.8%) reported to involve agriculture extension officers. It was further revealed both the users of the maize seeds (smallholder farmers) and the extension officers are not involved in preparing that important requirement. Although agro-dealers were business-oriented, agriculture extension officers know better on the general requirements needed by farmers and could be in a better position to give advice on which variety is more suitable according to the climatic conditions of the given area. However, during the KII with Maswa DAO, it was revealed

that the district agriculture office compile input requirements especially maize seed each planting season together with ward/village agriculture officers.

Table 4: Involvement of other stakeholders on preparation of maize seed requirements (n=51)

Involvement of stakeholders on requirement of improved maize seeds from farmers	Frequency	Percentage
Experience of the past season	24	47.1
Frequency of farmers inquiry	13	25.5
Asking other agro dealers	3	5.9
After communicating with extension worker	4	7.8
Prediction	7	13.7
Total	51	100

4.2.4 Procurement points of improved maize seed by agro dealers

As presented in Table 5, agro-dealers in the study area buy improved maize seed varieties mostly from wholesale agro-shop in the nearby commercial cities. The reasons given include that the suppliers from those areas tend supplying high quality and less counterfeited products, the availability of different seeds varieties, low price of the seed and presence many seeds agents. This implies that wholesaler shops in the nearby commercial city contribute to efficiencies in the marketing channels to the benefits of both agro-dealers and smallholder farmers. Marechera *et al.* (2016) pointed out that availability of good quality seed is important for increasing crop production.

Table 5: Procurement point to agro dealers (n=51)

Procurement points of maize seeds	Frequency	Percentage
Whole sale agro shops in the district	15	29.4
Whole sale agro shops in the nearby commercial city	32	62.7
Companies producing maize seeds	4	7.8
Total	51	100

Reasons for seed supplier		
High quality and less counterfeited	21	41.2
Found near my working place	17	33.3
Timely supply	6	11.8
Absence of other suppliers	7	13.7
Total	100	51

4.2.5 Maize seed varieties highly demanded by smallholder farmers

Results presented in Table 6 different seed varieties and farmers preference. It was found that improved maize seed varieties from African Seed Company (SEED-CO) are the most preferred and SITUKA M-1 variety from Tanzania Agriculture Seed Agency (ASA) was the least. The study established the main reason for farmers' preferences and the following were solicited; adaptability of maize seed variety to acclimatize to different ecological zones coupled with disease and drought resistance, potential yield and its maturity time frame. It was further leant that high preference of SEEDCO by most smallholder farmers has created a loophole for unfaithful business people to counterfeit this type of improved seeds. According information solicited from one of the KIs: *The farmers who were affected by counterfeited seeds, mentioned SEEDCO as among the seed company where their seeds varieties were mostly affected.*

Table 6: Improved maize seed most demanded in the study area (n=51)

Maize varieties most demanded	Frequency	Percentage
Seedco -high production	25	49.02
Pannar-big cobs	11	21.6
SITUKA-reused in next	5	9.8
Others(DEKALB)-new variety	10	16.6
Total	51	100

4.2.6 Constraints facing farmers access to improved maize seeds to agro shops

This study analyzed farmers' constraints in accessing improved seed. Their opinions were measured on a Likert scale comprises of four statements as presented in (Table 7). Respondents were asked to indicate whether they strongly agree (1), agreed (2), were

undecided (3), disagree (4) or strongly disagree (5) with each of the statements. The responses were then grouped into three categories: strongly agree and agree were grouped into agreeing, strongly disagree and disagree were grouped into disagreeing and undecided was left to stand alone. The results indicate that the main constraint faced by majority (64.8 %) farmers in accessing maize seeds is high a cost. This implies that majority farmers may be tempted to seek cheap seeds hence the likelihood of getting counterfeit seeds. Similar findings were reported by Anderson (2016) and Lyimo (2014) that the high price of improved maize seed is the main reason for smallholder farmers not using them. They maintain that smallholder farmers in Tanzania face a range of challenges including obtaining and paying quality seeds for a high cost. A similar argument was raised during FGD at Njiapanda Village; one discussant was quoted saying that;

SEEDCO maize seed variety, for example, is too expensive to the extent that during the previous season we were tempted to shift to informal seeds though we knew the significance of using certified and improved seeds. (FGD Njiapanda, 24 April 2019)

Table 7: Agro dealers opinions about farmers constrains in accessing improved maize seed (n=51)

Statements	Disagree		Undecided		Agree	
	n	100	n	100	n	100
Lack of cash money	7	13.7	20	39.2	24	47
Transportation problem	10	19.6	21	41.2	20	39.2
High cost of maize seed	9	17.6	9	17.6	33	64.8
Long distance to the agro shop	21	41.2	24	47.1	6	11.8

4.2.7 Approach used by agro dealers to reach remote areas farmers

Results tables 8 demonstrate strategies used by agro-dealers to reach farmers living in more remote areas. The commonly used approach was the phone call and texting as 37% of agro-dealers used the mobile phone as a means of communication. The use of extension officers was also reported as the second most used approach since 29.4% reported that they relied on extension officers as a source of information about inputs. The last method

that was revealed during KII was the physical visit. It was noted that some dealer visit the remote areas in personal, however this approach was reported to increase the cost on the farmers as the dealer tended to increase the price. This is was the KI says;

Some of the agro-dealers who manage to access themselves to the remote areas demand farmer to pay more than the normal price on top justifying the increased price as a means for them to cover transport costs, therefore a farmer end up paying double.

Table 8: Approach used by agro dealers to reach remote areas (n=51)

Variables	Responses	Frequency	Percentage
Approach used by agro dealers to reach remote areas	Using informal dealers	8	15.7
	Use of village/suburb leaders	9	17.6
	Use of extension officers	15	29.4
	Telephone numbers	19	37.3
Total		51	100

4.2.8 Suggestions to improve supply of improved maize seeds

Results table 9 present farmers and agro-dealers suggestion on how to improve the supply of improved seed and address the challenges experienced. It was observed that the cost of maize seeds is increasing from time to time hence driving smallholder farmers out of the system. Agro dealers pay high prices from wholesalers of maize seed, this lead to increase price for smallholder farmers, which results in the majority of poor farmers not afford to buy maize seeds and consequently some of the seeds are left without being purchased until the end of the planting season. In this regard agro-dealers urge the government to intervene in the system of agro-inputs price regulations. This concurs with Wageningen (2016) observation that even if farmers are convinced of the usefulness of quality seeds or certified seeds, they may not be in a position to purchase the seeds. The reasons among others are; the cost of the seeds and the inconvenient moment of purchasing the seeds.

It was revealed that some suppliers tend to delay the supply of inputs. Delay in supplying of maize seeds may cause low productivity to the smallholder farmers due to incidences of crop pests and shortage of soil moisture happened after prolonged rainy season. It was suggested that there is need for timely supply of inputs. This suggestion is similar to Abera's (2013) observation that unavailability and untimely supply of seed are the major production constraints in maize growing areas of sub-Saharan Africa.

Further, agro-dealers complained of several taxes charged by the government on the seed sector, thus they suggested the government to minimize or lower taxation on agro- inputs. The same results were reported by Goni (2018) that high taxation was the main constrains affecting agro inputs business.

An interesting finding is that the lowest (9.8%) number of agro-dealers recommended strengthening the inspection system. This create a question mark and doubtful environment for the quality of the improved maize seeds sold to the smallholder farmers as to why agro-dealers dislike to be inspected by inputs inspectors. The study solicited further from the KIs and their views among others was to strengthening inspection which seemed loose in sought of. For instance, one of the KIs said;

To strength inputs supply system; the government should consider regulating the price of the inputs, timely supply of inputs as well as strengthening the seed inspection system. (Maswa District Agriculture Office, 30 April 2019)

Table 9: Suggestion by agro dealers to improve supply of maize seeds (n=51)

Suggestion to improve supply	Frequency	Percentage
Government to regulate the price	15	29.4
Government to strength inspection system	5	9.8
Timely supply of maize seed inputs	15	29.4
Lowering taxation to inputs	16	31.4
Total	51	100

4.3 Regulations which Guarantee Good Quality Distribution of Improved Maize

Seed in the District

4.3.1 Possession status of business license by agro dealers

Business license is advantageous to any business personnel in possession including agro-dealers. The license enable the dealers to link to major agricultural input supply firms by credit guarantee to be supplied with inputs on credits, may have guaranteed input demand and profit margin for supplying agro-inputs in rural areas which reduces risks of having counterfeited maize seeds. Regardless all these advantages, results in table 10 demonstrate that majority (62.7 %) agro-dealers operated their business without business licenses. this result was also complemented by DAO that most licensed agro-dealer are based in the town centers as he says;

Most of the agro shops which have business license and other certificates are those which are found in business Centers like Malampaka, Lalago, Sangamwalugesha and Maswa Township.

This finding implies that smallholder farmers living away from business town centers are served with unlicensed dealers who are likely to be involved in the supply of fake inputs. According to Gainza (2015), lack of access to quantity supplies and seed causes poor production and the scarcity caused by unmonitored seeds in rural areas.

When asked to why they did not possess certificate and business license, some (45.1%) agro-dealers did know its importance while 37.3 % reported the tedious procedures and expenses of getting the license and certificates. As most of agro shops in the study area are operated without a legal government framework, there is high likelihood of an influx of unknown maize seeds with poor quality to the market. However, the study explored

further on the matter and it was revealed that TOSCI has regulated its procedures for issuing the licenses and certificate. The KI from TOSCI explained that:

TOSCI have reduced the processes of obtaining selling certificate but strengthen the quality party to get agro-dealers who are capable of selling quality maize seeds. Also, there is a need for distributing the mandate of providing certificates to the zones office because, for the moment, certificates of selling maize seeds are provided by TOSCI headquarters only

The results concur with Odame and Muange (2011) that for the efficiency of seed distribution agro-dealers are required to obtain a trade license from local authorities before starting operating their agro-inputs businesses.

Table 10: Possession status of business certificate (n=51)

Business license possession	Frequency	Percentage
No	32	62.7
Yes	19	37.3
Total	51	100
Reasons for not having certificate and license		
License authority office is far from my shop	9	17.6
There is no importance of having license	23	45.1
It is more expensive	19	37.3
Total	51	100

4.3.2 Inspection status conducted by government officers for the past 12 months

According to FAO (2011) and USAID (2017), seed inspection and certificate is meant to ensure the quality of seeds sold, to build trust and to guarantee a market. Apart from recommending a good price seed inspectors, also control the chances of having poor quality seeds or that do not meet minimum quality standards and maintaining seed law and regulations. However, as illustrated in Table 11, more than a half (56.9%) of the respondents were not inspected by the government officers for the past 12 months. The reasons given for low rate of inspection include low number of seed inspector at the

district level, lack of transport and fund for the fuel and other materials need for the regular inspection. finding was also complemented by the KI from Maswa District Agriculture Office who said;

Some time we used to work as a team in conducting maize seed inspection, but here at the district council, we don't have proper transport and fund especially for buying fuel to conduct regular inspection.

This result is similar to ASARECA (2014) observation that TOSCI's seed inspection services are inadequate in some of the remote zones which lead to the spread of counterfeit maize seeds.

Table 11: Inspection status (n=51)

Inspection by government officers for past 12 months	Frequency	Percentage
Not inspected	29	56.9
Once	15	29.4
More than once	7	13.7
Total	51	100

4.3.3 Opinions from agro dealers on effectiveness of different institutions on combating counterfeit maize seeds

Results table 12 demonstrate that more than half of the respondents believed that anti counterfeit agencies like TOSCI, TFDA, TBS and district officers and media t play a great role in the fight against counterfeiting inputs. While anti-counterfeit agencies as a governmental body are mandated to detect, investigate the one concerned with counterfeit inputs, media on the other hand are used to fight against counterfeit by portraying that counterfeit is an evil thing through their different programs that elaborate on the impacts of using counterfeit seeds to the smallholder farmers. By doing so, media may help to create awareness to the farmers and hence facilitate the fight against counterfeits.

Table 12: Opinions of agro dealers on effectiveness of the institutions in combating counterfeit maize seeds (n=51)

Institutions	Helped tremendously		Helped to some extent		Not at all		Don't know	
	n	100	n	100	n	100	n	100
Anti-counterfeit agencies	33	64.7	15	29.4	3	5.9	0	0
Tanzania POLICE	10	19.6	26	51.0	15	29.4	0	0
TRA	7	13.7	23	45.1	21	41.2	0	0
Media	16	31.4	30	58.8	5	9.8	0	0
NGO	4	7.8	29	56.9	11	21.6	7	13.7

4.4 Challenges Facing Agro Dealers in Selling Maize Seeds in the Study Area

4.4.1 Awareness on existence of counterfeit maize seed and complains most raised in the study area

The findings in Table 13 indicate that about most (78 %) farmers are aware of the existence and usage counterfeit maize seeds in their areas. However, farmers complained on lack of governmental commitment in fighting the same as in one of the FGD discussant said;

We were not sure if the government is strongly committed to fighting against counterfeit maize seeds in our area, small farmers' voice are ignored. (FGD Malekano, 15 April 2019)

The above comments were complimented by one the KI who had the following;

: It is true that counterfeit maize seed is a big problem in Maswa District. Smallholder farmers have been using them for a long period and are not capable of differentiate between genuine seeds and the counterfeited ones.

Other studies (Elliot, 2016; CTI, 2017) reported the sale of counterfeits expired or substandard agro-inputs in Tanzania. Unethical agro-dealers, sometimes in collusion with importers, re-package fake materials and sell it to smallholder farmers. And since majority of smallholder farmers in Tanzania cannot differentiate between genuine and counterfeit products, they innocently buy fake products. This partly accounts for why farmers' yields are still low despite government efforts to increase them.

The main effects farmers complain about counterfeit maize seeds, as illustrated in Table 13 are poor germination of the improved maize seed, poor yield and delayed maturity. However, the farmers were uncertain whether those reasons were due to counterfeit seeds or something else as in one of the FGD from Njiapanda village they altered:

We were getting difficulties to determine whether the seeds were counterfeited or if the cause of poor germination from seed was due to poor condition on the storage, agronomic problems or climatic conditions of the area. (FGD Njiapanda, 24 April 2019)

In this regard, farmers need knowledge to distinguish the real cause for the low maize production.

Table 13: Existence of counterfeit maize seeds to agro dealers (n=51)

Awareness on Existence of Counterfeit	Frequency	Percentage
No	11	21.6
Yes	40	78.4
Total	51	100
Complains most raised		
Poor germination	19	37.3
Low production after harvest	13	25.5
Take too much time to mature	6	11.8
Others (impurities)	14	27.4
Total	51	100

4.4.2 Opinions from agro dealers on the source of counterfeit maize seeds

Opinions were judged on Likert scale (Table 14) with a total of eight statements. The respondents were asked to indicate if they strongly agree (1), agreed (2), were undecided (3), disagree (4) or strongly disagree (5). With each of the statements, the responses were then grouped into three categories: strongly agree and agree were grouped into agreeing, strongly disagree and disagree were grouped into disagreeing and undecided was left to stand alone. As presented in Table 14, majority (56.9%) the respondents believe poor law

enforcement by the government is the main reasons for the existence of the counterfeit maize seed business. Others include poor product protectionist policies, Lack of effective and counterfeit agencies and increase of the high level of technological equipment's which were easily used to facilitate counterfeiting. On the other hand, cultural reasons, poor economic conditions, ignorance of smallholder farmers and corruption were not thought as the source of the problem. An interesting finding was highlighted by KI from Maswa District Trade Office who , argued that even the law enforcers are not aware of the fake products as he said: *Most law enforcers do not understand the products and thus they depend on other people to clarify if the goods are counterfeit or not.*

Similar findings were reported by CTI (2017) who found that 98% of the goods sellers were unable to identify fake due to the high standard of technology applied.

Other causes of counterfeits as mentioned during FGDs included lack of agro shops inspection to the village, the high growth rate of technology, poor economic conditions of the smallholder farmers, and lack of proper knowledge on how to validate the counterfeit seeds. For instance at Isagenhe village a discussion revealed that:

Delay in getting genuine maize seeds, the existence of poverty condition to the smallholder farmers results into an inability to afford genuine maize seeds and switch to cheap inputs which are counterfeited and also most of the farmers have low knowledge to recognize counterfeit and genuine inputs. (FGD Isagenhe, 17 April 2019)

Table 14: Opinions from agro dealers on the causes of counterfeited maize seeds

(n=51)

Statements	Disagree		Undecided		Agree	
	n	100	n	100	n	100
Cultural reason	28	54.9	22	43.1	1	2

Poor economic condition	27	52.9	18	35.3	6	11.8
Ignorance of smallholder farmers	18	35.3	18	35.3	15	29.4
Poor law enforcement	11	21.6	11	21.6	29	56.9
Information technology	13	25.5	17	33.3	21	41.2
Corruption	29	56.8	14	27.5	8	15.7
Poor product protectionist policies	18	35.3	18	35.3	27	54.7
Lack of effective and counterfeit agencies	12	23.2	19	37.3	26	53.2

4.4.3 Action taken against unfaithful agro dealers

The study wanted to establish if there are action take to identified situation of fake seed. As demonstrated in table 15, few (23.5%) farmers reported their case and the seller/supplier through other agents selling the same seed brand and the farmer is refunded by the seed company. However refunding process takes almost the whole season thus does not help the farmer as expected. These results imply that most of the smallholder farmers leave the case unreported which accelerate its persistence. It was further revealed that some farmers do not report because they cannot locate the sellers. As he said;

We do not take actions because some of the agro-dealers especially those who are selling maize seeds in the open markets “minadani” neither provide receipts nor have permanent locations to be found. (FGD Mwabayanda, 15 April 2019)

Similarly, one of the KI from Ipililo revealed that sellers are interested with money instead of solving farmers’ problems as he said:

Some of the agro-dealers are only interested in farmers’ money rather than thinking about addressing their problems. This could be translated that farmers do not have strong protection against unfaithful agro-dealers.

Table 15: Action taken by agro dealers on counterfeit maize seeds (n=51)

Action to take on counterfeit	Frequency	Percentage
Unfaithful dealers		
Take no action	21	41.1
Report to the seller and refund	12	23.5
Report to the police	18	35.2

Total	51	100
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4.4.4 Methods used mostly to distinguish genuine and counterfeit maize seeds

The study established the methods used by farmers and agro-dealers to distinguish originality and genuineness of the seeds. Results Table 16 indicates majority (47.1%) used expiration date, observed on the packets of the maize seeds as their starting point. Other methods include the brand name where some varieties like those from SEDCO are trusted by agro-dealers and farmers as the genuine seeds. In addition, some respondents use visible labels and special tags from TOSCI which were glued to the certified seeds. However, few (11.8 %) respondents do not bother with checking on genuineness of the product, as they believe that any product present in the shop is genuine. The methods were also revealed during the interview with one of the KI in Lalago ward who said:

We normally use the expiration date written on maize seeds bags and TOSCI tags to validate the genuineness of the maize seeds from agro-dealers. Though sometimes, there were some incidences where seeds bags were seen without expiration date

These results imply that, the existence of counterfeit maize seeds will prevail in the study area because the methods used to confirm on genuineness mainly the use of visible labels and expiration dates are weak and can be forged easily. The findings concur with USAID, (2017) observation that fake seeds dealers often operates by using names of brands that are trusted by farmers and pack the fake seeds in bags bearing the logo of genuine seed companies.

Table 16: Methods used to distinguish genuine with counterfeit maize seeds (n=51)

Methods used to distinguish genuine and counterfeit	Frequency	Percentage
Brand	12	23.5
Visible labels	9	17.6
Expiration date	24	47.1
Doing nothing	6	11.8
Total	51	100

4.4.5 Training on seed business and quality seed

Exploration on whether farmers get trained on issues related to seeds regulation and counterfeit maize seeds revealed that most farmers and agro-dealers had no any training on the same. As illustrated in Table 17, few (35.3 %) respondents got trained and trainings were organized either by agricultural extension officers or by maize seed distribution companies. This lowest percentage on the training is thought to be caused by unavailability of training institute, less involvement of relevant agricultural institutions in conduct training programs to agro-dealers in study area and lack of training program in the District Agriculture office. For example, it was revealed that because of lack of training, some agro-dealers purchase seed in bulk but often lack knowledge about which type of seed is most productive in their area. Lack of capacity building for the majority of agro-dealers/respondents implies their inefficient in the provision of quality inputs and detections of counterfeit maize seeds in the study area. The results concur with Kissinga (2007) who reported lack of regular training and capacity building for the majority of farmers and agro-dealers.

Information from key informant from Maswa agriculture district officer consolidates the statement by confessing that:

District agriculture office doesn't provide training to the agro-dealers regularly due to government budget constraints.

Table 17: Attendance of training by agro dealers (n=51)

Regular training	Frequency	Percentage
No	33	64.7
Yes	18	35.3
Total	51	100

4.4.6 Challenges mostly faced by agro dealers from wholesalers and supply system

Challenges mostly faced by agro-dealers from wholesalers and supply system in the level of severity were determined using a total of six statements. The respondents were asked to indicate if the situation is extremely severe (1), very severe (2), somewhat severe (3), somewhat less severe (4) very less severe (5) Extremely less severe (6) with each of the statements. The responses were then grouped into three categories: extremely severe and very severe were grouped into severe, very less severe and extremely less severe were grouped into not severe and somewhat severe was left to stand alone.

Results table 18 show that late delivery of the inputs from the wholesalers and supply systems is the most challenge to many dealers. Other challenges include high price of the maize seeds, the presence of limited varieties of maize seeds, long-distance of traveling from retailers to wholesalers and the last is poor quality of the maize seeds from the wholesalers. These results imply that late delivery maize seeds to agro dealers triggers both the unethical business personnel to produce fake seeds and farmers to opt for the available seeds particular when it is close or during the planting season. This conclusion is also confirmed by an Agricultural extension officer from Badi (KI) who uttered:

There were times when we reach planting season and the rains have started but no seeds available to our agro shops, farmers starting complaining.

Table 18: Challenges faced by agro dealers from wholesalers and supply system in level of severity (n=51)

Limited varieties	Frequency	Percentage
Severe	50	54.9
Somewhat severe	1	45.1
Total	51	100
Late delivery		
Severe	48	94.1

Somewhat severe	2	3.9
Not severe	1	2
Total	51	100
Long distance		
Severe	7	18.8
Somewhat severe	34	66.7
Not severe	10	19.6
Total	51	100
High price		
Severe	39	76.4
Somewhat severe	8	15.7
Not severe	4	7.8
Total	51	100
Poor quality		
Severe	9	17.6
Somewhat severe	31	60.8
Not severe	11	21.6
Total	51	100

4.4.7 Access to finance

It is argued that for the sustainable and business development, businessmen always take credits from financial institutions to sustain their growth. Agro enterprises needed some working capital injection for restocking. This study solicited the rate at which afro-dealers in the study area has access to micro-finances. The results Table 19 indicate that more than half (52.9 %) of the respondents have no access on credits and loan. Also through probing, it was observed that, even those who reported to have access to loan some of them were lack proper collateral and complained of high-interest rates charged by those financial institutions. The findings are in consistence with Mtisi (2017) who found that access to finance is a major problem for agro-dealers as they are considered high-risk ventures by financial institutions.

Table 19: Access to finance and Agro shop status on regulatory environment satisfaction (n=51)

Credit access	Frequency	Percentage
No	27	52.9
Yes	24	47.1
Total	51	100
Regulatory environment satisfaction		
No	36	70.6
Yes	15	29.4
Total	51	100

4.4.8 Regulatory environment

Studies (Odame and Munge, 2011; USAID, 2017) point out that, legal and regulatory systems enable the development, access, and availability of high quality agricultural inputs to build a vibrant agricultural sector and commercially successful agribusiness that benefits the smallholder farmers. Based on this argument the current study explored how legal and regulatory system enables the agro-dealers to achieve this objective. The findings as shown in table 19 illustrate that most of the agro shops in the study area are not satisfied with taxes and payment charged by the regulatory authorities. Through probing, it was revealed that agro-dealers have developed a negative attitude towards regulatory authorities due to those unfriendly taxes and other levies. This implies that the agro-business tax system must be crosschecked by regulatory authorities to create a good business environment for agro-dealers. Thus, regulatory enforcement has been a major constraint in the seed trade, leaving trading loopholes that have allowed ‘fake’ and poor quality seeds and unlicensed agro-dealers to infiltrate the system.

4.5 Agro Dealer’s Characteristics in Relation to Maize Seed Distribution with Counterfeit Challenges

4.5.1 Maize seed selling period

As illustrated in Table 20, most of the agro-dealers sell improved maize seed seasonally. The performance is low during the offseason and high during the planting season due to seed and other input requirements. Part-time nature of agro-business, therefore, implies dilution of efforts in doing the agro-inputs business. This may lead to poor efficiency and

quality of services provided to smallholder farmers. As reported by scholars (Chinsanga, 2011; Nagarajan, 2015), successful agro-dealers have diversified business portfolio. They are not entirely dependent on the agro-inputs line of work because of the seasonal nature of the agriculture activities and they conducted their businesses during the cropping season.

Table 20: Selling period of maize seeds (n=51)

Selling of maize seed every month of the year	Frequency	Percentage
No	30	58.8
Yes	21	41.2
Total	51	100

4.5.2 Encouragement on selling seed quality to agro dealers

Analysis of encouragement to sell quality seeds to the agro-dealers show that 45.1 % of the agro-dealers have been encouraged to sell improved maize seeds to smallholder farmers. This encouragement mostly comes from District agriculture office, District commissioner office and smallholder farmers themselves (Table 21). The encouragement is mainly done through village meetings in which farmers are also encouraged to use certified inputs. Other mean includes individual discussions with agro-dealers to convince them to deal with inputs business. It was further revealed that encouragement done by government leaders, result in high confidence of agro-dealers and increase more security to them. The results are similar Etyang (2013) who observed that agro-dealers who were encouraged by NGOs, government agencies, farmers, seed manufactures increase the sale of quality seeds.

Table 21: Encouragement status (n=51)

Encouragement to sell quality seeds	Frequency	Percentage
No	28	54.9
Yes	23	45.1
Total	51	100
Encouragement provider		

District commissioner	6	11.8
District executive director	3	5.9
District agriculture irrigation officer	8	15.7
Smallholder farmers	5	9.8
Others	1	2.0
Not given encouragement	28	54.9
Total	51	100

4.5.3 Evaluation of maize seed users' satisfaction by agro dealers

Apart from selling inputs, agro-dealers were also providing additional services to farmers. Evaluations of maize seed users' satisfaction were determined by using a total of four statements. The respondents were asked to indicate if the service they provided to the farmer is very good (1), good (2), fair (3), bad (4) with each of the statements. The responses were then grouped into three categories: very good and good were grouped into good, while fair and bad were left to stand alone.

As indicated in table 22, most agro-dealers have good knowledge transfer and farmers are satisfied with timely maize seed supply after obtaining from wholesalers, provision of quality, maize seed and fair credit services. The provision of knowledge transfer seems to be done regularly by most of the agro-dealers to motivate their customers but sometimes due to the high cost of inputs, most farmers lack enough cash to pay for the inputs, however, are always given on credit with a promise to pay later. This is however done only on a trust basis and so far there are reported incidences of unpaid debts from agro-dealers. Results are similar to Etyang (2013) who pointed that apart from selling inputs, the agro-dealers also provided additional services to farmers. The three important services provided to farmers were information on agronomic practices for seeds.

Table 22: Evaluation of agro dealers on services provided to farmers (n=51)

Types of services delivered	Good		Fair		Bad
	n	100	n	100	n

Timely maize seed supply	36	70.6	15	29.4	0	0
Maize seed quality	26	51	18	35.3	7	13.7
Credit provision	1	2	22	43.1	28	54.9
Knowledge transfer	38	74.5	13	25.5	0	0

4.5.4 Agro dealers and maize seed agent

The presence of agro-dealers who are also working as seed agents make them receive seeds directly from the seed companies and registered suppliers. This increases trust to smallholder farmers against counterfeit maize seeds. In the study area, the findings as illustrated in table 23 show that only few (23.5%) agro-dealers were maize seed agent. The lowest number of agents reduces the possibility of counterfeit seeds to come directly to the shops. This was also testified in one of the FGD in Malekano village where farmers said;

When we see seed companies' trucks entering our village, we are sure that the seeds from those trucks are genuine because we assume they are brought directly from the manufacturing companies to us at village level. (FGD Malekano, 15 April 2019)

Table 23: Status on seed agents (n=51)

Agro dealers who are also working as maize seed agent	Frequency	Percentage
No	39	76.4
Yes	12	23.5
Total	51	100

4.5.5 Background knowledge on agricultural inputs

Background and technical knowledge and skills on agricultural inputs on the side of agro-dealers are the prerequisite for efficiency services provision to smallholder farmers by agro-dealers. The study demonstrates that majority dealers have agricultural related professional training. For example, as shown in Table 24, only 33.3% of the respondents had nonprofessional qualification. Similar to Kissinga (2007) some traders do not join into the input business because they lack the background knowledge on agricultural inputs and unlike other commodities such as clothes and food, agricultural commodities and therefore lack of technical knowledge restricts other traders from entering the input business.

Table 24: Background knowledge on agricultural inputs to agro dealers (n=51)

Qualification background of the owner	Frequency	Percentage
Agriculture	16	31.4
Livestock	8	15.7
Agriculture and livestock	10	19.6
Nonprofessional qualification	17	33.3
Total	51	100

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In general, the numbers of agro dealers have increased in Maswa District in the last five years. This is partly due to a favorable environment to initiate agro-inputs business in the study area as facilitated by the Tanzania government.

Based on the findings of the study, the following conclusions can be drawn.

Most of the agro-dealers have no demonstration plots for testing the seeds in their business areas. Hence, most of them sell maize seeds that have not been tested. In this arrangement, smallholder farmers in the area have little justification of maize seed quality.

The main distribution channels of improved maize seeds include importers, distributors/agents and agro-dealers. Agro dealers are usually in direct touch with smallholder farmers by linking farmers to improved maize seeds. In addition, we saw that although agro-dealers are specialized, they are uneven distributed in the district whereby most of the agro shops are clustered in urban centers like Malampaka, Lalago, Sangamwalugesha, and Maswa township. This makes it difficult for smallholder farmers in remote areas to access improved maize seeds. It was also show that most agro shops which are not regularly inspected by TOSCI and government experts. This means they operate their maize seed business without TOSCI certification and business license. Low numbers of TOSCI staff makes it difficult for government experts to adequately monitor the system. This situation increases chances of unfaithful agro-dealers to distribute and sell counterfeit maize seeds.

It was demonstrated that a good number of farmers have an understanding on the problem of counterfeit agro-inputs. Similarly, agro dealers, and government experts have a clear

understanding of the issue as opposed to smallholder farmers who have mixed understanding. Smallholder farmers are more concerned with cost than quality. Further, the methods used in verifying the genuineness of the maize seeds like visible official labels and date to the maize seeds seems not helpful due to technological advance or development.

Some agro-dealers are accused of participating directly in counterfeit inputs activities. It was moreover demonstrated role of agro dealers in input distribution is not only to supply agro-inputs but also act as a link between private seed companies, technology developers and farmers. Thus, they are responsible for offering technical advice to smallholder farmers.

5.2 Recommendations

Based on the conclusions drawn from the findings, the following recommendations are made:-

- (i) Maswa District Council in collaboration with the Ministry of Agriculture should ensure that all manufactures and authorized inputs distributors and agro dealers establish demonstration plots on their areas.
- (ii) Maswa District Council in collaboration with the private sector should plan and establish regular farmers' forum in the field (villages) where maize seed companies, agro dealers, policymakers, agriculture officers, TOSCI officers can meet and discuss problems, challenges, and solutions on counterfeit maize seed. Also, the council in collaboration with the private sector should create a conducive environment and incentives to the investors/ businesspersons who interested in investing on agro-inputs activities in the remote areas where most of the smallholder farmers are found.

- (iii) The district council in collaboration with TOSCI should enhance their enforcement efforts by increasing the number of staff and develop regular inspection of sales points to make sure agro-dealers are doing their business with proper certifications and root out counterfeits. This should be carried out at the start of the season and repeated several times by conducting unplanned inspection.
- (iv) The government should empower authorities and institutions fighting counterfeit products. Through the input supply chain the government (ministry of Agriculture with TOSCI) should develop mobile phones technology to verify the genuineness of the maize seeds instead of depending on the old methods which seem to fail to intervene and stop counterfeit maize seed problem. .
- (v) Maswa District Council in collaboration with TOSCI should create a special program of identifying committed and faithful agro-dealers who would serve in extension services to bridge the gap of shortage of extension officers and increase the government's eyes in counterfeits fighting.
- (vi) The district council in collaboration with the ministry of agriculture should create conducive environment to the agro dealers so as they continue selling agro inputs and at the same time act as a link between private seed companies, technology developers and farmers as well as offering technical advice to smallholder farmers.

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APPENDICES

Appendix 1: Summary of data collection and analysis

S/N	Objective	Type of data to be collected	Source of data	Methods of data collection	Analysis of data
1.	Demographic characteristics	Status of respondents, sex, age, form of business, education, year's spent, purpose of agriculture involvement	-51 agro dealers -20 KI -5 FGD	-Semi-structured questionnaire -Key informants guide - Focus group discussion check list	Descriptive statistics on frequencies and percentages Content analysis of qualitative data.
2.	To determine the distribution chain of maize seeds from agro-dealers to smallholder farmers	-Nature of agro dealers -Demand trend -Basement of seed requirement -Suggestion to improve supply	-51 agro dealers -20 KI -5 FGD	-Semi-structured questionnaire -Likert scale with 4 statements -Key informants guide - Focus group discussion check list	Descriptive statistics on frequencies and percentages Content analysis of qualitative data.
3.	To examine regulations which guarantee good distribution of maize seeds in the District.	-Possession status of business license -Reasons for not possessing -Inspection status -Opinion from agro dealers in effectiveness of institutions	-51 agro dealers -20 KI -5 FGD	-Semi-structured questionnaire -Key informants guide - Focus group discussion check list	Descriptive statistics on frequencies and percentages Content analysis of qualitative data.
4,	To determine challenges facing agro-dealers in selling maize seeds in the study area.	-Existence of counterfeit seeds, opinion on origin of counterfeit, training status, methods to validity seeds, access to finance, regulatory environment	-51 agro dealers -20 KI -5 FGD	-Semi-structured questionnaire -Likert scale with 8 statements -Key informants guide - Focus group discussion check list	Descriptive statistics on frequencies and percentages Content analysis of qualitative data.
5.	To analyze agro-input dealers' characteristics in relation to maize seeds distribution in the District.	-Selling period, Encouragement, Evaluation -Working as agent, qualification background	-51 agro dealers -20 KI -5 FGD	-Semi-structured questionnaire -Key informants guide - Focus group discussion check list	Descriptive statistics on frequencies and percentages Content analysis of qualitative data.

Appendix 2: Questionnaire for respondent-agro-dealers

Roles of agro-dealers in inputs distribution and the counterfeit challenges to smallholder farmers: a case of maize seeds, in Maswa district council, Tanzania

Division.....Ward..... Village.....

SECTION A: Demographic characteristics

A1. Status of respondent

1. Owner of the shop ()
2. Employee ()
3. District focal person ()
4. Family member ()
5. Others (specify).....

A2. Sex of respondent

1. Male ()
2. Female ()

A3. Age of respondent.....years

A4. Form of business

1. Sole proprietor 2. Partnership 3. Family 4. Society 5. Company
6. Others.....

A5. What is education level of the owner of the shop? 1. University

2. Diploma 3. Certificate 4. Secondary 5. Primary 6. Adult 7. None

A6. Please tell me the number of years this business has been selling maize seeds in this village?.....years

A7. As an agro-dealer, do you also involved in maize farming at your area for the past five years? 1. Yes 0.No.

A8. If yes in A7, what type of maize do you prefer to cultivate?

1. Hybrid Maize ()
2. Composite maize ()
3. Improved local seed ()
4. Others (specify)..... ()

A9. For which purpose are you involved in agriculture?

1. For family consumption only ()
2. For selling ()
3. For farmer's demonstrations' and family consumption ()
4. Others (specify)..... ()

SECTION B: Distribution chain of maize seeds

B1. Mode of input supply (**Please tick appropriate response**)

1. Retailers-sells to farmers only ()
2. Retailers-sells to farmers directly and micro retailers ()
3. Wholesaler-sells to other retailers and farmers ()
4. Wholesaler-sells to retailers only ()

B2. What are the trends of demand for maize seeds over the past 3 seasons in your area?

1. Low 2. Moderate 3. Increasing 4. No change

B3. How do you know farmer's requirements in terms of maize seeds each season?

1. Experience of the past season ()
2. Frequency of farmer's enquiry ()
3. Asking other agro dealers ()
4. After communicating with extension worker ()
5. Prediction ()
6. Others (specify).....

B4. Where do you usually procure maize seeds for the past 3 years? ()

1. Whole sale agro shops in the District ()
2. Whole sale agro shops in the nearby commercial city ()
3. Companies which are producing maize seeds themselves. ()

4. Non-governmental organizations ()

5. Others (specify).....

B5. Why do you choose the seed supplier from which you are procuring for the past 3 seasons?

1. Lower price ()

2. High quality and less counterfeited record ()

3. Found near your home ()

4. Timely supply ()

5. Absence of other suppliers ()

6. Others, specify.....

B6. Types of maize seeds that were supplied and farmers were mostly demanding for the past 12 months.

	Type of seed	Amount received	Provide reasons for your answer
1	SEEDCO		
2	PANNAR		
3	LUBANGO		
4	SITUKA		
5	Others (specify).....		

B7. Do you have access to wholesalers of improved maize seed procuring points throughout the year? 1. Yes 0. No

B8. If no in B7 what is/are the main constraint(s) regarding access to maize seed procuring points

- 1. Unable to get business information on maize seeds ()
- 2. Far distant of seed market place ()
- 3. Lack of means of transportation ()
- 4. Poor road infrastructure ()
- 5. Other, specify.....

B9. In your opinion, what are the constraints which most farmers face in trying to access maize seeds at your shop for the past 3 years? Please rank in term of what the farmers were complaining [1=strongly disagree, 2= Disagree, 3= Undecided, 4= Agree, 5= Strongly Agree]

Statements	Responses				
	1	2	3	4	5
Lack of cash money					
Transportation problems					
High cost of maize seeds					
Long distance					
Others (specify).....					

B10. Which approach do you use to reach people in remote areas

- 1. Using informal dealers ()
- 2. Use of village/suburb leaders ()
- 3. Use of extension worker ()
- 4. Use your own transport ()
- 5. Others (specify).....

B11. What is the hindrances of trading maize seeds to the new agro dealers?

- 1. Requires big capital ()
- 2. Long chain of certifications on rules and regulations of seeds ()

3. High tax ()

4. Others (specify).....

B12.What do you think why other traders failed to participate on maize seeds business in rural areas?

1. Presence of poor road infrastructure ()

2. Seasonality of the business ()

3. Presence of Poor storage facility ()

4. Others (specify).....

B13. What is your suggestion if one wanted to improve the smooth supply system of maize seeds in your area for the next seasons?

1. Government to regulate the price of seeds ()

2. Government to strengthen the seed inspection systems. ()

3. Timely supply of inputs ()

4. Lowering taxation to inputs business ()

5. Others, specify.....

B14.Are you also working as an agent with other maize seed companies at your area? 1.

Yes 0. No

B15.If yes in 14, which maize seeds are you selling as an agent?

1. SEEDCO ()

2. PANNAR ()

3. SITUKA ()

4. LUBANGO ()

5. Others, specify

SECTION C: Regulations to ensure quality maize seeds and distribution to agro-dealers.

C1. Does your agro-shop/institution possess business license/certificate from a recognized institution in order to operate maize seed business? 1. Yes 0. No

C2. If yes in C1, business certificates coming from:

1. TOSCI certification ()
2. TPRI certification ()
3. TFRA certification ()
4. District Council license ()
5. All of the above ()
6. Others..... (Specify)

C3. If the answer is no, in C1 why?

1. License authority office is far from my shop ()
2. There is no importance of having license ()
3. It is more expensive ()
4. Others (specify).....

C4. How many times has your agro-shop been inspected by government officers for the past 12 months.....times

C5. As an agro dealer how do you determine maize seed quality?

1. Seed with uniform variety ()
2. Seed free from inert materials ()
3. Seed with high germination percentage ()
4. Seed that is disease free ()
5. Seed tolerant to pests and diseases ()
6. Others, specify.....

C6. Have you ever been asked by the government to give feedback as a stakeholder on formulated regulations and policies on maize seed distribution for the past 5 years? 1. Yes
0. No

C7. If yes, in C6 how many times?.....

C8. In your own opinion, is the level of counterfeit of improved maize seeds increased or decreased?

- 1. Increased ()
- 2. Decreased ()
- 3. I don't know ()
- 4. Others, specify.....

C9. For your opinion, what are the most causes of counterfeit to the maize seed?

Please rank in term of your experience as an agro dealer [1=strongly disagree, 2= Disagree, 3= Undecided, 4= Agree, 5= Strongly Agree]

S/N	Statements	Responses				
		1	2	3	4	5
1	Cultural reason					
2	Poor economic condition of most smallholder farmers					
3	Ignorance of smallholder farmers					
4	Poor law enforcement by the government agencies					
5	Information technology					
6	Corruption by anti-counterfeit					
7	Poor product protectionist policies					
8	Lack of effective & anti counterfeit agencies					
9	Others (specify).....					

C10. How effective are the following institutions in combating improved maize seed counterfeit in Maswa? (Tick appropriate answer)

S/N	Organization	Helped tremendously	Helped to some extent	Not at all	Don't know
1	Anti-counterfeit agencies				
2	Tanzania POLICE				
3	TRA				
4	Media(Press,radio,TV)				
5	NGOs				
6	Others.....				

C11. When rating the impacts of counterfeit maize seed in Maswa, what do you base your assumptions.

1. Personal experience ()
2. Talk by business partners ()
3. Information from media ()
4. Complains from farmers ()

SECTION D: Challenges faced by Agro-dealers in selling improved maize seeds

D1. Have you ever experience farmers' claims on counterfeit maize seeds? 1. Yes 0.No.

D2. If Yes in D1, what complains which mostly rose about maize seeds from farmers.

1. Poor germination ()
2. Low Production after harvest ()
3. Others (specify).....

D3. As an agro-dealer, have you ever got counterfeited maize seeds for selling for the past 12 months at your shop? 1. Yes 0.No. (If no, go to question no.6)

D4. If yes in D3, what do you think are the sources of counterfeited maize seeds?

1. Some unfaithfully maize seed wholesalers ()
2. Maize seed manufactures ()
3. Maize seed transporters ()
4. Some unfaithfully maize seed retailers ()

5. Others (specify).....

D5. If yes in D3, from your experience, what action taken by farmer to unfaithful dealer?

1. Take no action ()
2. Report to the seller and refunded ()
3. Report to the police ()
4. Others (specify).....

D6. Does your shop/organization have a compensation plan for farmers who faced crop failure due to low quality of your inputs? 1. Yes 0.No.

D7. If yes in D6 what type of compensation do you offer?

1. To give farmers seeds to compensate ()
2. To pay back money ()
3. Supply insurance ()
4. Others.....

D8.What method used mostly to distinguish genuine and counterfeit maize seeds?

1. Brand ()
2. Visible labels ()
3. Expiration date ()
4. Doing nothing ()
5. Others ()

D9.In the past 12 months have you attend any training program on counterfeit maize seeds? 1. Yes 0.No. (If No, go to question no 17)

D10.If yes in D9, Indicate the training which you have undergone with year/duration

S/n	Title of the training	Year	Duration	By whom
1				
2				

D11. Do you get regular trainings on modern technique handling to maize seed in your agro shop? 1. Yes 0.No

D12. If yes in D11, at which period do you get the training?

1. Before long rain season ()
2. Before land preparation ()
3. Before harvesting ()
4. No specific time ()
5. Other, specify.....

D13.If you have attended the training in D11, what are the significant contribution of the training in selling maize seed?

1. Increased the knowledge of knowing counterfeited maize seed ()
2. Increased the knowledge of calculating farmer's maize seed demand ()
3. Increased the knowledge of rules and policies of maize seed business ()
4. Others, specify.....

D14.Do you have access to credit at your area? 1. Yes 0.No.

D15.If yes in D14, if you wanted to expand your business, mention institutions ready to finance your shop.....

D16. Are you capable to pay taxes and levies charged by regulatory authorities to maize seeds business for the past 5 years? 1. Yes 0.No. (If the answer is no, go to question number C9)

D17. If yes, in D16, how many times did you attend?.....times.

D18. If you have been visited by seeds regulatory authorities for the past 5 years, where were the officers from?

1. TOSCI representative ()
2. Ministry of agriculture ()
3. Ministry of industry and trade ()
4. Maswa District council ()
5. Others (specify)..... ()

D19. Rank the following challenges you faced from wholesalers and supply system in level of severity from 1-6 (i.e. 1=Extremely severe, 2=very severe, 3=somewhat severe, 4=somewhat less severe, 5=very less severe, 6=Extremely less severe).

SN	Item	Level of severity					
		1	2	3	4	5	6
1	Limited varieties						
2	Late delivery						
3	Long distance						
4	High price						
5	Inadequate quantity supplied						
6	Poor quality						

SECTION E: Agro-dealer's characteristics on improved maize seeds distribution and counterfeit challenge

E1. Does this business sell improved maize seed every month of the year? 1. Yes 0.No.

E2. If no in E1, what months of the year does this business sell maize seeds mostly? (List all that apply)

1. January () 2. February () 3. March () 4. April () 5. May ()
 6. June () 7. July () 8. August () 9. September () 10. October ()
 11. November () 12. December ()

E3. Have you ever attended any agriculture show on maize seeds for the past 5 years? (1.

Yes 0. No) If yes go to question E4 and if no, go to question number E5.

E4. If yes in E4, how many shows attended between 2013-

2018?.....times

E5. If no in E4, why?

1. Not invited to participate ()
 2. Not interested with the program ()
 3. Others, specify.....

E6. Does the owner of this business own another agro shop which is selling maize seed? 1.

Yes 0. No

E7. If yes in E6, what is the type of business?

1. Permanent ()
2. Seasonal ()
3. Mobile ()
4. Other, specify.....

E8. As an agro dealer of farm inputs, have you ever been encouraged to sell quality maize seed to smallholder farmers at your area? 1. Yes 0.No

E9. If yes in E8, who gave you the encouragement?

1. District commissioner ()
2. District Executive Director ()
3. District Agricultural Irrigation Cooperative Officer ()
4. Member of parliament ()
5. Smallholder farmers ()
6. Other, specify.....

E10. What is the qualification background of the owner of the shop?

1. Agriculture ()
2. Livestock ()
3. Agriculture and livestock ()
4. Agriculture and livestock medicine ()
5. Other than agriculture and livestock studies ()
6. Nothing studied ()

E11. How do you evaluate your maize seed user's satisfaction? Put the x mark in the most appropriate column

S/N	Types of services delivered	Level of user satisfaction
-----	-----------------------------	----------------------------

		Very good	Good	Fair	Bad
1	Timely maize seed supply				
2	Maize seed quality				
3	Credit provision				
4	Knowledge transfer				
5	Others, specify.....				

THANK YOU FOR YOUR TIME

Appendix 3: Checklist for District Agriculture, Irrigation Cooperative Officer,

District Crop inspector

Research Title: Roles of agro-dealers in inputs distribution and the counterfeit challenges to smallholder farmers: a case of maize seeds, in Maswa district council, Tanzania

Items for discussion

1. What are the strategies that the DAICOs/District office use to ensure the smallholder farmers get access to quality maize seeds.
2. Whether the smallholder farmers are getting access to improved maize seeds at the right time
3. What are initiatives by District agriculture officers to enhance knowledge of counterfeit to smallholder farmers?
4. Have you experience complaints about counterfeit on improved maize seeds from farmers in your District? When? From which wards/village, type of seeds
5. Methods used in the district to distinguish genuine with counterfeit seeds
6. Ways used by the District to fight against counterfeit of improved maize seeds
7. Key constraints facing the fight against counterfeit agro business at the District.
8. What is the suggestion for the District smooth functioning of the maize input supply system?

THANK YOU FOR YOUR TIME

Appendix 4: Checklist for Ward Agriculture Extension Officers

Research Title: Roles of agro-dealers in inputs distribution and the counterfeit challenges to smallholder farmers: a case of maize seeds, in Maswa district council, Tanzania

Items for discussion

1. What are the strategies that the ward agriculture office use to ensure the smallholder farmers get access to quality maize seeds?
2. Whether the smallholder farmers are getting access to improved maize seeds at the right time
3. What are initiatives by ward agriculture officers to enhance knowledge of counterfeit to smallholder farmers?
4. Have you experience complaints about counterfeit on improved maize seeds from farmers in your ward? When? From which villages/ type of seeds
5. Methods used in the ward to distinguish genuine with counterfeit seeds
6. Ways used by the Ward to fight against counterfeit of improved maize seeds
7. Key constraints facing the fight against counterfeit agro business at the ward.
8. What is the suggestion for the ward in smooth functioning of the maize input supply system?

THANK YOU FOR YOUR TIME

Appendix 5: Checklist for District Trade Officer

Research Title: Roles of agro-dealers in inputs distribution and the counterfeit challenges to smallholder farmers: a case of maize seeds, in Maswa district council, Tanzania

Items for discussion

1. Whether the District Trade office have any Trade policy addressing counterfeit agricultural products
2. What are the strategies that District Trade office use to ensure the smallholder farmers get access to quality improved maize seeds.
3. Reasons for traders failed to participate in maize seed business on rural areas
4. What are the strategies that District Trade office uses to ensure distribution of counterfeit maize seeds are getting stopped.
5. Key constraints facing District trade office in fighting against counterfeit of improved maize seeds
6. Whether there is any type of training provided to agro dealers on regulations driving maize seeds business.
7. Opinions on the sources of counterfeit maize seeds in the district.

THANK YOU FOR YOUR TIME

Appendix 6: Checklist for TOSCI Officer

Research Title: Roles of agro-dealers in inputs distribution and the counterfeit challenges to smallholder farmers: a case of maize seeds, in Maswa district council, Tanzania

B; Items for discussion

1. What are the Strategies that TOSCI use to ensure the smallholder farmers get access to quality maize seeds?
2. Are you involved in inspecting agro-dealer's activities? How
3. Training program of TOSCI to agro-dealers and smallholder farmers on the knowledge of knowing counterfeits maize seeds.
4. Are you involved in solving challenges faced by Agro-dealers? How?
5. Have you experience Complaints about counterfeit maize seeds from smallholder farmers in the country. When? From which regions? Type of seeds
6. Key constraints facing TOSCI office in fighting against counterfeit maize seeds
7. Ways used by TOSCI to fight against counterfeit maize seeds

THANK YOU FOR YOUR TIME

Appendix 7: Checklist for Focus Group Discussion (FDGs) with smallholder maize farmers in the village

Name of the Ward.....

Name of the village.....

Items for discussion

1. Based on the input prices, do you afford to buy the recommended maize seeds at the agro-shop?
2. Have you seen any follow up made by the Government to ensure proper distribution of maize seeds in the village?
3. How do know if the maize seed in the bag is counterfeited or genuine?
4. What negative impacts do you know caused by using counterfeit maize seeds to smallholder farmers in the village?
5. Whether there is any type of training provided to farmers in the past 12 months on counterfeit of maize seeds.
6. What are your own opinion on the existence of counterfeit maize seeds in the village?
7. What ways to you know are used by the District/village to fight against counterfeit maize seeds
8. Apart from selling maize seed, what other services do you know are provided to smallholder farmers by agro dealers?

THANK YOU FOR YOUR TIME

Appendix 8: Wards and Villages under Survey

S/N	WARDS	VILLAGES
1.	SUKUMA	ISAGEN'HE
2.	MASELA	MASELA,MWASAYI
3.	NG'WIGWA	MWABAYANDA,NYASHIMBA
4.	LALAGO	LALAGO,GULA,MWAKIDIGA
5.	SANGAMWALUGESHA	SANGAMWALUGESHA,MWANDETE
6.	NYALIKUNGU	NYALIKUNGU
7.	BINZA	BINZA,IYOGELO
8.	SOLA	SOLA
9.	SHANWA	SHANWA
10.	KADOTO	KADOTO,MALEKANO,MWANG'ANDA
11.	IPILILO	IPILILO
12.	MALAMPAKA	MALAMPAKA,BUKIGI,
13.	ISANGA	NJIAPANDA
14.	BADI	MUHIDA
15.	ZANZUI	MALITA
16.	SENG'WA	SENG'WA