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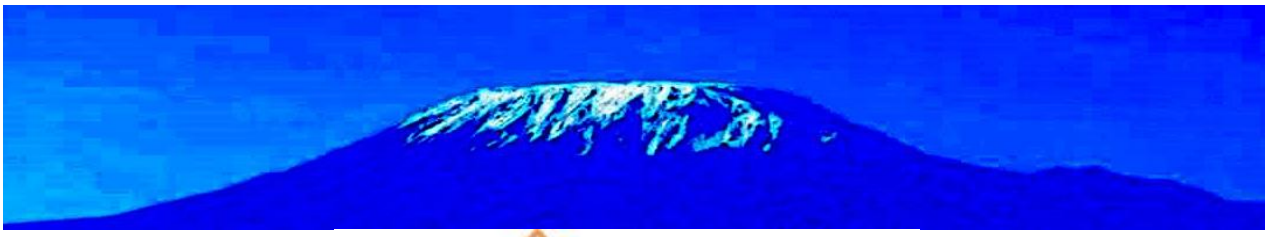

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The causes and detrimental effects associated with the use of 'fake' inputs and seeds to the smallholder farmers in Tanzania

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Abstract

This paper attempts to study the causes and detrimental effects of using fake agro-inputs and seeds by using primary survey data collected from four regions of Tanzania. The study employed mixed methods of data collection entailing secondary review of the relevant documents in the seed input sector. It involved an intensive field survey using structured questionnaire tool as well as consultative interviews/meeting with all key informants across the entire agro-inputs and seeds value chain in Mbeya, Morogoro, Njombe and Arusha regions. The achieved sample size of this study were total of 495 people from selected different categories including famers, input dealers, research institutions, seed producers and Apex bodies- regulators in the country. The study applied sampling procedures of both random and systematic sampling throughout the entire seed value chain. The data collected were descriptively analyzed by the help of the computer program known as Statistical Package for Social Science (SPSS). The causes that are accelerating the existence of fake agro-inputs and seeds in the markets include the shortage of improved certified seeds in the market whereby the businessmen take advantage of this situation to falsify brands and sell these to unsuspecting farmers at exorbitant prices thus masking the inferior quality perception; also, farmers perceive the cost of certified seeds/inputs to be high, they do not understand the value proposition for buying improved seeds ending up buying fake seeds sold at low prices. Besides, there are a number of detrimental effects including social effects such as household food insecurities; failed marriages attributed to crop failures. The economic effects were decreased income of up to 60 percent and in some instances, up to 90% due to crop failures; reduced individual and household purchasing power; most households depend on the sale of crops to smoothen their cash flows. The environmental effects include; decreased soil fertility leading to reduced productivity and loss of biodiversity. Therefore, the study recommends the creation of supportive business environments for investment in production of various seed varieties production to increase supply as well as strengthening the regulatory authority bodies for enforcement of the laws and regulations that will regulate the agro-inputs and seeds markets in the country.

1.0. INTRODUCTION

In the world, Agriculture is the main source of survival for the global population as it provides food for life to the people and animals on earth. The number of people however is facing hunger and poor health due to lack of nutritional food as a result of low agricultural productivity affected by climatic changes alongside poor good agricultural practices. The recent studies show that,

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the number of people affected by hunger and poor nutritional status continues to rise up globally. “There are nearly 60 million more undernourished people now than in 2014, when the prevalence was 8.6 percent up by 10 million people between 2018 and 2019; much of the recent increase in food insecurity can be attributed to the greater number of conflicts, often exacerbated by climate-related shocks.” (FAO, et al, 2020). The eruption of the ongoing pandemic of COVID-19 is also considered to affect the Agricultural production scale in the world.

Besides, agriculture serves as the source of employment opportunity to the large population in the world. The recent report by FAO (2020) indicates that, “Employment in agriculture declined globally by about 15 percent between 2000 and 2018. Yet, agriculture is the second source of employment worldwide with 27.3 percent of total employment in 2018. In rural areas worldwide, one out of every two persons works in agriculture”. This signifies how the sector is an important tool for the social and economic development in the World.

Agriculture is an important economic activity in most countries of Africa. It contributes to 25-40 per cent of the national Gross Domestic Product (GDP) and employs up to 60 per cent of the population in these countries (FAO, 2016). Nevertheless, in “Africa, the agricultural sector remains the main source of employment and provided jobs to almost half of the employed population with 49.3 percent; whereas one out of every two person’s worldwide working in agriculture is located in rural areas (51.2 percent)” (FAO, 2020). According to FAO (2016), in Tanzania, the sector accounts for about 70 per cent of the economic activities, mainly carried out by the rural populations in which about 80 per cent of production is done by smallholder farmers.

Despite its vital role in the economy, agriculture in Tanzania has experienced slow growth due to low production and productivity especially from the smallholder farmers. The low production and productivity is caused by several factors including low use of agricultural inputs, use of fake seeds, and lack of appropriate technologies, inadequate extension services, and poor market access for crop production. This results in not only having low sector contribution to the national GDP, but also smallholder farmers remained trapped in the poverty cycle.

1.1. Statement of the problem and justification

The Tanzanian seed system has grown over the years as observed from the increase in seed enterprises, the number of agro-dealers, improved public seed services, and overall increased volumes of certified seed. However, the use of quality seed remains lower than expectations. Reasons are varied, including a limited growth of the private seed sector in the central, southern, and western parts of the country, combined with direct competition with the government’s Agricultural Seed Agency, a prevalence of fake seed, and a lack of follow-through on key policies that could have a major impact.

A seed and fertilizer voucher program was initiated in 2009 with the assistance of the World Bank to provide inputs to smallholder farmers and thereby increasing national production and productivity. The report by the USAID Enabling Agricultural Trade (EAT), (2013) reveals that, the success of the program is measurable: there are more registered seed enterprises (65) and a significant increase of agro-dealers (over 4000). This has led also to an overall increase in the supply of seed from roughly 16,000 to 28,000 metric tons in the period 2008-2012. At the same time, the Seed Unit of the Ministry of Agriculture, Food Security, and Cooperatives (MAFC) estimates those only 27 seed companies and less than 2,000 agro-dealers are actually active today. Furthermore, certified seed production is estimated to cover only 15-25% of the national seed requirements”. This denote the critical reason for the flourishing of fake inputs and seeds in the markets which farmers uses and get affected economically and socially as well as the

environmental harms. Besides, there are noticeable efforts for increasing financing the sector from the international development partners. FAO (2020) provides that, "Development flows to agriculture reached USD 11 billion in 2018, up USD 6.8 billion or 154 percent, compared with 2002. With USD 4.8 billion (3.4 for sub-Saharan Africa and 1.4 for Northern Africa and Africa unspecified), Africa was the largest recipient in 2018, accounting for 42.3 percent of the total".
Despite these efforts by the development partners, government and other key stakeholders to catalyze agricultural development in Tanzania. Still the sector is facing among others the challenges in the Agro-inputs supply and uses whereby majority of the users (farmers) are using fake seeds and inputs for their farming activities. This leads to low productivity and production of low quality crop produces that are unfit for human consumption in the markets. For example, Seed companies indicated that, a total of 18 cases involving sale of fake seed were reported to them in 2016. This figure is likely to be an underestimate as most cases of fake seed are not officially reported (Mabaya, et al, 2017). The problem of using fake and poor seeds is even terrible among the smallholder farmers in Tanzania. This is evidenced in the ASARECA report of 2014 which found that **"**only 5.3 percent of the seeds used in Tanzania are certified, which doesn't come close to meeting farmers' needs. Again, 95 percent of the seeds planted by farmers are obtained from the informal seed systems. What's more, women are the main actors in most operations in the informal seed systems that relate to the seed value chain of under-resourced crops.

Therefore, this study aimed at exploring the causes and detrimental effects (economic, social, and environmental) associated with the use and application of fake agro-inputs and seeds to the smallholder farmers in Tanzania. The findings of this paper will inform decisions and policymakers on the best ways to curb the problem while improving agricultural productivity in the country.

2.0. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Related literature

Several scholars have attempted to study and present the effects of fake agro-inputs and its solutions to mitigate the problem. However, they failed to present the real state of the counterfeit inputs in Tanzania by using the data from the primary survey across the entire agro-inputs value chain. Also they have not presented the real root causes for the problem; the social, economic and environmental effects resulted from uses of fake inputs as well as the innovative solution to mitigate the problem to the users. This is the research gap that has been addressed in this paper.
Shao and Edward (2014) studied the ways to combat fake agro-inputs products in Tanzania using mobile phones. The study indicates that, the fake agro input is the tragedy to the famers in the country. It therefore recommends the introduction of Agro-inputs Products Verification System (APVS) as the major solution to combat the fake agro-inputs in the country. Ashour, et al, (2017) indicates a huge problem of counterfeits herbicides in Uganda where farmers have no belief of the quality of the agro inputs. FAO (2015) presents the study on the lives of small holder farmers using the households data from nine (9) countries testifying that, majority of smallholder farmers are living in poor living conditions with low income. This makes difficult to purchase quality seeds inputs for their production. Likewise they undertake the farming enterprises at low areas usually below one hector. Lahr, et al (2016) conducted the scoping study in Tanzania, the report revealed that, there are many issues related to pesticide management and pesticide risks that need attention when the SAGCOT is further developed and pesticide use increases. Besides, Sheahan, et al, (2016) conducted the study in four countries from Sub Sahara Africa (SSA) including Ethiopia, Nigeria, Tanzania and Uganda to investigate the link between the use of agro-chemicals in crop agriculture and both agricultural productivity and farmer's health. The report of the study revealed that, their use may have

negative human health. It was found that, agro-chemicals use is associated with increased value of harvest, with similar magnitudes across three of the four countries under study. Besides, is also associated with increases in costs associated with human illness, including increased health expenditures related to illness and time lost from work due to sickness in recent past. Given that, SSA farmers appear to be using agro-chemicals more commonly than policymakers or researchers have recognized. Several scholars had studied the agro-inputs sub sector and testify that, the awareness to the farmers/users and a dealer is still low. There is need to strengthen the knowledge ability especially among the users/famers who are the major users and consumers of agro products. Price regulation and subsidy to the agro input sector is of paramount important to make affordability of products to the users (smallholder farmers).

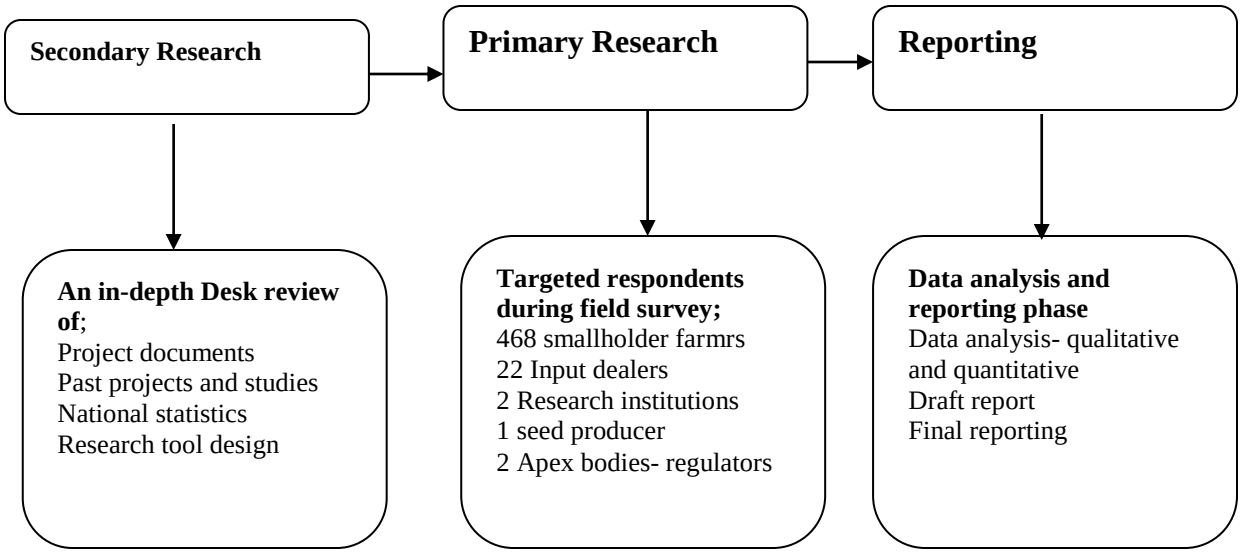
2.1. Theoretical concept

This paper uses the theoretical concept in the "Theory of Agricultural development" adopted from Udemezue and Osegbue (2018). It is stated that, the main aim of agricultural development is the improvement of material and social welfare of the people. Therefore, it is often seen as integrated approach to improving the environment and well-being of the people of the community. The first step in the process of agricultural development is to abandon the view of agriculture in pre-modern or traditional societies as essential static. However the problem of agricultural development is not that of transforming a static agricultural sector into a modern dynamic sector, but of accelerating the rate of growth of agricultural output and productivity consistent with the growth of other sectors of a modernizing economy. Therefore, any attempt to embrace a meaningful perspective on the process of agricultural development must abandon the view of agriculture in pre-modern or traditional society as essential static. Hence, a theory of agricultural development provides insights into the dynamics of agricultural growth, either into the changing sources of growth, in economies ranging from those in which agricultural output is growing at a rate of 2.2% or less in Tanzania (http://www.fao.org/tanzania/fao-in-tanzania/tanzania-at-a-glance/en/).

3.0. METHODOLOGY

The source of empirical evidence for this study was based on the primary survey data supplemented by the secondary data collected from various sources within the Agricultural inputs and seeds sub-sector in Tanzania. The study employed a mixed methodological approach entailing secondary and primary data collection. The study applied the People-Centered Approach (PCA) whereby several different key informants including farmers, government bodies, Agro-dealers, Companies, Regulatory bodies, research institutions, and all key actors/stakeholders in the seed value chain were reached for interviews and consultation.

The primary data collection involved both qualitative and quantitative data collection. The open-ended interviews guided by semi-structured interview schedules/guides were used. The qualitative interviews through Focus Group Discussion [FGD] and consultative discussions with smallholder farmers, financial services providers, and other actors in the inputs and seeds



distribution channel were aimed to provide the researcher with an in-depth understanding of experience, ideas, risks, and concerns around the agricultural inputs and seeds sub-sector. On the other hand, the quantitative interview was used to assess parameters such as production and productivity, income, and improvements in the livelihoods of small-scale farmers. Data collection during fieldwork was focused on the identification and exploring the following key issues; 1. Causes and detrimental effects (economic, social, and environmental) associated with the use of 'fake' inputs and seeds for government in Tanzania 2. Associated losses (social, economic, and environmental) to farmers associated with the use of fake inputs and seeds (which risks are impacting their lives most?) and 3. What is the role of the financial service providers in de-risking farmers from adverse effects of counterfeit?. The data collected were analyzed with descriptive and figures.

The study employed a mixed-methods approach, engaging the entire agriculture seed and agro-inputs distribution ecosystem. The researchers conducted 5 FGDs, 396 Household Interviews, and 27 key informant interviews. It took place in 4 regions and 12 villages.

4.0. RESULTS AND DISCUSSION

The research findings presented herein are the results from the intensive field survey conducted in four (4) regions of Tanzania mainland namely Arusha, Mbeya, Morogoro and Njombe as a representation of the whole country; the survey was carried out in 2018.

4.1 Causes of the use of fake seeds and agro-inputs

4.1.1 Farmer's financial access profiles

The majority of the smallholder farmers (63%) do not belong, cannot associate themselves, and have never experienced formal financial services to finance their farming operations.
In Morogoro however, a majority (52%) of smallholder farmers are organized in rotating savings and credit associations (ROSCAs).

The smallholder farmers do not belong to commercial banks due to the perception that banks are not client-centric. One of the respondents said, *"I cannot go to the bank and take a loan because a bank will not understand if I fail to repay their loan because my production depends*

on whether condition". FAO (2015) indicates that, smallholder farmers "depend predominantly on family labor. In China, nearly 98 percent of farmers cultivate farms smaller than 2 hectares, the country alone accounts for almost half the world's small farms. In India about 80 percent of farmers are small. In Ethiopia and Egypt, farms smaller than 2 hectares constitute nearly 90 percent of the total number of farms. In Mexico, 50 percent of the farmers are small; in Brazil smallholders make up for 20 percent of the total number of farmers." The findings of the study show that 81% of the respondents owned a mobile phone and about 75% used their Mobile phones to make and receive calls.

In Morogoro however, a majority (52%) of smallholder farmers only about half (50%) of the respondents use mobile for sending and reading messages, 36% of the respondents use their mobile phone to access the internet. The above scenario further collaborates the earlier findings that; personal direct contact or person to person approach (e.g. extension agents, agro-dealers, etc.) remain the most feasible way to create awareness to farmers. Further, it also shows the potential to use a combined approach to create awareness about the use of counterfeit seeds and inputs.

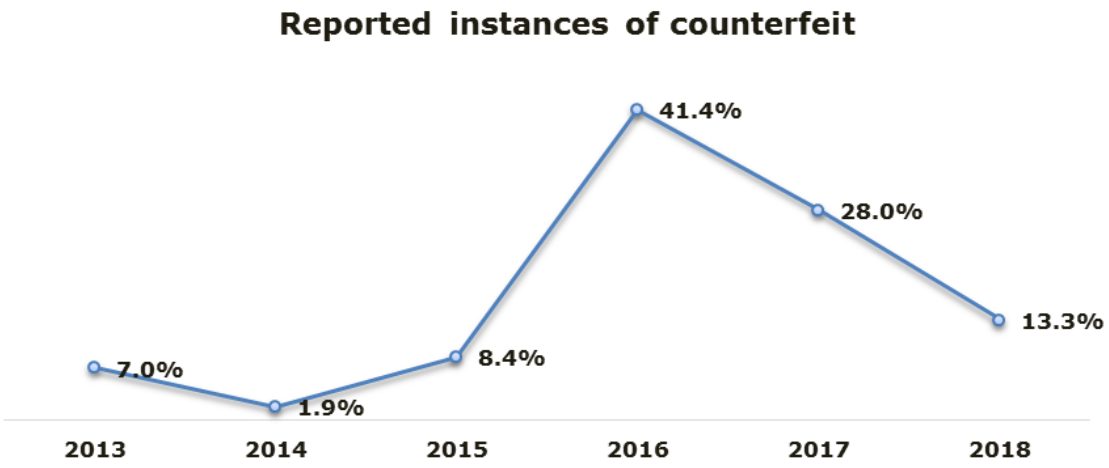
Traditional financial service providers have not given value in serving smallholder farmers. The mobile phone has changed the landscape of financial access and can be leveraged in information delivery in Tanzania.

Farmers' financial access is limited because commercial banks require physical collateral which most farmers lack. Farmers, therefore, shy away from them. Commercial banks are far away from the farmers. Farmers waste a lot of time and cash traveling to access very basic services. *From the village, the bank is more than 100km; also the Agricultural bank has no branch in the rural where farmers are staying, this is limiting the access to the services by farmers who are main clients"* Said one of the key informants during the interview. The majority of the farmers are in the financial groups commonly known as Village Community Banks "VICOBA" where they put their savings and accumulate to access microcredit. Smallholder farmers take loans from their VICOBAs with the main purpose of supporting production [buying inputs such as fertilizers and seeds]. They can take a loan anytime in the year. The amount of loan depends on the number of shares one has in the group account. For example one can take three times his/her capita share say three times TZS, 100,000 equal to TZS, 300,000.

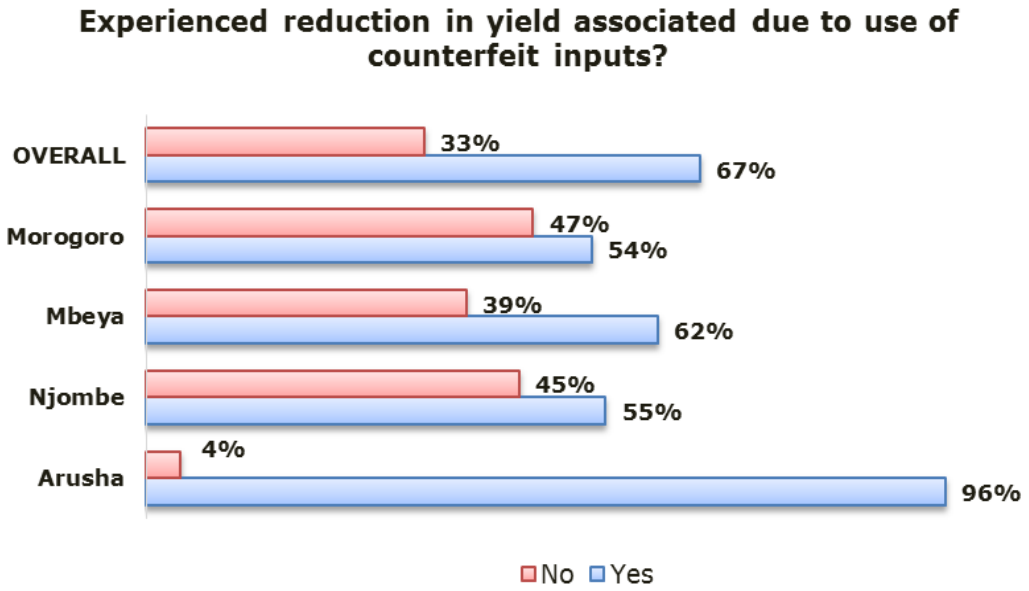
The other challenge is that the bank does not understand the agriculture value chain. When a farmer takes a loan from the bank; the bank is oblivious to the fact that they have to sell their crops. Sometimes, the price offered doesn't pay their costs of production and make any profit. For example, the bag of maize sold at TZS 15,000 instead of about TZS 100,000, the market information also is limited.

Most financial institutions are not farmer-centric. Their products are inappropriate and thus making access to inputs a hurdle for the most smallholder farmer. The Village Community Banks (VICOBA) is therefore perceived as more accessible and more tailored than formal financial services.

4.1.2. The counterfeit situation in Tanzania



Did the farmers stop using purchased/hybrid seeds after 2016? Were there mechanisms to report that currently do not exist? A behaviour research is required to identify the actual cause for this drop.



Reported cases of counterfeit seeds were high in 2016. There seem to be a reduction in reported cases but the impact of counterfeit seeds on productivity threatens food security for the country.
Among the farmers that used counterfeit hybrid seeds, majority 76.5% reported reduced yield. This was high in Njombe and Arusha and lesser in Morogoro; as reported earlier, majority of farmers in Morogoro used previous season's seeds.

4.1.3 Reasons and perceptions for using fake seeds to the smallholder farmers

Only 40% of the farmers of the farmers reported consistently used purchased hybrid seeds. Above scenario present a business case for seed suppliers in the region. It means at least 40%

of potential market is not explored. The use of recycled seeds has been scientifically proven to lead to low productivity, spread of diseases and hurting genetic setting of the seeds which can also be harmful to the soil structure. Majority of the farmers (65%) preferred the use of recycled seeds due to the perceived and real high costs of the hybrid seeds. Interestingly, Morogoro, being the centre for most seed research companies, over 84% reporting cost as a deterrent to the use of hybrid. Generally, majority of the farmers across Tanzania continue to use recycled seeds from the previous season. Cost of hybrid seeds still remains the lead contributor to this behaviour followed by the belief that, recycled seeds are high yielding.

4.1.4 Crop highly affected by counterfeit seeds trade

Majority of the farmers 87% mentioned maize as the major crop that is heavily counterfeited in the market. The identified different varieties that farmers were not aware they existed in the marked. Overreliance on rainfall, make farmers to plant at the same time. This therefore creates a huge demand in the market. The lack of a structured supply chain creates shortages in some areas. Unserious businessmen take advantage and supply the farmers with counterfeit seeds Farmers reported to use an average of TZS 49,000 in Arusha, TZS 66,000 in Njombe, 42,000 in Mbeya and 60,000 in Morogoro to purchase maize seeds each season. Assuming an average of TZS 50,000 is what average farmer will use to buy seeds. And that 60% of farmers are exposed to counterfeit [nearly 3million smallholder farmers] each season as depicted earlier, it therefore indicate that the sector is losing up to TZS 150 Billion which can be reverted through prudent actions. In conclusiveness, Maize, the most prevalent crop grown and traded in Tanzania, is a key target of counterfeit seeds. There are very many varieties of maize and lack of better executed awareness, most farmers are exposed to potential counterfeits.

4.1.5 Counterfeit business practices on agro-inputs and seeds

Counterfeit agro-input is systemic and a value chain issue. While ignorance is a great contributor to the use of fake inputs, little is being pushed through by the value chain actors. Below are some collections of sentiments that support that;

- Shortages of particular inputs especially seeds lead some people to forge the brands and sell at a low price to the farmers.
- Wrong timings: Supply of inputs that is not in sync with farmers farming cycles force farmers to fall back to using counterfeit.
- Agro-dealers cannot solve the issue reported to them. Regulators such as TOSCI require one to have all the evidence including the receipts and package materials of a particular product.
- Perceived high price of agro-inputs triggering smallholder farmers to buys and use fake inputs sold at low prices.
- Limited research on soils and suitability of seeds in different geographies. Farmers continue to deplete nutrients by the use of wrong inputs in the wrong soil location.
- Some people prey on opportunities of a missing particular seed variety in the market. *They take grain and forge the brand name then sell to the farmers*." said Mr. Edwin Pella of Werembli Shop in Njombe Town.

- Negative &unhealthy competition: Players forge the brand of their competitors to destroy the reputation so they can win the market.

- Weak regulatory system: inactivity and failure to punish those dealers or manufacturers who are found to engage in fake business. "….*I have not seen any police catching the dealers of fake inputs since I started this business….also, there is poor coordination of the actors in the sector"* said Mr.Fred Myinga of Agri-grow shop in Morogoro

- Ignorance: education to the majority of end-users and agro-dealers -not aware of how to differentiate the fake and origin inputs, say seeds. *There is a case where a farmer can come back and say I sold to him fake herbicides but once I start questioning him how he applied, I discover that he applied in wrong ways"* said one of the sales personnel in the Mtewele Shop in Njombe Town.

- One farmer from Dihinda village said, "*I bought maize seeds at the Agro dealer shop in the last season when I planted, the seeds germinated with different levels and looking; some failed to germinate completely, I knew it was fake seeds*".

4.1.6 Reported causes of counterfeit agro-inputs and seeds in the market

The following are the identified causes of use and existence of fake agro-inputs and seeds in the Tanzanian market to the smallholder farmers: a) shortage of improved certified seeds in the market-Businessmen takes advantage of this situation to falsify brands and sell these to unsuspecting farmers at exorbitant prices thus masking the inferior quality perception; b) Farmers perceive the cost of certified seeds/inputs to be high; c) farmers do not understand the value proposition for buying improved seeds. They end up buying fake seeds sold at low prices. Low literacy levels among smallholders' farmers-High levels of ignorance about the seeds/inputs available in the market expose farmers to buying fake seeds; d) limited participation of Agro dealers in farmer awareness initiatives-Agro-dealers, who are critical in the last-mile supply of inputs and seeds have not been involved in creating awareness among farmers; f) Weak regulatory enforcement- the Tanzania Seed Agency (TSA), Ministry of Agriculture and Cooperatives, and Tanzania Official Seeds Certification Institute (TOSCI) cannot enforce the input regulations in the country.

Other causes were failed extension service system. Farmers have limited knowledge of Good Agriculture Practices (GAP). Alternative channels need to be explored on how to provide awareness and knowledge to smallholder farmers. Poor farming practices e.g. farmers still use recycled seeds from the previous season. Entrenched/inherited practices handed down the generations compounded by limited access to improved seeds especially in the rural areas encourage the use of fake seeds. Unethical business practices among seed suppliers-Falsifying competition brand and poor branding of seeds packages to make a higher profit. There is a reliance on neighbouring countries for seeds. The research identified that about 95% are imported from neighbouring countries.

4.2 Social, Economic and Environmental effects of using fake agro-inputs and seeds

4.2.1 Impact of 'fake inputs and seeds' to farming households.

The Social effects of using fake agro-inputs and seeds are:

- Household Food insecurities

- Failed marriages attributed to crop failures. Blame games between spouses as to whom was responsible of purchasing the seeds
- Increased incidences of diseases (lifestyle and some chronic)
- Death in adverse conditions. Reported incidences of family members starving to death after a crop failure or consuming toxic food
- Reduced labour force at the family level due to poor health and deaths
- Failure to meet basic needs such as buying of cloths, paying school fees, medical care

"I bought rice seeds in the 2016/17 season; it didn't germinate completely in the farm" One user said during interview
"Pesticides, especially, can damage human immune systems, increasing the incidence of short term sickness over time"(Sheahan, M.B, Christopher B. and Goldvale, C. 2016),

Economic effects of using fake agro-inputs and seeds are
- Decreased income of up to 60 percent and in some instances up to 90 percent due to crop failures
- Reduced individual and household purchasing power. Most households depend on sale of crops to smoothen their cash flows
- Failure to repay loans taken from the banks or financial institutions. Some farmers have their assets auctioned by financial institutions to recover their money
- Poor performance of agriculture enterprises. Farmers are forced to scale down their farming activities in consequent seasons due to capital loss
- Loss of business for the agro-dealers. Farmers become suspicious of the inputs sold at agro dealers and shun them.

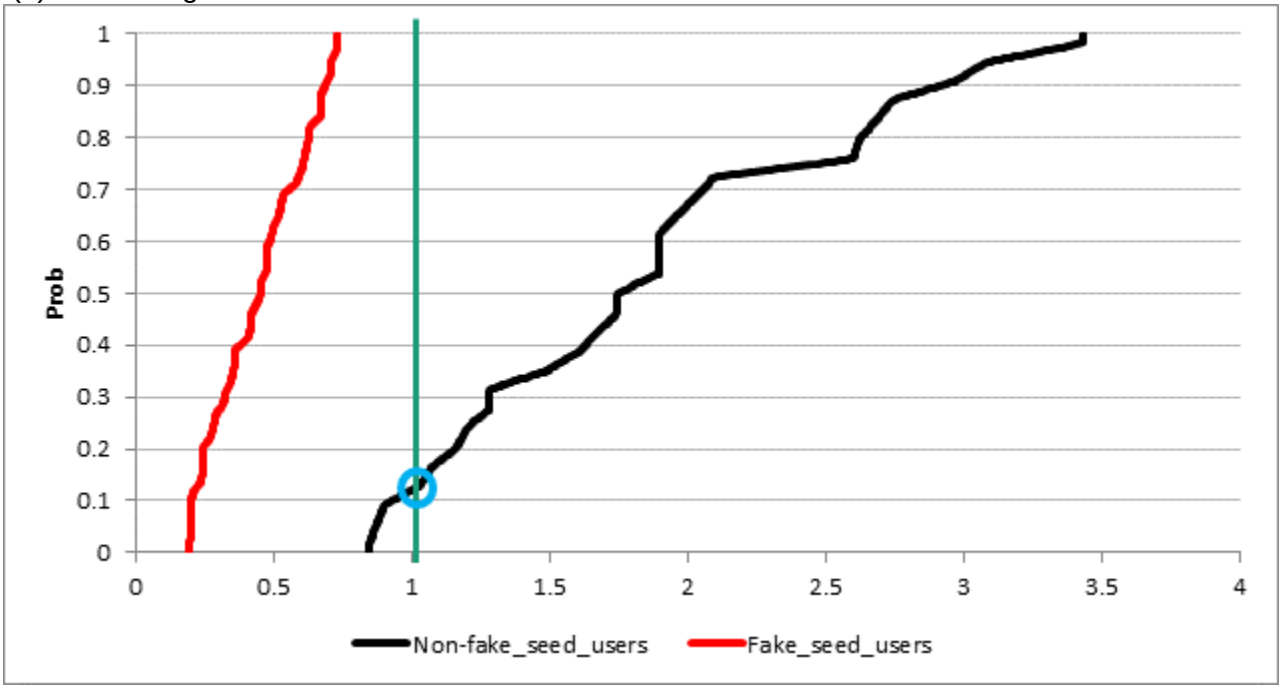
..I used fake seeds in the 2016/17 season I harvested 10 bags of maize instead of 25 bags I had harvested in previous season" said one of the users

Environmental effects of using fake agro-inputs and seeds are:
- Decreased soil fertility leading to reduced productivity
- Loss of biodiversity: Farmers reported disappearance of some flora and fauna that existed in their area after continued use of certain inputs
- Expert reported significant death of microorganisms in the soil samples taken from lands that reported using counterfeit inputs and seeds
- Eruption of new and chronic weeds immediately after the use of counterfeit inputs
- Eruption of new crop diseases and pests attacks in the fields. Some inputs were reported to cause new diseased and also cause invasion of crop by new pests like the Fall Army Worms than had never been experienced earlier

4.2.2 Graphical Representation of Loss in yield

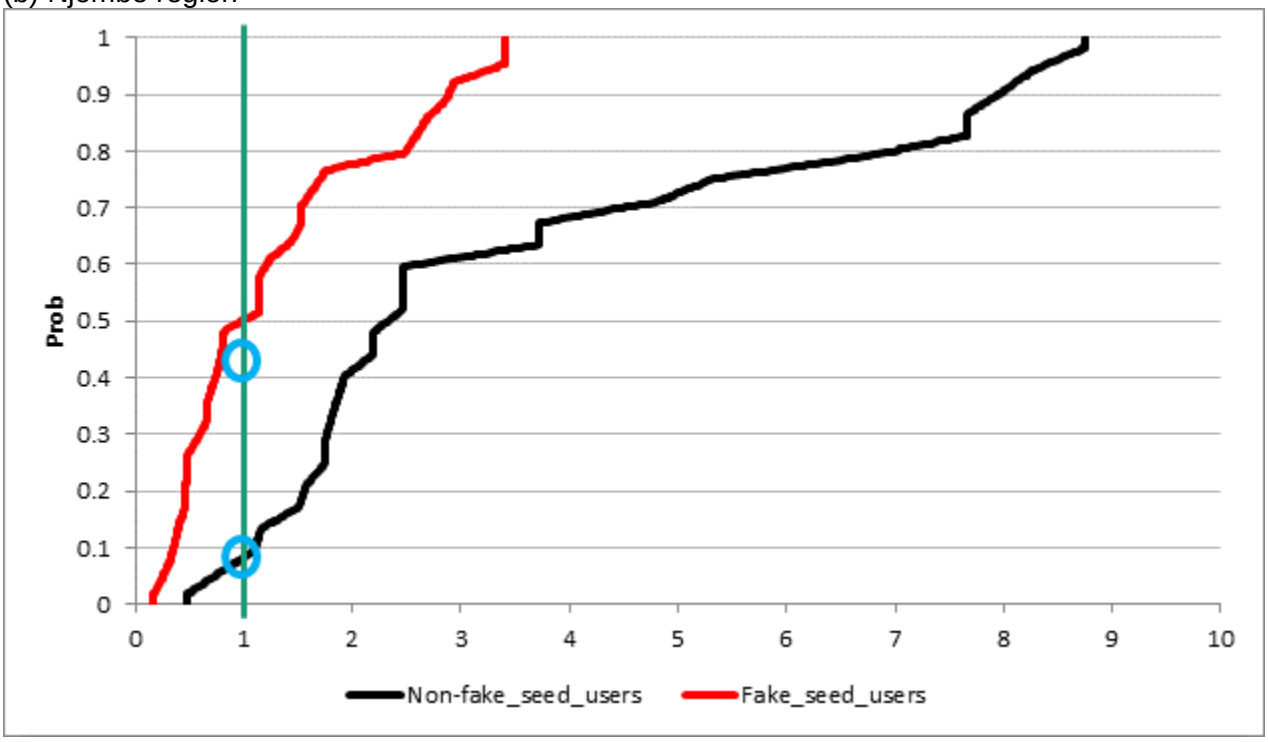
To estimate the impact of counterfeited maize seeds on yields, all farms that used counterfeit seed (*fake seed user*) were compared to farms that did not (*non-fake seed users*) and the results are as pictured by Cumulative Distribution Functions (CDFs). For analysis, we set our threshold (minimum target) equal to 1000kg/ha (1ton per hectare).

(a) Arusha region



The above figure indicate that that only 12.2% of farmers who did not use fake seeds were below our threshold of 1 ton/ha (this means that nearly 87% of the farmers using hybrid seeds were above the minimum threshold). Further, all the farmers who used fake seeds were below the target by 100% in Arusha.

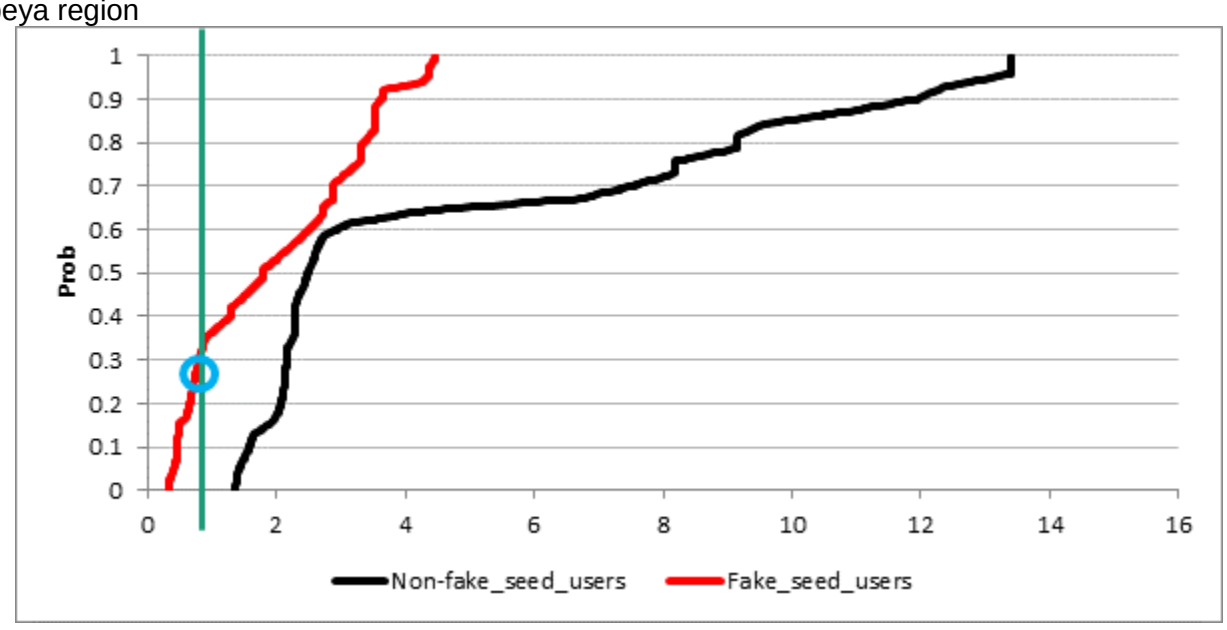
(b) Njombe region



In the Njombe region, the result indicates that only 8.4% of the respondents/farmers who used hybrid seeds were below the threshold. More than 50% of farmers that used fake seeds harvested below the minimum threshold.

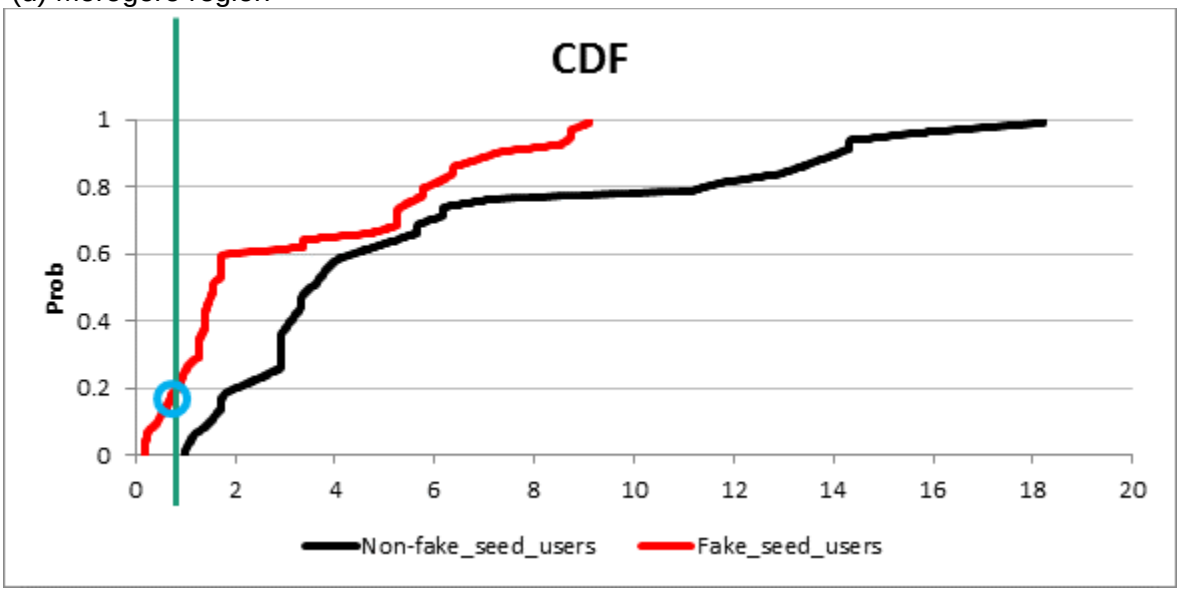
Across the study locations, there is a significant loss in yield due to the use of counterfeit seeds. With deprived harvest, the farmers' income is further deprived, which leaves them in a vicious cycle.

(c) Mbeya region



The figure for representing Mbeya indicates that 100% of the farmers who used hybrid seeds had their harvest above the minimum threshold. For farmers that used fake/counterfeit seeds, nearly 30% of the farmers harvested below the threshold of one tone per hectare.

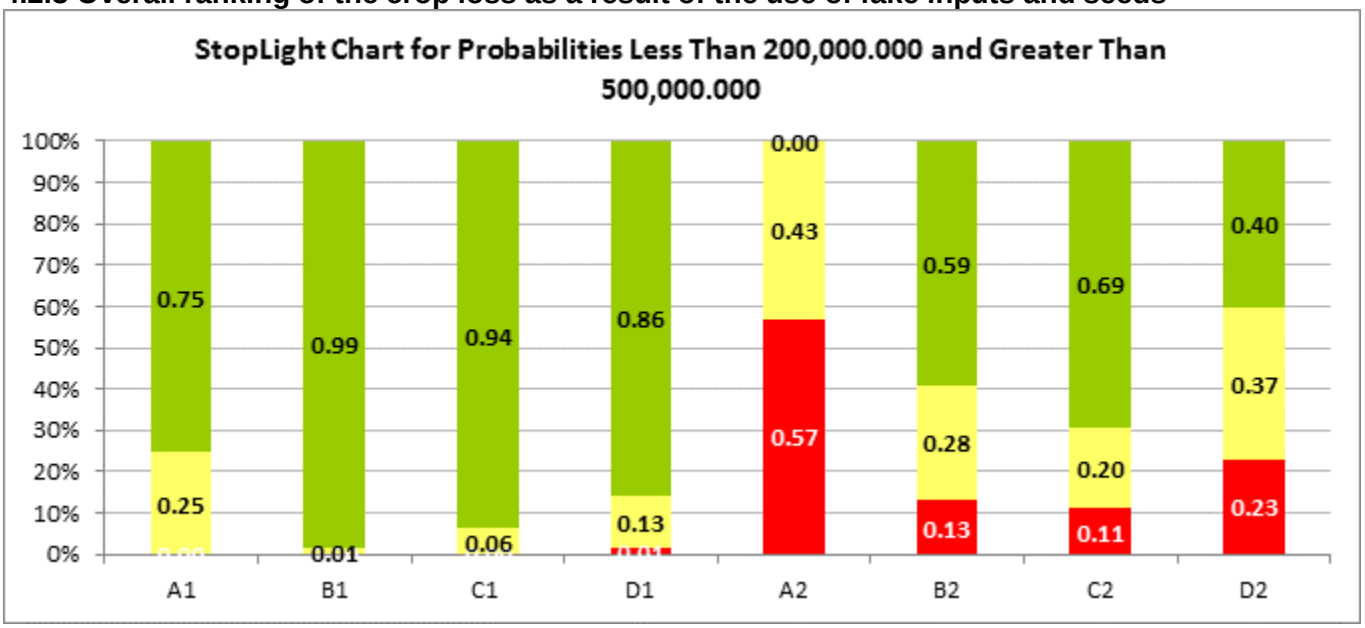
(d) Morogoro region



The figure for the Morogoro region shows that, about 20% of the farmers that used fake/ counterfeit seeds harvested below the minimum threshold. All the farmers that used hybrid seeds harvested above the set minimum threshold.

Overall in the study regions, over 52% of the farmers that use fake seeds harvested below our minimum target of 1 ton/ha while only 5% of the farms that use clean/hybrid seeds were below our minimum target. This is a clear indication that there is a value proposition for using hybrid seeds and secondly, the need to target behaviour change amongst the farmers using fake/ recycled seeds.

4.2.3 Overall ranking of the crop loss as a result of the use of fake inputs and seeds



The StopLight charts for gross revenue percentage less than TZS 200,000 and Greater than TZS 500,000. Where A1, B1, C1, D1 = receipts (gross revenue) for clean/pure seeds planted in Arusha, Mbeya, Morogoro and Njombe, while and A2, B2, C2, D2 = are receipts for farms used fake seeds respectively. The GREEN colour shows that the GR were above the Max target, AMBER colour show the percentage of farms falling between our target and the RED colour shows percentage of farms earning less than the minimum target. The researchers used stoplight chart to rank the population for the two scenarios each scenario in terms of the percentage of falling in either unfavourable (in red), cautionary (in amber) or favourable area (green).

Stoplight charts for receipts percentages less than TZS 200,000 and greater than TZS500, 000. The charts for farms used clean seeds show that all farmers in Arusha, Mbeya, Morogoro, and Njombe were above the maximum gross revenue target of TZS 500,000 by 75%, 99%, 94%, and 86% respectively, with almost none of the farms falling below the minimum target of TZS 200,000 except Morogoro which show a 1 percent of farms below the minimum (1%). The charts for farmers using fake seeds show that 57%, 13%, 11%, and 23% of the farms were below the minimum gross revenue in Arusha, Mbeya, Morogoro, and Njombe respectively. Arusha has the highest proportion of households who incurred the losses dues to fake seeds followed by the Njombe region.

5. CONCLUSION AND RECOMMENDATIONS

Agricultural development needs a cross sectional cooperation of all the key stakeholders in the country. Working together to address the challenges and financing the sector as well as continued efforts to build capacity of the small holder farmers in terms of their knowledge and technical know-how related to farming and uses of agro-inputs. The fake seeds continue to hurt farmers. The catalyst to the use of fake/counterfeit seeds in the market can be traced across the entire seed supply value chain. That is the challenges stemming from farmers illiteracy to institutions inability to produce enough agro-inputs and enforce existing laws. The low level of knowledge of seeds inputs by the users and shortage of quality seeds emanating from low production investment are among the key causes of famers to continue using fake seeds in the farming sector. Perhaps more research needed to find out why low investment in the seed multiplication sector as well as agro-inputs accessibility to the users! Will farmers prefer locally produced agro inputs if massively produced or will they continue relying on imported agro inputs?.

Therefore, the study recommends the followings for action from actors, policy and decision makers; Create smooth environments for investment in production of various seed varieties production within the country to address the shortages and high prices of seed varieties into the markets. All stakeholders and government to continue promoting awareness to the farmers who are the main users of seeds and agro-inputs especially on the ways/techniques identifying of fake seeds or inputs in the markets and the action to take once they come across with the case.
Strengthen the regulatory enforcement capacity for the Tanzania Seed Agency (TSA) and Tanzania Official Seeds Certification Institute (TOSCI). This will allow serious action to be taken for all untrusted business people who engage in selling poor and fake agro-inputs and seeds.
Increasing capacity building to the extension officers so that, they can always pass the Good Agricultural Practices (GAP) knowledge and skills to the farmers for improved productivity.

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APPENDICES

1. Respondents sample reached during survey

S/N	Region	District	Village	Households visited per village	Total sample size
1.	Arusha	Monduli	Olarash	36	74
		Arumeru	King'ori	38	
2.	Njombe	Wanging'ombe	Isidagosi	20	80
			Itulahumba	19	
		Njombe Rural	Ihalula	20	
		Njombe Urban	Itulike	21	
3.	Mbeya/Songwe	Mbalali	Malamba	48	121
		Mbeya rural	Nsenga	33	
		Mbozi	Nanyara	10	
			Songwe	30	
4.	Morogoro	Mvomero	Dihimba	38	121
			Diburuma	83	
	Total			**396**	**396**

Region	District	Female	Male
Arusha	Monduli	17 (47.2%)	19 (52.8%)
	Arumeru	9 (23.7%)	29 (76.3%)
Njombe	Wanging'ombe	18 (46.2%)	21 (53.8%)
	Njombe Rural	8 (40.0%)	12 (60.0%)

	Njombe Urban	7 (33.3%)	14 (66.7%)
	Mbalali	26 (54.2%)	22 (45.8%)
Mbeya/Songwe	Mbeya rural	12 (36.4%)	21 (63.6%)
	Mbozi	22 (55.0%)	18 (45.0%)
Morogoro	Mvomero	47 (38.8%)	74 (61.2%)

POLICY BRIEF

The causes and detrimental effects associated with the use of 'fake' inputs and seeds to the smallholder farmers in Tanzania.

Key messages

- Fake agro-inputs continues to harm agricultural sector development
- Control of fake agro-inputs needs joint efforts across the entire agro-inputs value chain
- Serious implementation of laws and regulations against fake input dealers is required
- Stimulation of local investments in production of quality seed varieties and fertilizers
- Continued capacity building training for awareness creation to the input users and dealers through community development officers and extension officers at LGA's

Overview

This policy brief explores the causes and detrimental effects (economic, social, and environmental) associated with the use and application of fake agro-inputs and seeds to the smallholder farmers in Tanzania.

The use of fake agro-inputs and seeds continue to hurt farmers in Tanzania. Majority of people affected by this bad practice are farmers who earn their lives depending on Agricultural production. This could ultimately damage the lives of millions of people and soil species, thus lacking sustainability of production as a result may lead to food loss and food insecurity in the country.

The present situation in the agro-input sub-sector of Tanzania continues to testify the problem of existence of fake agro-inputs in the country as the cases of fake inputs such as fertilizers, pesticides and seeds persist[4]. Controlling of fake agro-inputs requires serious joint efforts among all key actors in the Agricultural sector including socio-economic development actors and policy makers at all levels. The existence and use of fake inputs risk the health of the food consumers; reduce the food productivity and lower level of soil capacity to produce more crops that in return hinder the development of the community and the nation at large.

Causes of fake agro-inputs uses

Throughout synthesizing the relevant previous studies and extensive field visits, interviewing the key informants, it is evidenced that, there are number of causes for the use of fake agro-inputs. These includes but not limited to; about 63% of smallholder farmers have no access to loan/credit services from financial institutions (Banks) due to their poor economic status making difficult to finance their farming operations including buying quality inputs; weak regulatory

[4] https://www.habarileo.co.tz/habari/2021-07-286101596148ad2.aspx -Tani 70 za dawa fekiyaSulphur zakamatwa

framework; little awareness among farmers and shortages of particular seeds varieties in the market.

Detrimental effects of using fake agro inputs

Social effects	Economic effects	Environmental effects
▪ Household Food insecurities ▪ Failed marriages attributed to crop failures. Blame games between spouses as to whom was responsible of purchasing the seeds ▪ Increased incidences of diseases (lifestyle and some chronic)	▪ Decreased income of up to 60 percent and in some instances up to 90 percent due to crop failures ▪ Reduced individual and household purchasing power. Most households depend on sale of crops to smoothen their cash flows ▪ Poor performance of agriculture enterprises. Farmers are forced to scale down their farming activities in consequent seasons due to capital loss	▪ Decreased soil fertility leading to reduced productivity ▪ Loss of biodiversity: Farmers reported disappearance of some flora and fauna that existed in their area after continued use of certain inputs ▪ Eruption of new and chronic weeds immediately after the use of counterfeit inputs

Recommendations

The recommendations include the creation of smooth environments for investment in production of various seed varieties, fertilizers and pesticides production within the country to address the shortages and high prices of agro-inputs especially seed varieties into the markets; promoting more awareness to the farmers who are the main users of seeds and other agro-inputs especially on the ways/techniques for identification of fake seeds or inputs in the markets as well as the action to take once they come across with the case. Other recommendations include strengthen the regulatory enforcement capacity for the Tanzania Seed Agency (TSA) and Tanzania Official Seeds Certification Institute (TOSCI). This will allow serious action to be taken for all untrusted business people who engage in selling poor and fake agro-inputs and seeds as well as to increase knowledge capacity building to the extension officers at LGA's levels.