



Characterised existing sweetpotato seed system actors, identified efficient seed distribution channels and market preferred varieties in Bukombe and Butiama districts, Tanzania

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Acronyms

FAO	Food and Agriculture Organization
NGOs	Non-Governmental Organizations
SCP	The Structure, Conduct, and Performance
SPVD	Sweetpotato Virus Disease
SPW	Sweetpotato Weevils
SSA	Sub-Saharan Africa
TARI	Tanzania Agricultural Research Institute
DVM	Decentralized Vine Multipliers

Executive summary

Tanzania is a major sweetpotato producer in sub-Saharan Africa. The area under sweetpotato has been rising steadily relative to main food staples. However, the yields have stagnated at around 4 t/ha compared with the potential yield of above 20 t/ha, partly due to limited access to quality seeds. Most farmers in SSA recycle seed from the previous crop or source from neighbours. This increases the probability of accumulating viruses, which may reduce the sweetpotato yield by over 50%.

Studies have shown that farmers are willing to pay a premium for quality seeds. Therefore, an efficient seed distribution channel that ensures seeds move from the breeding stage to the multiplication stage without any disconnections between the nodes can provide farmers with better access to quality seed at an affordable price. However, there are disconnections in the current seed distribution channels, particularly between the public and private sectors. In addition, most farmers do not often replenish planting materials once they buy quality planting materials.

There are hardly any exclusive seed multipliers in the seed value chain due to a lack of understanding about potential business opportunities. Identifying a sustainable and profitable business model for seed multipliers is important in ensuring that farmers are constantly supplied with quality planting materials when they need them. This needs greater efforts to demonstrate the benefits of using quality planting materials, establish delivery seed distribution channels to reach a large number of end-users, and strengthen farmer seed management capacities and farmer seed networks.

A study was conducted in Mara and Geita regions to identify market preferred and the main sources of the sweetpotato roots. The survey on the root producers were carried to understand the acquisition and provision of the market-preferred varieties and the connections between the nodes in the existing seed distribution channels. The study also conducted key informant interviews with other key stakeholders such as the public sector (i.e., Tanzania Agricultural Research Institute-TARI). The team will propose a sustainable business model that can link formal and informal seed sectors for consistent supply of quality and market preferred planting materials to root producers.

The study utilized “the structure, conduct, and performance (SCP)” tool to establish relationships in the sweetpotato seed market. The SCP paradigm postulates a causal relationship where the structure influences the conduct, and in turn, the conduct influences the performance. The structure refers to the type of market, pricing strategy, the degree of concentration of buyers and sellers, the level of product differentiation, and condition of entry in the market. The conduct is the behavior of buyers and sellers and how they react to each other strategy. The performance of the seed market considers indicators such as profit of the seed and root producers and seed security indicators. The study also mapped the

linkages of the existing nodes of sweetpotato seed channels by looking at the seed acquisition and provision transactions.

A total of 45 traders participated in the survey in Bukombe, Butiama, Ilemela and Nyamagana districts. Most of the traders were male, and the average age was between 37-44 years in the four districts. Most traders are members of trader's associations, some traders were in cooperatives, and a few were in digital platforms. The traders benefited from the association through access to credit, access to market information, facilitating joint marketing, and saving cash.

The markets were mainly rural (Bukombe and Butiama) and urban markets (Ilemela and Nyamagana). The type of traders in these markets were either wholesalers or middlemen (aggregators), with most markets operating the whole day, where the contract between sellers and buyers is largely oral. The high season when the supply of sweetpotato roots is high in the market ran from February to June, while the low season runs from July to November.

Overall, Polista (62%), Mage (40%), and Ukimwi (28%) were the three most traded in the market, but there were district differentials in the traded varieties. For instance, Ukerewe (56%) was the most traded variety in Butiama. The common attributes liked about these varieties include high dry matter, big root size, good taste for Polista, high dry matter, good color and high market demand for Ukimwi, long shelf life, high market demand, and good color of the flesh for Mage. The three most disliked attributes in Polista were late maturing, short storage life, and susceptibility to pests and diseases. In Ukimwi susceptible to pests and diseases, limited supply of planting material, and small size of the root. Low dry matter, late maturing, and high-water content were the three most disliked attributes of Mage variety.

In the root and seed producers survey, a total of 110 households from the Bukombe and Butiama district participated in the rapid seed system assessment survey after being identified as a major source to sweetpotato markets in the region. The proportion of root producers who also produced seeds was higher in Bukombe (72%) than Butiama (42%), where the majority of the seed producers were not trained. Most producers produce seeds for their own use. However, the neighbor farmers play a dominant role in both seed acquisition and seed provision. The existing root buyers include wholesalers, commission agents/aggregators, retailers, and NGOs. Most farmers sell the roots to wholesale traders, followed by commission agents and retailers.

The median size for sweetpotato root plots was 0.8 hectares in both districts, while the average size for sweetpotato seed plots was 0.2 hectares in Bukombe and 0.32 hectares in Butiama. The average root yield was 2,461 kg/acre in Bukombe and 2060kg/acre in Butiama. The average seed yield was 5,695kg/acre in Bukombe and 3,140 kg/acre in Butiama.

Overall, the three most preferred varieties are Polista, Ukimwi, and Mage, but varied with the district. Polista variety was liked because of its high dry matter content, better taste, and high market demand. The traits that farmers disliked include matures late, has low yield and is not

resistant to SPW. Ukimwi was preferred because it matures early, has high market demand, high dry matter. The traits producers disliked were less resistant to SPVD, not stress-tolerant, short shelf life, and limited access to planting material. The preferred attributes in Mage include high market demand, good flesh color, early maturing, and high root yield. However, the variety is late maturing, has low dry matter content, has a shorter shelf life, and less resistant to stress (drought and poor soils).

About 90% of producers sell/share sweetpotato roots. The roots are mostly sold to wholesale traders, followed by commission agents, retailers, and NGOs. The average quantity sold by the respondents in the last year was about 8924 kg in Bukombe and 4850kg in Butiama. Only 26% and 53% of respondents sold seeds in Butiama and Bukombe, respectively. The most common varieties provided were Ukimwi (33%), Pisi tatu (27%), Uso wa mchina (20%) in Bukombe. Polista (57%) and Ukerewe (29%) were the most common varieties in Butiama. Farmers predominantly sold to sweetpotato producers in both Butiama (86%) and Bukombe (97%). Other seed buyers were international organizations, and local NGOs. Respondents sold to producers mainly because they were friends and relatives without expectations but sold to local NGOs, international organizations because they give higher prices.

About 47% in Bukombe and 28% Butiama acquired seed from elsewhere. Ukimwi was the most dominant variety in Bukombe, while most respondents in Butiama received Polista and Ukerewe. At least half of the respondents chose these varieties because they were market preferred. The seeds were mainly sourced from sweetpotato producers because of close relationships (relatives and friends).

TARI produced Kabode, Kakamega, NASPOT 12, and Mataya varieties through rapid multiplication in screen houses and conventional methods in open field plots. The three most preferred varieties were Kabode, NASPOT 12, and Mataya. All of them are early maturing, high yielding, with better nutritional benefits. Kabode and NASPOT 12 are also tolerant to SPVD and SPW. TARI has regular contact with about 20 decentralized vine multipliers and 30 farmers. In the last one year, TARI provided 5 types of varieties

The five types of varieties that TARI provided were Kabode, Kakamega, NASPOT 12, Mataya, and Ejumula, where the seed class was basic. TARI provided a total of 1257 bundles to local NGOs in February at TSH 2500 for each bundle of 100 cuttings of 30cm size.

Chapter 1: Introduction

1.1 Introduction

Sweetpotato (*Ipomea batatas* (L. (Lam.)) is a major food crop in Tanzania. Tanzania is one of the largest producers of sweetpotato in Sub-Saharan Africa (SSA) with estimated annual production of 3.8 metric tonnes from 766,494 ha in 2018 (FAO, 2020). The area under sweetpotato relative to major food staples in Africa shows that sweetpotato has continued to expand significantly from a relatively low base in 1995 compared to cereals (FAO, 2020). However, available data indicates that though acreage has increased, yields obtained by smallholders have stagnated (around 4 t/ ha) and remained significantly below the potential 30-38t/ha or higher achievable with improved varieties due to poor access to quality planting materials (FAO, 2020).

Many smallholder farmers in Sub-Saharan African (SSA) countries rely on local seed varieties sourced informally from own farms seed or neighbor farmers. Majority of market preferred seed varieties are local landraces, with unknown seed quality. Farmers recycle seed from season leading to accumulation of viruses. Access to clean can reduce yield losses arising from virus infections. However, systems for delivery of clean seed are still at a nascent stage and there is a disconnect between upstream sources of early generation of seed and users downstream. Therefore, a need for an efficient seed distribution channel that can move seed of preferred seed producers to reach root producers, and provide access to quality seed at an affordable price. Therefore, under the SweetGAINS project we conducted a rapid assessment in potential target areas in Tanzania to identify appropriate seed distribution channels to efficiently reach a large number of end-users in a sustainable manner.

1.2 Objectives of the study

The main objectives of the study were to:

- i) Identify market-preferred variety(s) and the major root production areas for those varieties.
- ii) Map the linkages (seed flows) among nodes of existing sweetpotato seed distribution channels (informal and formal).
- iii) Understand the role and functions of different stakeholders within the seed system in target areas.
- iv) Describe the market structure, assess performance of sweetpotato seed business
- v) Identify yield and profit margin for root producers based on various types of seed sources.

- vi) Identify potential options for developing a sustainable business model for sweetpotato seed entrepreneurs to link the formal and informal seed sector in the target area.

1.3 Research questions

The overall research question to be addressed over the project life is what are the sustainable business models that can improve the overall performance of the sweetpotato seed system and the marketing efficiency of seed distribution channels for market preferred varieties to male and female root producers? However, the following research questions will be addressed to understand the current sweetpotato seed distribution channel (s) and market structure, performance and conducts of sweetpotato seed business.

1. What is the major market preferred variety(s) and where it is sourced from?
2. Does market preferred variety have cleaned planting materials?
3. Does Early Generation Seed (EGS) producers and sweetpotato seed producers in the downstream seed value chain connected with each other for the market preferred variety(s)?
4. What is the level of interaction among seed system stakeholders and how does this influence availability, access and quality of seed?
5. What is the strength of relationship between seed value chain actors?

Chapter 2: Survey design and methodological framework

2.1 Study area and sampling design

Mara and Geita regions were purposively selected in Tanzania as potential target areas for the project intervention. The first objective of the study is to identify market preferred varieties at the market and identify the source of sweetpotato varieties preferred in the market (Figure 1). Therefore, using a snowball sampling method the study started with traders' survey at the major sweetpotato root market in the target area. Once the market preferred variety(ies) and sources of sweetpotato roots were identified, the study traced the connections between nodes in the existing seed distribution channels. The survey team visited and interacted with the extension officers and root aggregators to identify the villages where the market preferred varieties are produced. Once the villages were identified the participating households were randomly selected with help of leaders, and individual structured interviews were conducted to understand the acquisition and provision of sweetpotato roots and seed. A total of 110 households participated in the survey that was carried in August 2020. The study also interviewed a representative of Tanzania Agricultural Research Institute (TARI) to understand the distribution channels for early generation seed (pre-basic and basic). Concurrently, focus group discussions (FGDs) were also conducted with select female and male consumers to get more information on the traits of market-preferred varieties. The sample size was based on the actual number of actors who were involved in sweetpotato production and marketing in the target area. The results from the Focus Group Discussion (FDGs) will help to link the formal and informal seed sectors to ensure a consistent supply of quality planting materials of market-preferred varieties to root producers.

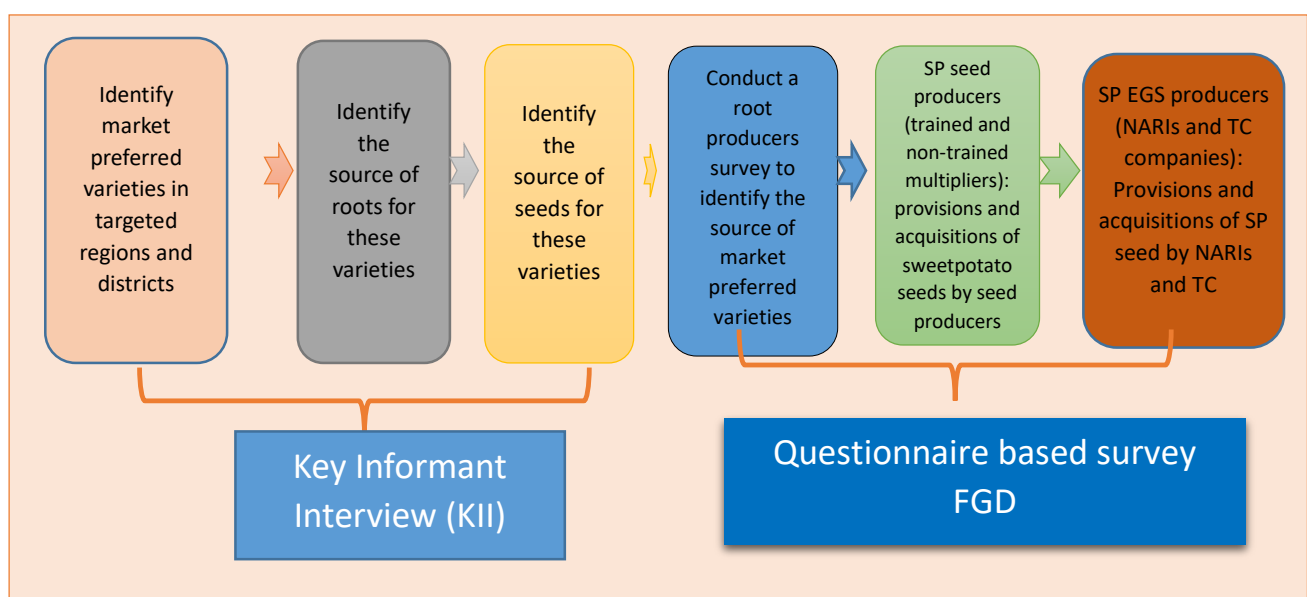


Figure 1. Assessment of distribution channels of market-preferred sweetpotato varieties

2.2 Methodological framework

Firstly, the study analyzes the sweetpotato seed market to establish the relationships across market structure, conduct and performance using a tool called “the structure, conduct and performance (SCP) (Figure 2). The SCP paradigm postulates a causal relationship, where the structure influences conduct and conduct in turn influences performance (Lee, 2008).

We need to understand how the functioning and structure of the seed market, have an influence on the strategy and decision making of a sweetpotato seed business in terms of strategic supply management. The market structure describes the type of market whether it is operating as a monopoly (single trader), duopoly (two traders) or oligopoly (more than two traders) and the competitive basis of the market. The type of market may influence the pricing strategy for the product. Three market structure variables were analyzed. Number of buyers and sellers of sweetpotato seed ii. Level of product differentiation (i.e., branding, labelling etc.) and iii. Conditions of entry into the market.

The conduct indicates the behaviors of buyers and sellers and how do they interact with each other (i.e., investment in marketing the product, pricing strategy, collusions etc.). For example, highly concentrated sweetpotato seed market can create a cartel market and price rises during peak demand, same situation might arise for root market as well., The study analyzed the performance of the sweetpotato root and seed markets by analyzing net profit of seed and root producers, economic pre-post-harvest losses and seed security indicators i.e., availability, access to quality seed, affordability of quality seed.

Finally, the study mapped the linkages among nodes of existing sweetpotato seed distribution channels by looking at seed acquisition and provision for the last major transaction. the study validated these linkages through key informant interviews with key stakeholders such as Tanzania Agricultural Research Institute (TARI), NGOs and Tissue Culture Lab (private company).

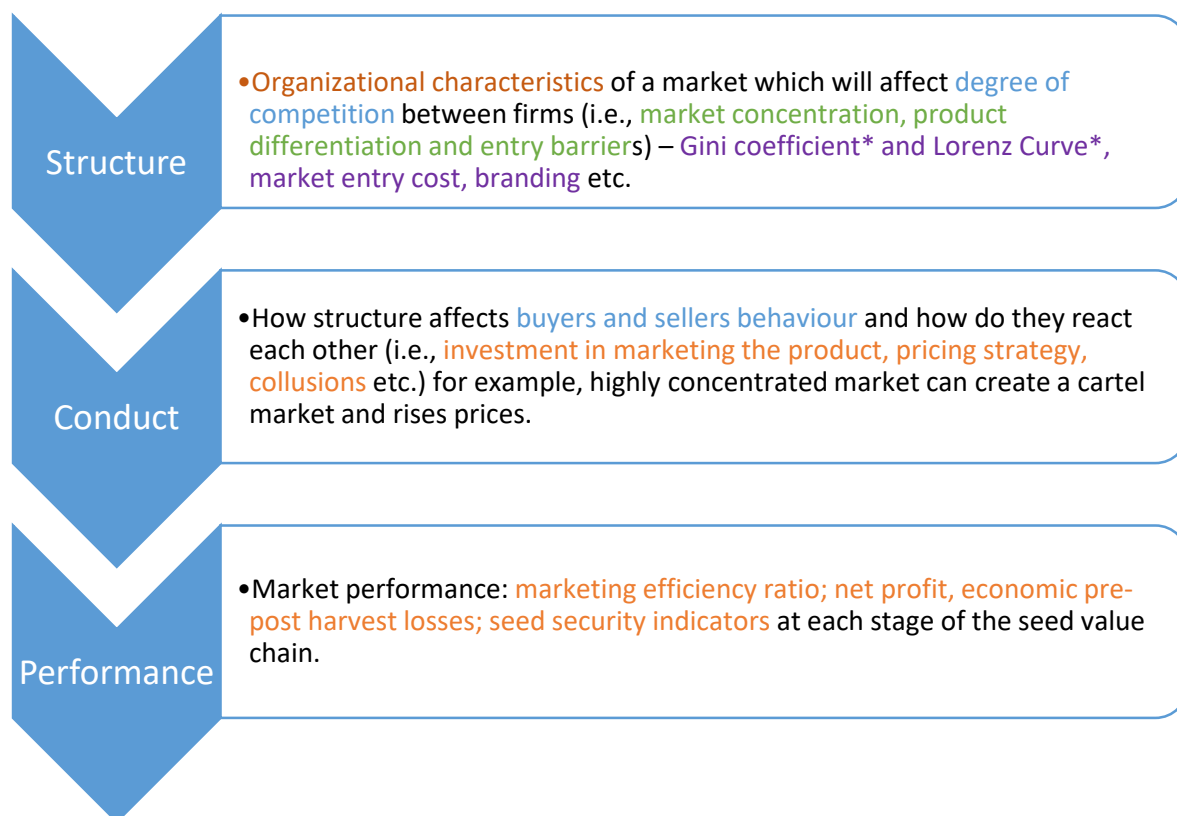


Figure 2. Structure, Conduct and Performance (SCP) framework

Chapter 3: Results

3.1 Results from the Sweetpotato-traders survey

The aim of the survey was to identify market preferred varieties and the root production areas for those varieties. The survey also captured the structure of the market, and conduct and performance of the sweetpotato traders.

3.1.1 Background of sweetpotato traders' socio-economic characteristics

Forty-five traders involved in sweetpotato root business participated in the key informant survey in Bukombe, Butiama, Ilemela, and Nyamagana districts in the target area. The survey targeted at least one market in each district.

The majority of the traders in Bukombe (87%), Butiama (100%), and Nyamagana (81%) were male. In Ilemela district, most traders were women where only 29% of the traders were male. The mean age of the traders varied across the districts. On average, the traders were 37-44 years in the four districts (Table 1). The average years for the education of the traders was 7.9 years in Bukombe and Nyamagana, 7.4 years in Butiama 6.6 years in Ilemela.

Table 1. Traders' characteristics

District	Trader characteristics	Mean	Median	Min	Max
Bukombe (n=15)	Sex (Male)	0.87	1.00	0.00	1.00
	Age	36.8	34.0	23.0	60.0
	Education Level	7.93	7.00	6.00	13.0
Butiama (n=11)	Sex (male)	1.00	1.00	1.00	1.00
	Age	42.82	40.0	34.0	60.0
	Education Level	7.36	7.00	7.00	11.0
IL Emera (n=7)	Sex (Male)	0.29	0.00	0.00	1.00
	Age	44.29	44.0	30.0	64.0
	Education Level	6.57	7.00	3.00	11.0
Nyamagana (n=16)	Sex (Male)	0.81	1.00	0.00	1.00
	Age	39.38	37.5	32.0	48.0
	Education Level	7.94	7.00	7.00	11.0

3.1.2 Access to mobile phone and membership to association

All traders interviewed indicated that they had a mobile phone, but as shown in Figure 3, the access to smart phones differed by district (Figure 3). Traders in Ilemela (50%) had highest proportion of traders with smart phones followed by traders in Nyamagana (38%), Bukombe (27%) and Butiama (18%). Membership to association also varied by district (Figure 4), where the percentage of traders belonging to an association was greater in Nyamagana (72%) than in Bukombe (39%), Butiama (56%) and Ilemela (29%).

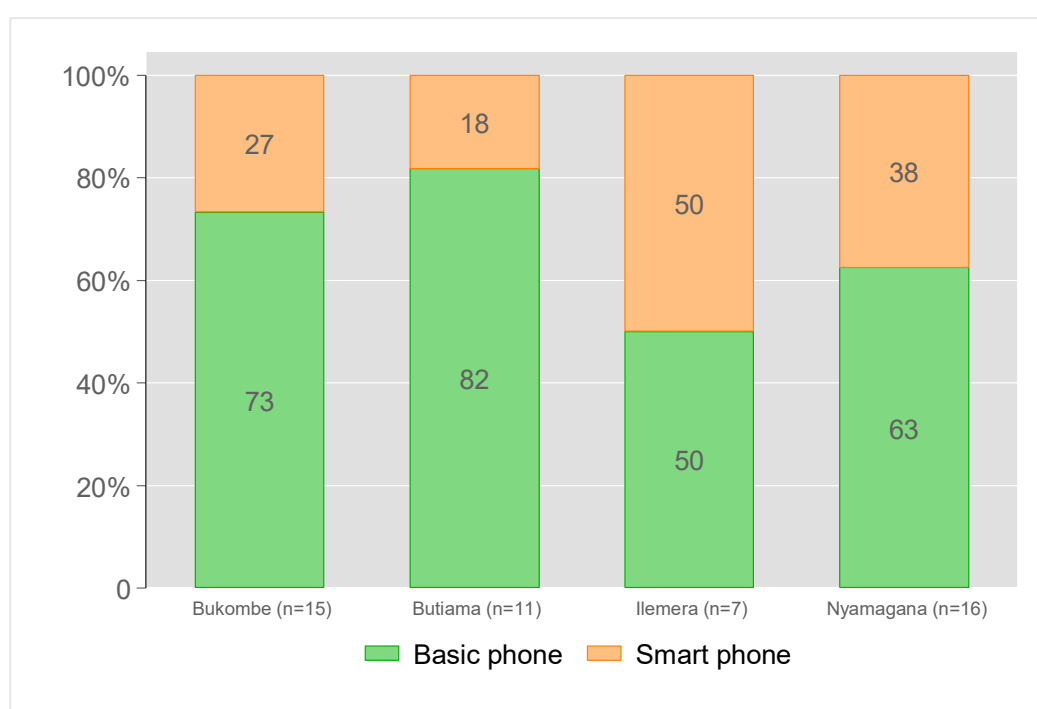


Figure 2. Type of mobile phones owned by traders



Figure 3. Sweetpotato traders' membership to an association (n=45)

Overall, most traders were members of the traders' associations, but this differed substantially by district. For instance, Table 2 show membership to cooperative society was only reported Bukombe and Butiama while membership to a digital platform was in Bukombe and Ilemera, but not in Butiama and Nyamagana. The traders indicated that they benefit from membership of these association. The benefits include access to credit, access to market information, facilitating joint marketing, and encouraged traders to save.

Table 2. Type of association by district, percentage of traders (%)

Type of association	Bukombe (n=5)	Butiama (n=5)	Ilemera (n=2)	Nyamagana (n=11)	Overall (n=23)
Traders' association	20	60	100	63.6	56.5
Cooperative society	20	20	0	0	8.7
Digital platform	20	0	50	0	8.7
Others	60	20	0	54.5	43.5

3.1.3 Structure for sweetpotato roots markets

As shown in Figure 5, the sweetpotato root markets in Butiama and Bukombe were largely rural, whereas markets in Ilemela and Nyamagana were all urban markets, but the rural markets were linked with the urban markets. Most of the traders in Bukombe (79%) and Butiama (78%) were in rural markets, compared to Ilemela and Nyamagana where all the traders were in urban markets. The type of traders in these markets were wholesalers and middlemen/aggregators. The aggregators/middlemen linked the farmers and the wholesale traders in the urban markets, by collecting the sweetpotato roots in the villages and selling to the wholesale traders in bulk. Figure 6 presents the proportion of wholesalers and middlemen. Traders in Nyamagana (87%) and Ilemela (57%) were mostly wholesalers, while more than half of traders in Bukombe (56%) and Butiama (57%) were middlemen. Figure 7 shows that all the markets traded in an all Agri-commodity across all the district except Bukombe district, where 62% of the respondents reported that the markets traded in specialized Agri-commodity (the market specialized in one agricultural commodity).

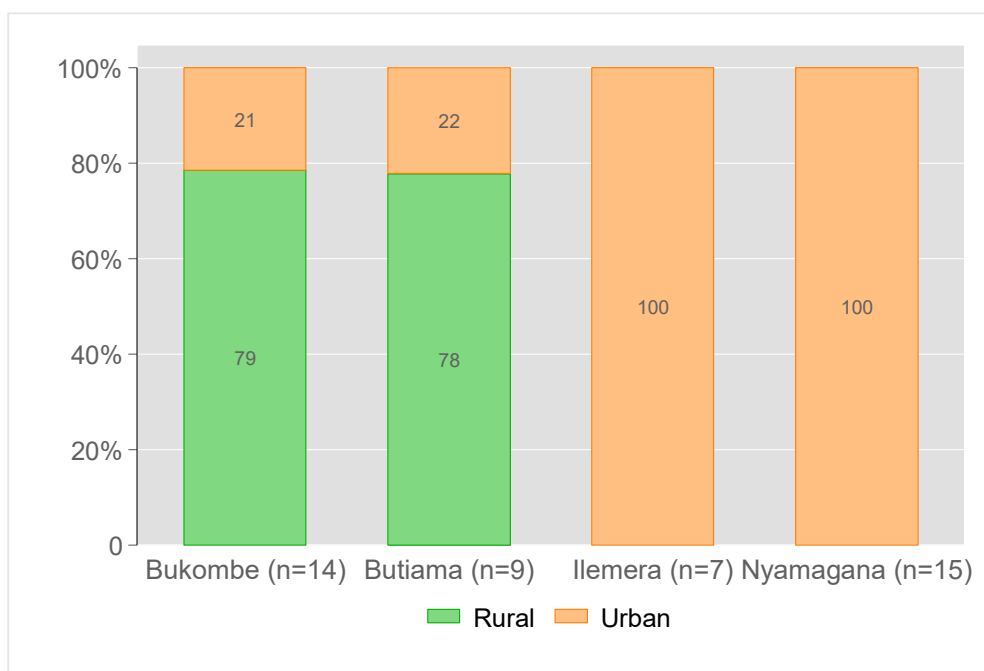


Figure 4. Type of markets by district (n=45)

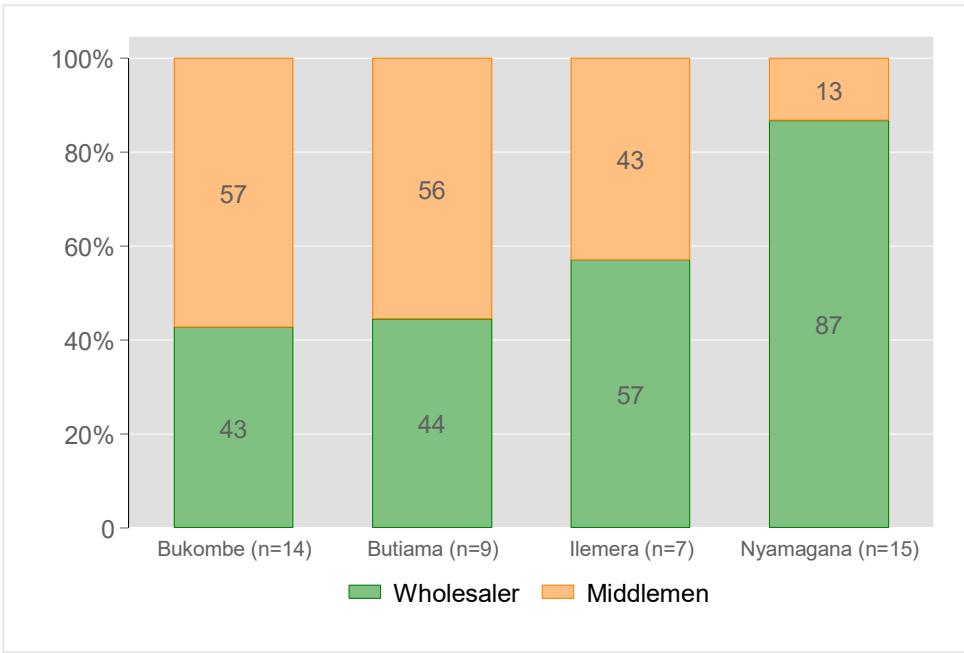


Figure 5. Type of traders by district (n=45)

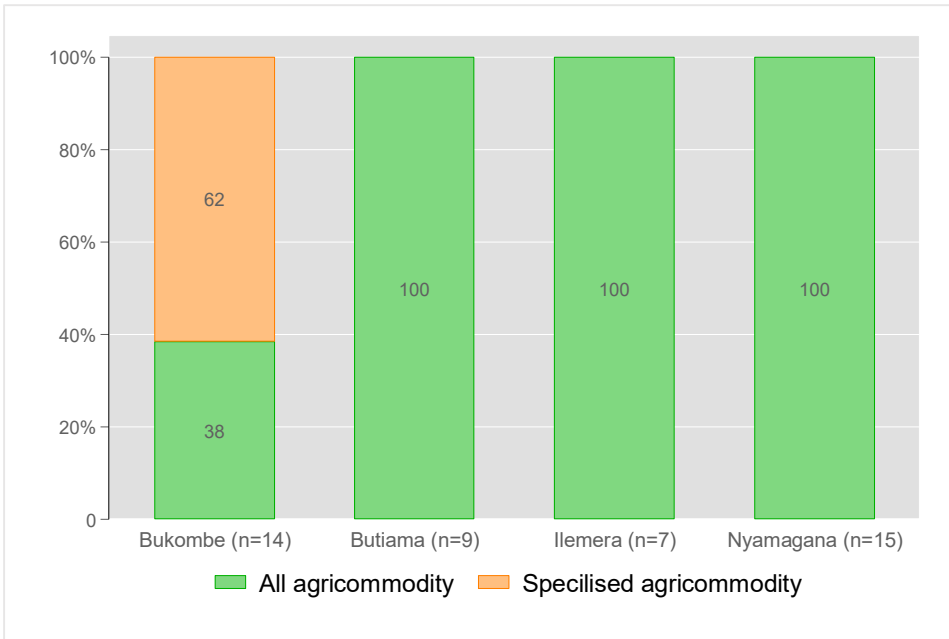


Figure 6. Type of agricultural commodity traded in the market by district(n=44)

All the markets in Ilemela and Nyamagana operated the whole day while 31% and 25% of respondents in Bukombe and Butiama, respectively, indicated that some markets were open for a few hours (Figure 8), probably because the majority of the markets in Bukombe and Butiama districts are rural markets.

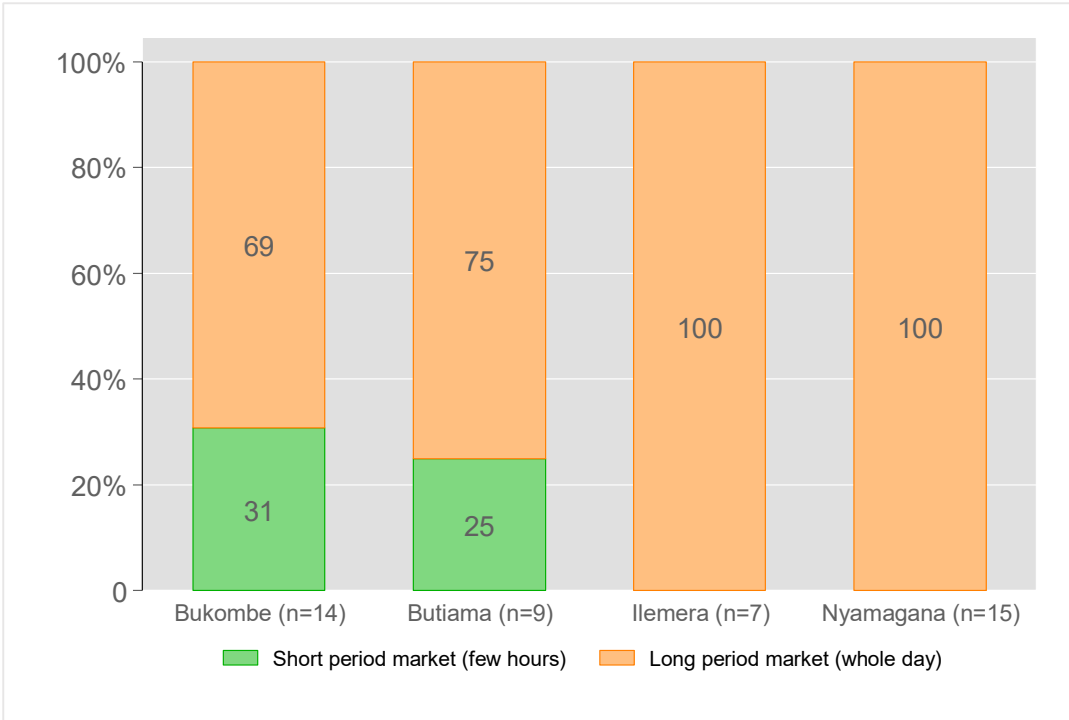


Figure 7. Market time by district

The major season are the months with a high supply of sweetpotato roots in the market, while the minor season are the months with a low supply of sweetpotato roots. The major season runs from February to June, while the minor season is from July to November, as shown in Figures 9 and 10.

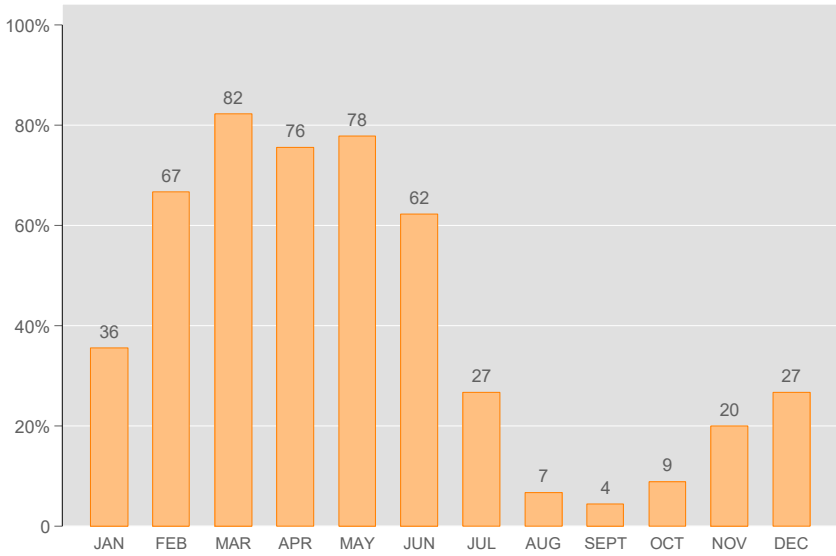


Figure 8. Major season months for sweetpotato

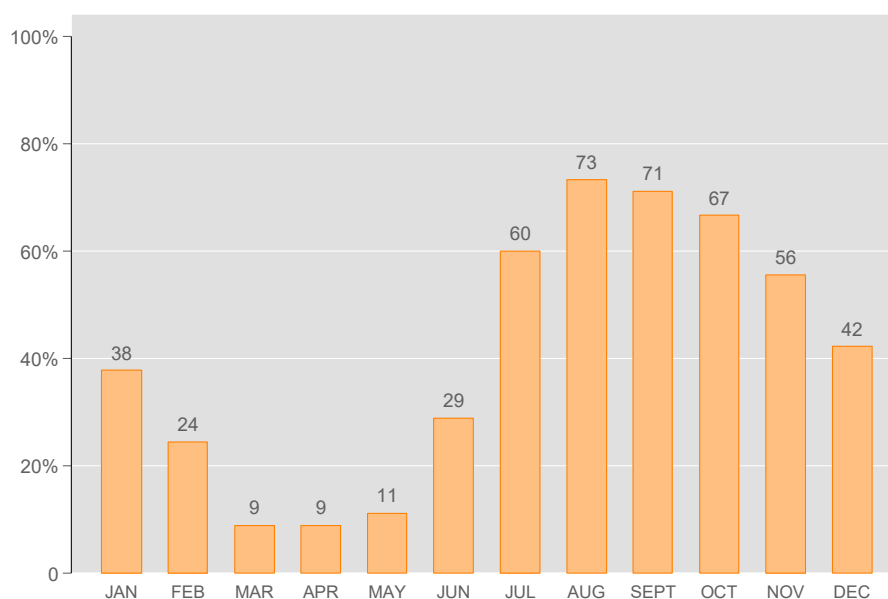


Figure 9. Minor seasons months for sweetpotato

3.1.4 Market preferred sweetpotato varieties

Overall, the most common variety traded was Polista but this differed by district. For instance, Ukimwi (93%) was the most common variety in Bukombe, followed by Polista (64.3%) and Mage (50%), while Ukerewe (56%) was the most common variety in Butiama (Table 3). All other varieties were absent in at least one district, except Polista. For example, Ukimwi and Ukerewe were only present in Bukombe and Butiama districts, respectively.

The average wholesale price⁹ ranged from TSH 223-360 (US\$ 0.1-0.16) per Kg in the major season and TSH 378-520 (US\$ 0.16-0.23) per kg in the minor season. The average price of sweetpotato roots is higher in minor season than in major season. The prices in major season are likely to be lower due to a higher volume of sweetpotato roots (supply) in the market.

Table 3. Most traded varieties, proportion of traders by district

Variety	Overall (n=45)	Bukombe (n=14)	Butiama (n=9)	Ilemela (n=7)	Nyamagana (n=15)
Polista	62.2	64.3	44.4	57.1	73.3
Mage	40.0	50.0	-	-	66.7
Ukimwi	28.9	92.9	-	-	-
Katebe	20.0	-	-	42.9	40.0
Bukoli	15.6	-	-	28.6	-
Ukerewe	13.3	-	55.6	-	-
Berita	8.89	-	44.4	-	-

⁹ US\$ 1 = 2,300 TZS

Table 4. Average wholesale price for sweetpotato roots by seasons in major markets

Season	Max price (TSH/Kg)		Min price (TSH/Kg)	
	Wholesale	Retail	Wholesale	Retail
Major season	360	-	223	-
Minor season	520	-	378	-

3.1.5 Varietal preferences

The traders (aggregators and wholesale traders) were asked to list varieties preferred by customers, where each respondent mentioned three varieties liked by their customers. For the wholesale traders, their customers were the retail traders, while the customers for the aggregators were consumers wholesale traders. Table 5 shows the result of the customer's variety preference. The three most preferred varieties were Polista, Mage, and Ukimwi. However, Mage and Ukimwi do not have significant differences. It is almost the same figures.

Table 5. Three most preferred varieties in the wholesale markets

	Frequency	Percentage of responses
Polista	25	26.04
Mage	14	14.58
Ukimwi	13	13.54
Katebe	11	11.46
Bukoli	7	7.29
Ukerewe	6	6.25
Pisi tatu	3	3.13
Unknown	3	3.13
Berita	2	2.08
Kilihona	2	2.08
Tiba	2	2.08
Busana gurwa	1	1.04
Caroti	1	1.04
Chupi ya mbuli	1	1.04
Lumala	1	1.04
Mtesayo	1	1.04
Njoo na tera	1	1.04
Nyehunge	1	1.04
Runzewe	1	1.04
Simama	1	1.04
Tegesha	1	1.04
Uso wa mchina	1	1.04

Table 6 presents three common characteristics/attributes of Polista, Ukimwi, and Mage, mentioned by respondents. Overall, high dry content, good taste, and the big root size were the most common attributes mentioned for Polista variety. Both men and women mentioned good taste and high dry matter content for Polista. In addition to high dry matter content, the color of the flesh, and high demand, long shelf-life (postharvest) was also an attribute mentioned for Ukimwi variety. Similarly, customers cited long storage life after harvest for Mage in addition to high market demand and good taste.

Table 6. The three most common attributes mentioned by traders

Three most preferred varieties	The common attributes mentioned by traders		
	Men	Women	Overall
Polista	<ul style="list-style-type: none"> i. Good taste ii. High dry matter content iii. High market demand iv. Big size of the root 	<ul style="list-style-type: none"> i. High dry matter content ii. Good taste iii. Good color of the flesh iv. Good shape 	<ul style="list-style-type: none"> i. High dry matter content ii. Good taste iii. Big size of the root
Ukimwi	<ul style="list-style-type: none"> i. High market demand ii. High dry matter content iii. Long storage shelf life iv. Good color of the flesh 	<ul style="list-style-type: none"> i. High dry matter content ii. Good color of the flesh iii. Long storage shelf life (postharvest) iv. Good taste 	<ul style="list-style-type: none"> i. High dry matter content ii. Good color of the flesh iii. High market demand
Mage	<ul style="list-style-type: none"> i. Long storage shelf life ii. Good taste iii. High market demand 	<ul style="list-style-type: none"> i. Good color of the flesh ii. Good taste iii. High market demand 	<ul style="list-style-type: none"> i. Long storage life ii. High market demand iii. Good color and of flesh/Good shape

Table 7. The three main things customers dislike about this variety

Three most preferred varieties	What are the three main things do you or some of your customers dislike about this variety?
Polista	<ul style="list-style-type: none"> i. Long duration of growth cycle/Late maturing ii. Short storage shelf life iii. Have disease and pests
Ukimwi	<ul style="list-style-type: none"> i. Have disease and pests ii. Limited availability(supply) of planting material iii. Bad shape; Small size of the root
Mage	<ul style="list-style-type: none"> i. Low dry matter content ii. Long duration of growth cycle/Late maturing iii. High water content iv. Not easy to peel

Table 8. What are the two main qualities/traits that are missing or improved further in this variety and you need?

Three most preferred varieties	The traits desired, but missing in the variety
Polista	<ul style="list-style-type: none"> i. Long storage shelf life ii. Short duration of growth cycle/early maturing
Ukimwi	<ul style="list-style-type: none"> i. Long storage shelf life ii. Availability (Supply and Disease free) of planting material iii. Good shape iv. Big size of the root v. High vine yielding vi. High root yield vii. Hard root
Mage	<ul style="list-style-type: none"> i. High dry matter content ii. Not fibrous iii. Short duration of growth cycle/early maturing iv. Long storage shelf life v. Flesh sweetness vi. Resistance to sweetpotato virus disease (SPVD) vii. Resistance to sweetpotato weevils (SPW) viii. Big size of the root ix. Smoothness of the root tuber skin/good texture x. Hardness after cooking xi. Better nutritional & health benefits e.g. Vitamin A

Table 9. Three most common reasons why you dislike the variety

Three least preferred varieties	Three most common reasons why you dislike the variety		
	Men	Women	Overall
Mwana nzoza	<ul style="list-style-type: none"> i. Short storage shelf life ii. Bad color of the flesh iii. Long duration of growth cycle/Late maturing iv. Softness after cooking v. Low demand/not marketable vi. Bad shape vii. Lack of flesh sweetness viii. Fibrous ix. High water content x. Low dry matter content 	<ul style="list-style-type: none"> i. Short storage shelf life ii. Bad color of the flesh iii. Softness after cooking iv. High water content v. Low demand/not marketable vi. Low dry matter content vii. Long duration of growth cycle/Late maturing viii. Bad/poor taste ix. Lack of flesh sweetness x. Lack of nutritional & health benefits e.g., Vitamin A xi. Fibrous 	<ul style="list-style-type: none"> i. Short storage shelf life ii. Bad color of the flesh iii. Low demand/ not marketable iv. Have disease and pests v. Softness after cooking vi. Fibrous vii. Low dry matter content viii. Long duration of growth cycle/Late maturing ix. Not stress resistance (drought, poor soils) x. Bad shape xi. Bad/poor taste xii. Lack of flesh sweetness
Sirare	<ul style="list-style-type: none"> i. Low dry matter content ii. High water content iii. Not stress resistance (drought, poor soils) iv. Fibrous v. Low demand/not marketable 	<ul style="list-style-type: none"> i. Low dry matter content High water content ii. Not stress resistance (drought, poor soils) Bad/poor taste iii. Fibrous 	<ul style="list-style-type: none"> i. Low dry matter content ii. High water content iii. Softness after cooking iv. Fibrous v. Long duration of growth cycle/Late maturing vi. Not resistance to SPW vii. Not stress resistance (drought, poor soils) viii. Bad shape ix. Low demand/ not marketable
Nyangubo	<ul style="list-style-type: none"> i. Short storage shelf life ii. Low demand/not marketable iii. Bad color of the flesh iv. Lack of nutritional & health benefits e.g Vitamin A 	<ul style="list-style-type: none"> i. Short storage shelf life ii. Low demand/not marketable iii. Bad color of the flesh Lack of nutritional & health 	<ul style="list-style-type: none"> i. Short storage shelf life ii. Low demand/ not marketable iii. Low vine yielding iv. Low root yield v. Bad color of the flesh vi. Lack of nutritional & health benefits e.g., Vitamin A vii. Fibrous

Table 10. Three least preferred varieties and its preferred traits?

Three least preferred varieties	The traits you like of this variety
Mwana nzoza	<ul style="list-style-type: none"> i. Good taste ii. Flesh sweetness iii. Long storage shelf life iv. High root yield v. Big size of the root vi. Not fibrous vii. High dry matter content viii. Short duration of growth cycle/early maturing ix. Disease free x. High vine yielding xi. Easy to peel xii. Low water content xiii. Availability (Supply) of planting materials
Sirare	<ul style="list-style-type: none"> i. Long storage shelf life ii. Good color of the flesh iii. Good shape iv. Short duration of growth cycle/early maturing v. Stress resistance (drought, poor soils) vi. Big size of the root vii. Flesh sweetness viii. Low water content ix. High demand/marketable x. High dry matter content
Nyangubo	<ul style="list-style-type: none"> i. Good taste ii. High dry matter content iii. Big size of the root iv. Flesh sweetness v. Low water content vi. Not fibrous vii. Short duration of growth cycle/early maturing viii. High vine yielding ix. High root yield x. Good shape xi. Good smell xii. Easy to peel xiii. Availability (Supply) of planting material

3.1.6 Binding agreements during sweetpotato trading

Most of the traders have no binding agreements when selling or buying sweetpotato in the market. Only 22% and 20% of traders have a binding agreement when buying and selling, respectively (Figure 11). The buyers and sellers frequently use the oral contracts to engage in the market, with the price either set by the traders or through negotiations.

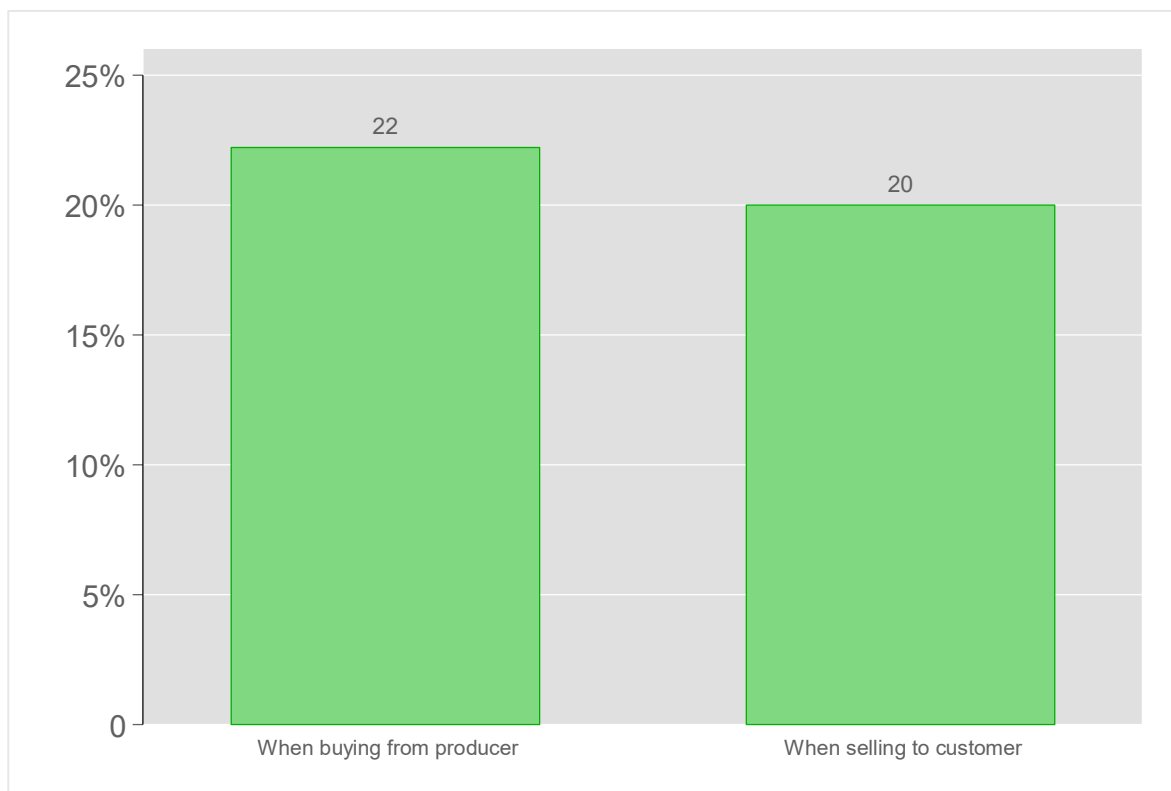


Figure 10. Proportion of traders with binding agreement when selling/buying sweetpotato

3.2 Results from root and seed producer

3.2.1 Background of the sweetpotato root and seed producers

Structured interviews with root and seed producers were carried out in Bukombe and Butiama district in Tanzania as most preferred varieties are coming from these two districts. The proportion of sweetpotato producers who participate in both seed and root production is higher in Bukombe (72%) than in Butiama district (42%), indicating that a higher percentage of households participate in seed production in Bukombe district relative to Butiama district (Figure 12). The overwhelming majority of the seed producers in the survey were not trained seed multipliers (Figure 12).¹⁰

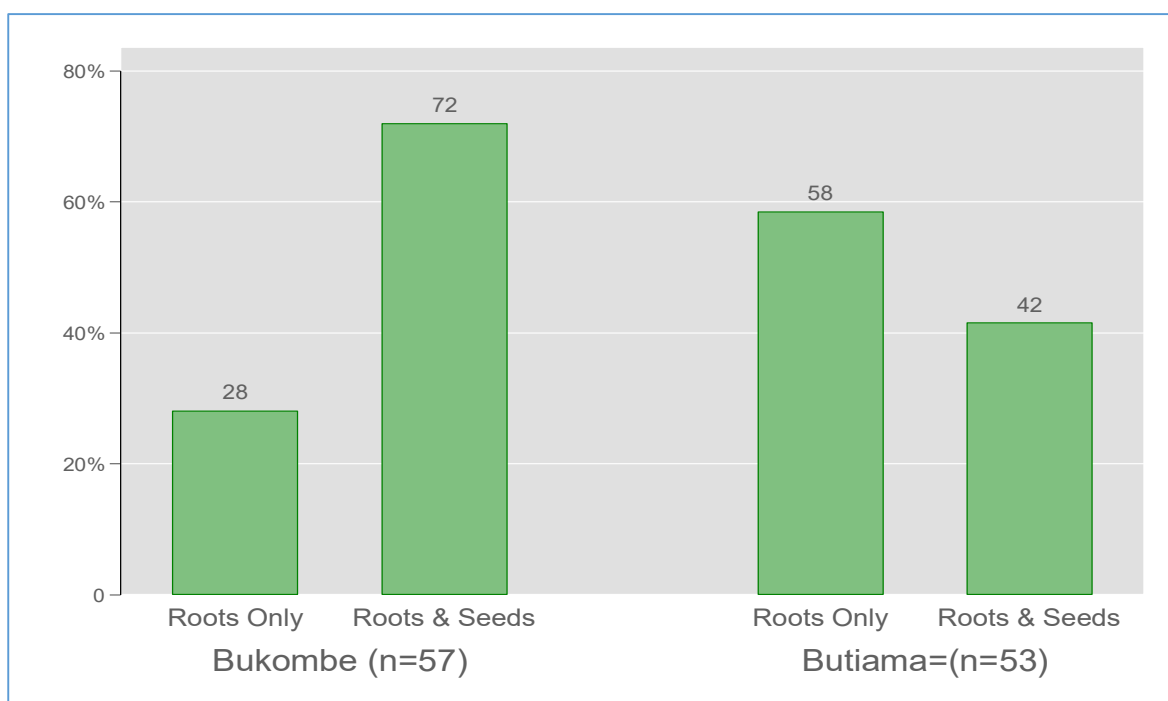


Figure 11. Type of sweetpotato producers in potential target areas, Tanzania (n=110)

Table 11. Type of sweetpotato producers, frequency count (n=110)

Type of sweetpotato producers	Bukombe (n=57)	Butiama (n=53)
Root producers	16	31
Roots and seed producers	41	22
Total	57	53

¹⁰ Trained seed multipliers received training on good agricultural practices

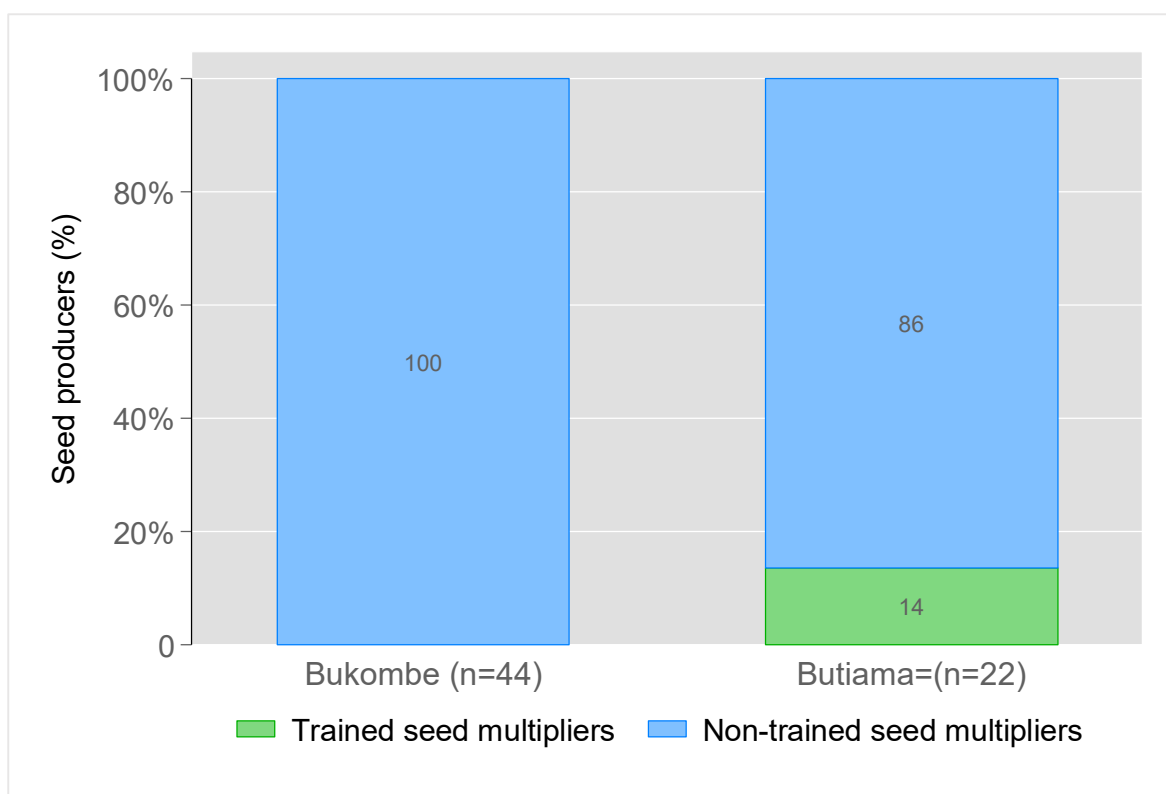


Figure 12. Type of sweetpotato seed producers in Tanzania (n=66)

3.2.2 Household characteristics of the participants in the survey

Table 12 presents the characteristics of the households that participated in the survey. The mean household size was 9.2 and 9.7 in Butiama and Bukombe, respectively, implying that the households are relatively large. The number of members who ate and lived in the last six months is slightly lower than the household size for both Bukombe and Butiama. Generally, the average household size in Bukombe is slightly higher than in Butiama, including children under five years, pregnant women, and breastfeeding mothers. The median years of formal schooling and farming experience in Bukombe are comparable to Butiama. The results also show that 70% of the households are headed by men in both districts.

Table 12. Household characteristics

Characteristics	Bukombe (n=57)				Butiama (n=53)			
	Mean	Median	Min	Max	Mean	Median	Min	Max
Total household size	9.7	9.0	2.0	18.0	9.2	8	4	18
Members (eat and live together in the last 6 months)	8.3	8.0	2.0	17.0	7.7	8	3	17
No. of members < 5 years	1.7	1.0	0.0	10.0	1.3	1	0	4
No. of members pregnant	0.2	0.0	0.0	3.0	0.1	0	0	1
No. of members breastfeeding	0.5	0.0	0.0	2.0	0.3	0	0	2
Household head (1=Male)	0.7	1	0	1	0.7	1	0	1
Education (years)	5.4	7	0	11	6.7	7	0	9
Farming experience (years)	22	25	2	48	24.0	23	3	45

3.2.3 Occupation of the household head

Nearly all (95.37%) of household heads practice farming as a primary occupation, where 28.7% of households have no secondary occupation (Table 13). Animal husbandry (34.3%) was the most dominant secondary occupation, followed by trading (19.4%) and private jobs (2.8%).

Table 13. Primary and Secondary occupation(n=108)

Occupation	Primary Occupation (%)	Secondary Occupation (%)
Farming	95.37	4.63
Animal husbandry	0.95	34.26
Trade/business	1.85	19.44
Private job	1.85	2.78
Other	-	1.85
None	-	28.7

3.2.4 Key farming activities

Figure 14 shows the ratio of male to female household members participating in key farming activities. Men played a dominant role in land preparation, harvesting, marketing, and transportation, while women were more involved in planting than men. The results show male and female members equally involved in fertilizer application, manure application, pesticide application, and weeding.

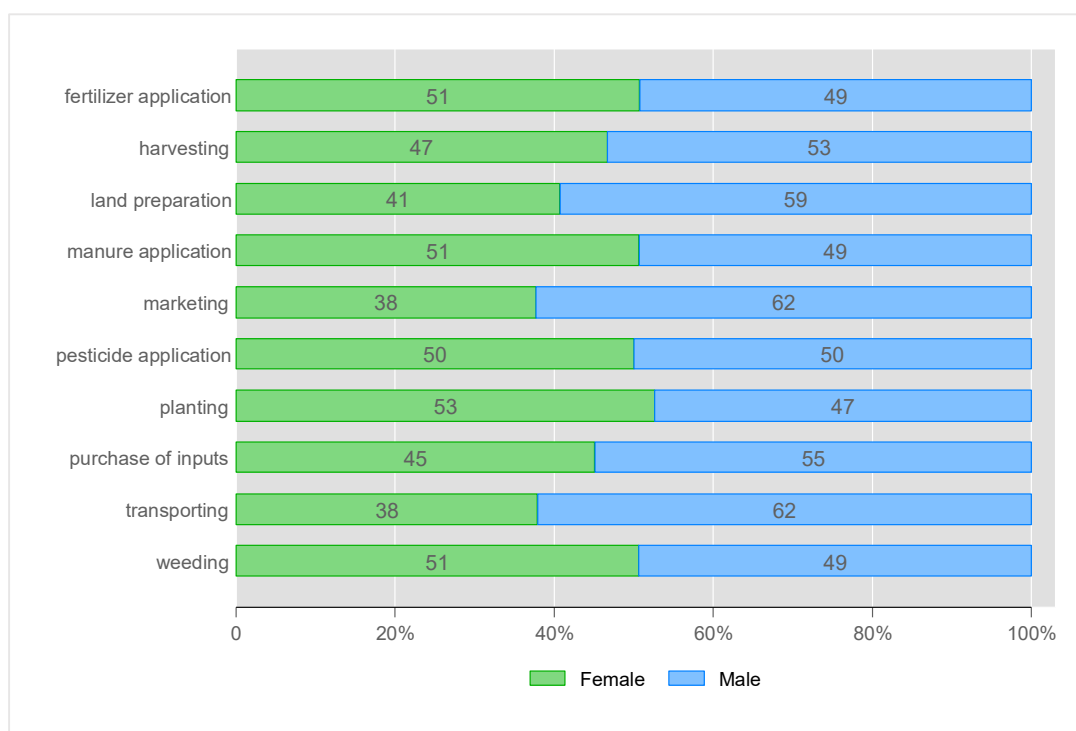


Figure 13. Proportion of household members undertaking key farming activities by gender

3.2.5 Background of sweetpotato seed production

Those who produce sweetpotato seed, most households used for own use, but the proportion is higher in Butiama. The result further shows that 30% of respondents in Bukombe produced seed for sale, indicating the existence of seed market than in Butiama, where no respondent produced seed for sale only. However, 11% and 23% of respondents in Bukombe and Butiama, respectively, produced seed for both sale and own use.

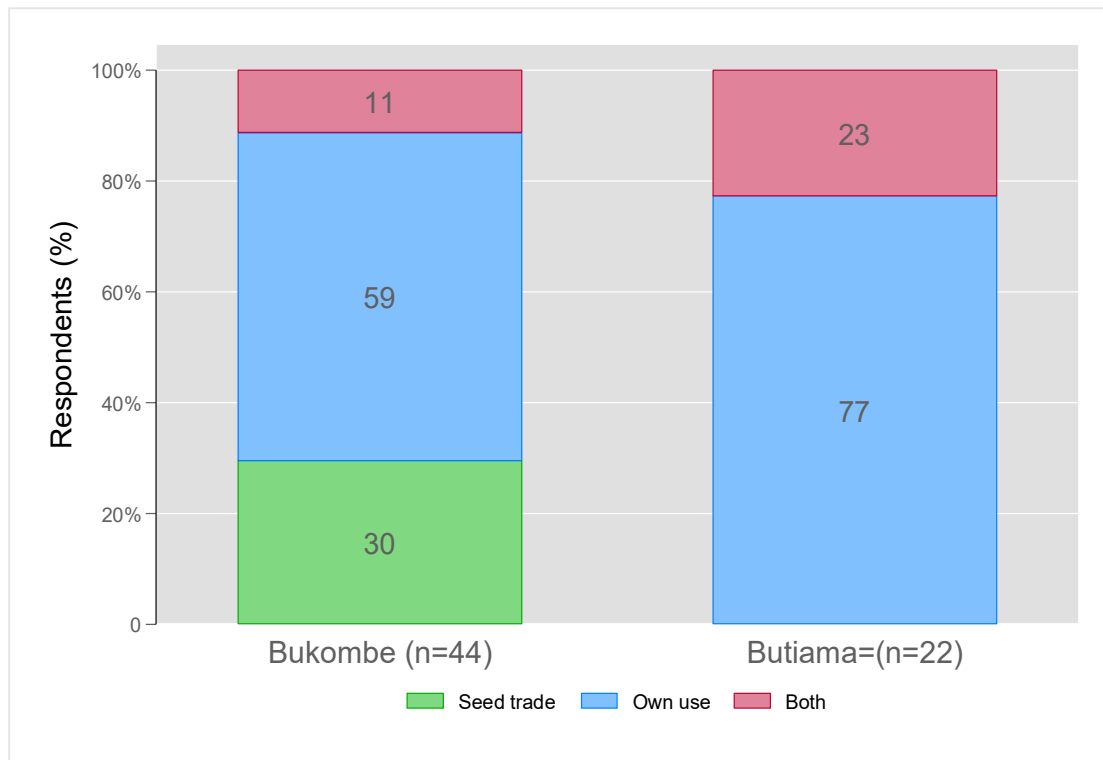


Figure 14. Use of sweetpotato seeds (n=66)

Membership to association/digital platform was low, given that less than 30% of respondents who produce seed were members of association/digital platform (Figure 16). However, the membership is slightly higher in Butiama (27%) than in Bukombe (20%).

Respondents were asked if they were using any technology such as using net tunnel, drip irrigation, rapid seed multiplication etc., to improve seed production. Figure 17 suggests greater use of technology in seed production in Bukombe (55%) than in Butiama (27%), which could be attributed to a better seed market in Bukombe.

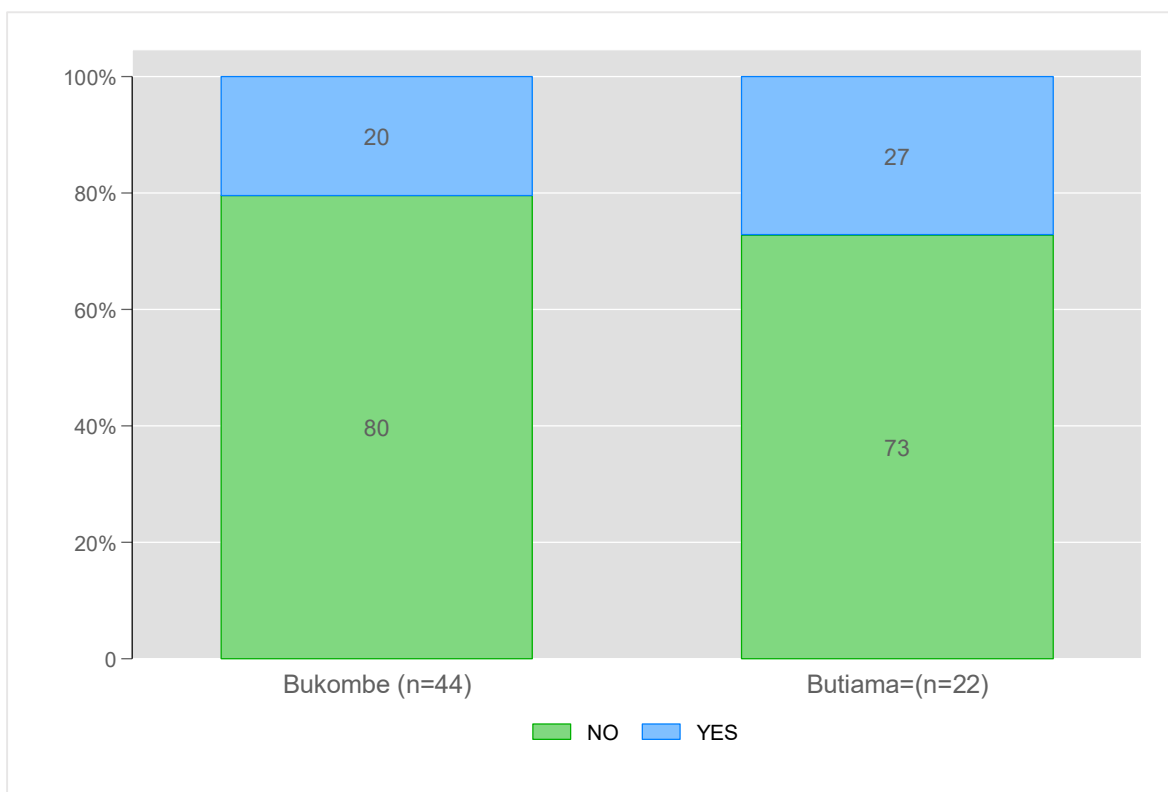


Figure 15. Membership of association /digital platform, seed producers (n=66)

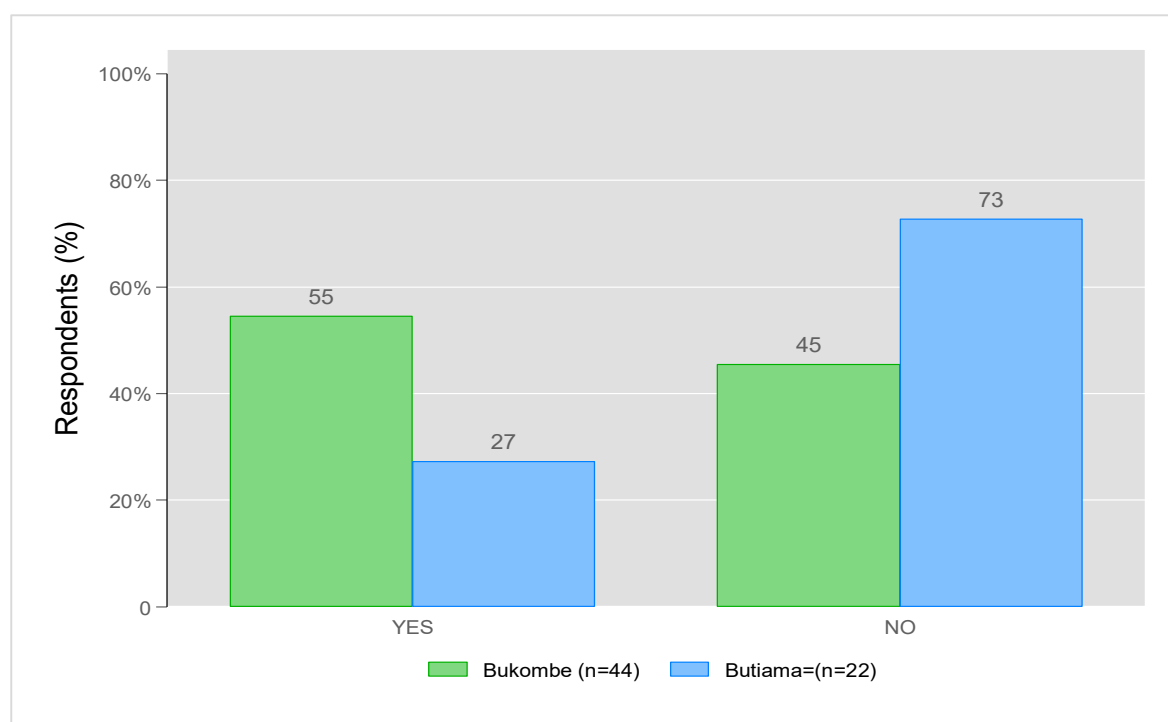


Figure 16. Are you using any technology to improve sweetpotato seed production (n=66)?

3.2.6 Pricing strategy for sweetpotato roots

Table 14 shows the different pricing strategies used when selling sweetpotato roots. The majority of respondents maintained the same price even after observing the competitor's price in both Bukombe and Butiama districts. Strategies like lowering price, discounts, and negotiations differed by the district. Lowering price and discounts were common strategies in Bukombe than in Butiama, while negotiation strategy was used in Butiama but not Bukombe.

Table 14. Pricing strategy when selling sweetpotato roots, after observing competitors' price

	Bukombe (n=40)			Butiama (n=21)	
	Freq	Percent		Freq	Percent
Lower the price	6	15.00		1	4.76
Maintain the same price	29	72.50		16	76.19
Provide discount	5	12.50		-	-
Negotiations	-	-		4	19.05

3.2.7 Sweetpotato seed suppliers, seed buyers and root buyers

Table 15 provides a summary of seed suppliers, seed buyers, and root buyers who are personally known to and have regular contact with the respondents. The mean number of suppliers was about 6 and 9 for Bukombe and Butiama, respectively. This shows that the respondents in Butiama interact with more seed suppliers than their counterparts in Bukombe. In contrast, respondents in Bukombe (10) had more contact with seed buyers than respondents in Butiama (6). The mean number of root buyers in regular contact with the respondents was 4 and 9 in Bukombe and Butiama, respectively.

Table 15. Number of sweetpotato seed suppliers, seed and root buyers you personally know

Variable	Bukombe						Butiama				
	N	Mean	Median	Min	Max		N	Mean	Median	Min	Max
Seed suppliers	31	5.97	4	1	30		16	9.44	6	1	50
Seed buyers	22	9.6	4.5	1	30		10	5.5	2	1	25
Root buyers	20	4.35	3	1	20		14	8.71	4.5	1	50

Respondents were asked where they acquire sweetpotato seeds for planting. Farmers played a dominant role in seed supply in Bukombe (64%) compared to Butiama (32%), while most producers conserved their own seed (55%) in Butiama. Other existing seed suppliers in Butiama include NGOs and NARI (Figure 18).

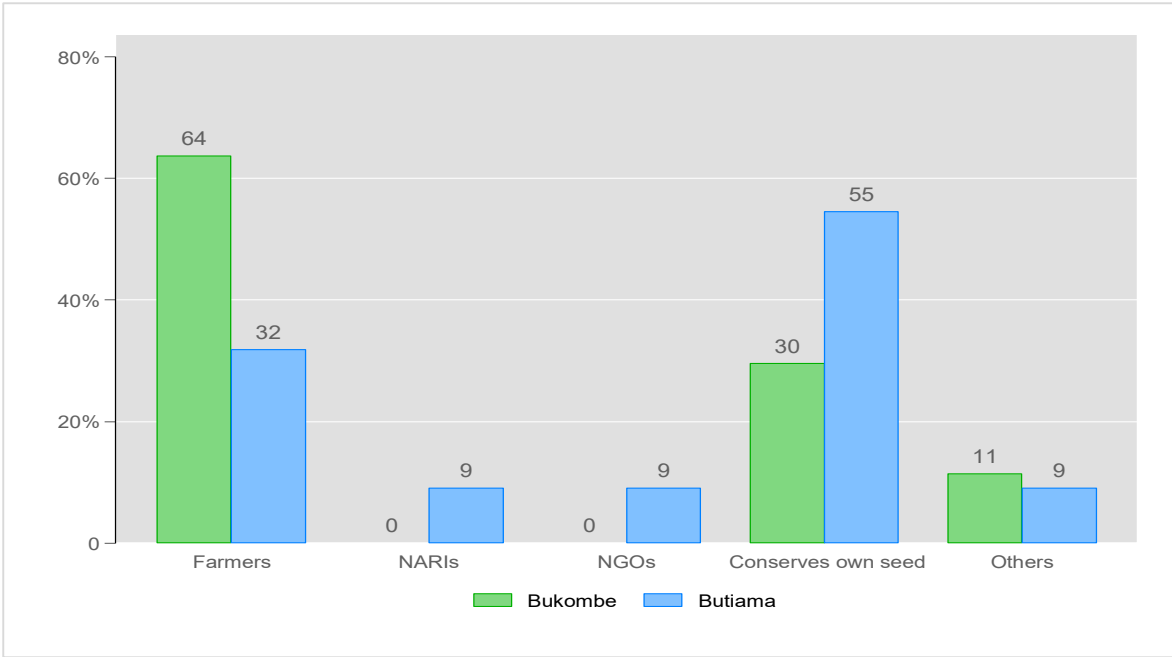


Figure 17. Types of sweetpotato seed suppliers (n=66)

Figure 19 show that farmers were the most dominant customers/buyers for the respondents, where 75% and 64% of farmers in Bukombe and Butiama, respectively. About 5% of the respondents sell to NGOs in Butiama, while 14% and 27% of respondents in Bukombe and Butiama, respectively, did not sell/share seed.

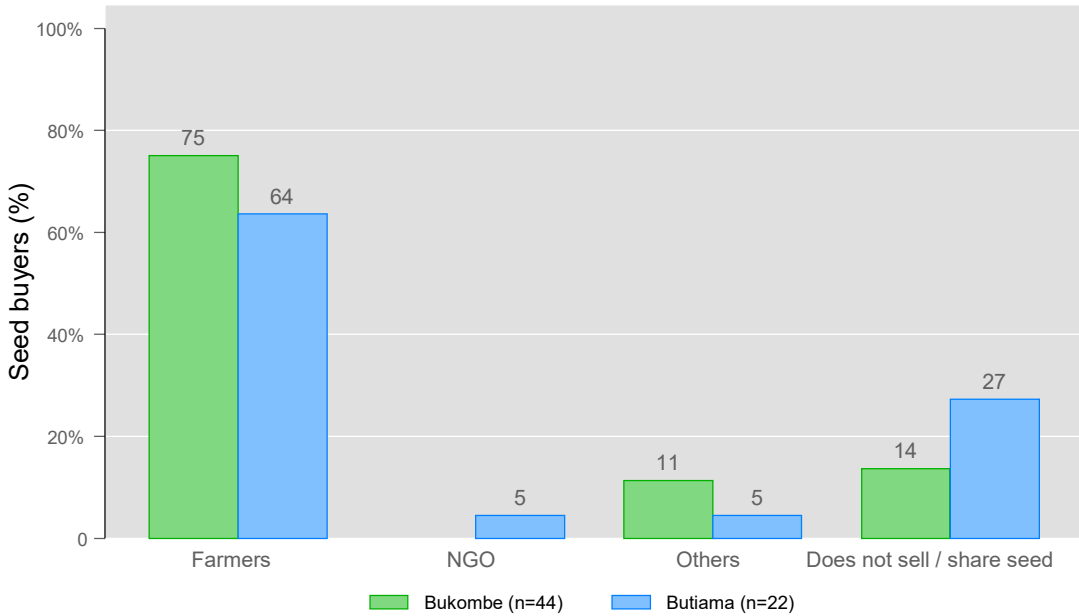


Figure 18. Types of sweetpotato seed buyers (n=66)

The seed/root producers in Bukombe and Butiama districts had regular contact with an average of eight and seven farmers, respectively (Table 16). Only one seed producer in Butiama indicated that he had contacts with an NGO. Therefore, the main customers for sweetpotato seeds were farmers.

Table 16 Number of seed buyers you know under each type

	Bukombe					Butiama				
	Obs	Mean	Median	Min	Max	Obs	Mean	Median	Min	Max
Farmers	27	8.6	6	1	30	12	7.4	4.5	2	20
NGOs	0	0	0	0	0	1	1	1	1	1

3.2.8 Type of sweetpotato root buyers

The wholesale traders were the main buyers of sweetpotato roots, followed by commission agents/aggregators and retailers (Figure 20). Table 17 shows the average number of root buyers who had contact with root producers in the last one year. The root producers had contacts with more retailers than wholesale traders and commission agents in Butiama, whereas in Bukombe, root producers have more contact with commission agents.

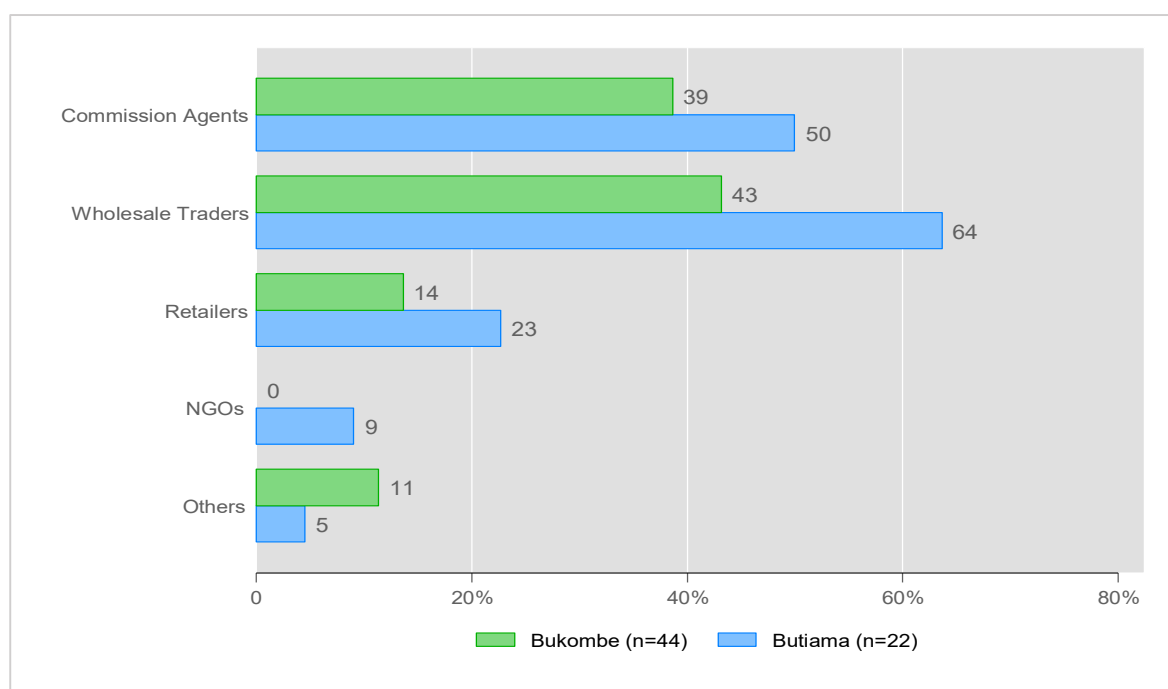


Figure 19. Types of sweetpotato root buyers (n=66)

Table 17. Number of sweetpotato root buyers that are known and have regular contact with the root producers in the last one year

Buyers	Bukombe					Butiama				
	N	Mean	Median	Min	Max	N	Mean	Median	Min	Max
Commission Agent	14	29.43	5.5	1	150	9	4.22	3	1	20
Wholesale Trader	18	5.78	3	1	50	14	4.43	3	1	20
Retailers	6	11.83	11	4	20	5	17.6	10	3	50
NGOs	0	2	1	1	1	1

3.2.9 Land Ownership and land tenure

The average land owned (for farm and non-farm activities) in Bukombe was 5.67 ha, ranging from 0-80, while the average land size in Butiama was 4.45, ranging from 0.8-19.4 ha. As illustrated by Table 18, respondents in Bukombe owned bigger land sizes than respondents in Butiama. The average arable land was 4.67 and 3.6 ha in Bukombe and Butiama respectively, implying that farmers in Bukombe have relatively larger sizes of land allocated for farming. However, there are some outliers in the dataset few farmers have exceptionally large land size as compared to large number of farmers that are holding smaller and medium size of the land. Therefore, looking at median value might be more appropriate for the land ownership and arable land holding size. The results further show that farmers both lease-out and lease-in their land for farming.

Table 18. Average land owned by district in the last one year

Land variables (ha)	Bukombe (n=57)					Butiama (n=53)				
	N	Mean	Median	Min	Max	N	Mean	Median	Min	Max
Total land owned	57	5.67	4.05	0.0	32.4	53	4.45	3.24	0.8	19.4
Total arable land	57	4.66	3.64	0.0	24.3	53	3.74	2.83	0.8	17.0
Total land leased-out	57	0.38	0.00	0.0	8.1	53	0.36	0.00	0.0	8.1
Total land leased-in	24	2.62	1.21	0.5	17.4	26	1.48	0.81	0.4	6.1

3.2.10 Sweetpotato root production

There were no variations in the land tenure for sweetpotato root production between Bukombe and Butiama, where about 69% of sweetpotato plots are owned, and about 31% are rented-in (Figure 21). The main source of water for the root production is rain. Irrigation is rarely practiced, and only 2%-4% of the sweetpotato root plots in Bukombe and Butiama, respectively, were irrigated in the last year (Figure 22). The median size of sweetpotato plots is 0.8 ha in both districts (Table 19).

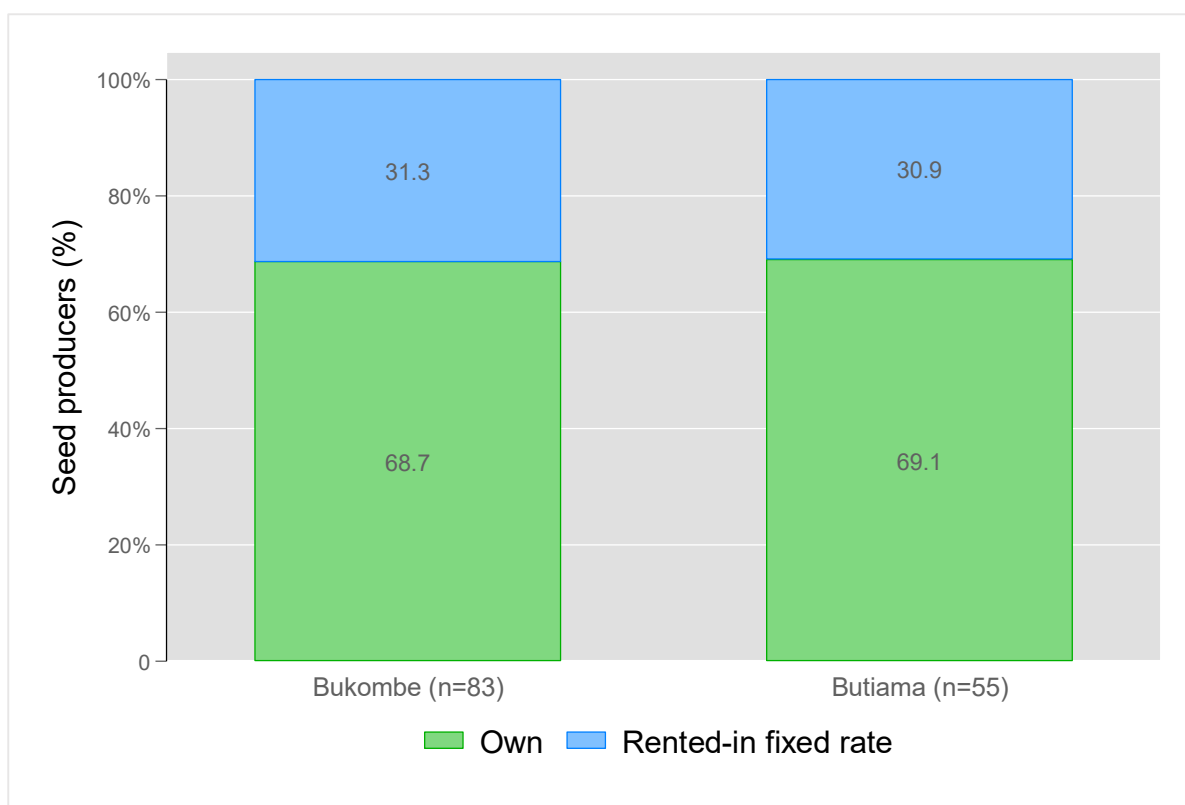


Figure 20. Land tenure status of the sweetpotato roots plots (n=138)

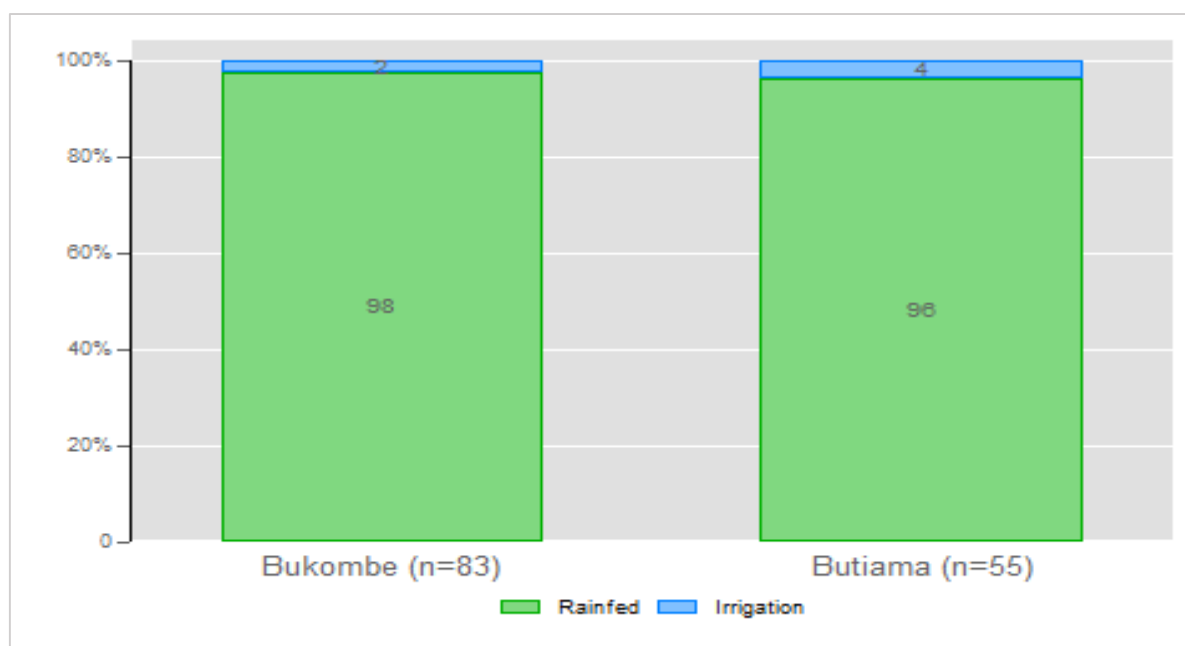


Figure 21. Irrigation status of the plots (n=138)

Table 19. Area under root production in hectares (n=138 plots)

District	Mean	Median	Min	Max
Bukombe (n=83)	1.40	0.8	0.20	13.3
Butiama (n=55)	1.08	0.8	0.10	4.4

3.2.11 Sweetpotato root varieties produced

The most common sweetpotato root varieties produced include Polista, Ukimwi, Uso wa mchina, Pisi Tatu, Ukerewe, and Mage. Polista (62%) was the most produced variety in Butiama, followed by Ukerewe (26%), whereas Ukimwi (48%) was the most common variety produced in Bukombe (Table 20). Other varieties include Mwezi Gumo, Songoma, Kula na Maji, Uchungu wa Nyau, Toniki, Mweneyokaya, and Paracetamol.

Table 20. Sweetpotato root varieties produced, % percentage of plots (n=138)

Variety produced	Bukombe (n=83)	Butiama (n=55)	Overall (n=138)
Polista	23	62	38
Ukimwi	48	0	29
Uso wa Mchina	19	0	12
Pisi tatu	18	0	11
Ukerewe	0	26	10
Mage	12	6	10
Nyangubo	0	9	4
Mwana nzoza	6	0	4
Kasinia	0	8	3
Sugute	5	0	3
Berita	0	6	2
Simama	0	6	2
Kabode	0	6	2
Kiroba	2	0	1
Kisasa	2	0	1
Lyaga na lukulu	2	0	1
Magimbi	0	2	1
Kalamu	1	0	1
Katebe	0	2	1
Mazao	0	2	1
Mataya	0	2	1
Jewel	0	2	1
Mwezi gumo	1	0	1
Songoma	1	0	1
Kula na maji	1	0	1
Uchungu wa nyau	1	0	1
Toniki	1	0	1
Mweneyokaya	1	0	1
Paracetamo	1	0	1

3.2.12 Quantity of sweetpotato roots produced per acre

Figure 23 presents the sweetpotato yield based on farmers' response on the basis of recall method. The result shows the differences in yield in the two study locations. The average yield of sweetpotato roots in Bukombe was 2,461 kg/acre and was substantially higher than in Butiama, which produced 2,060 kg/acre.

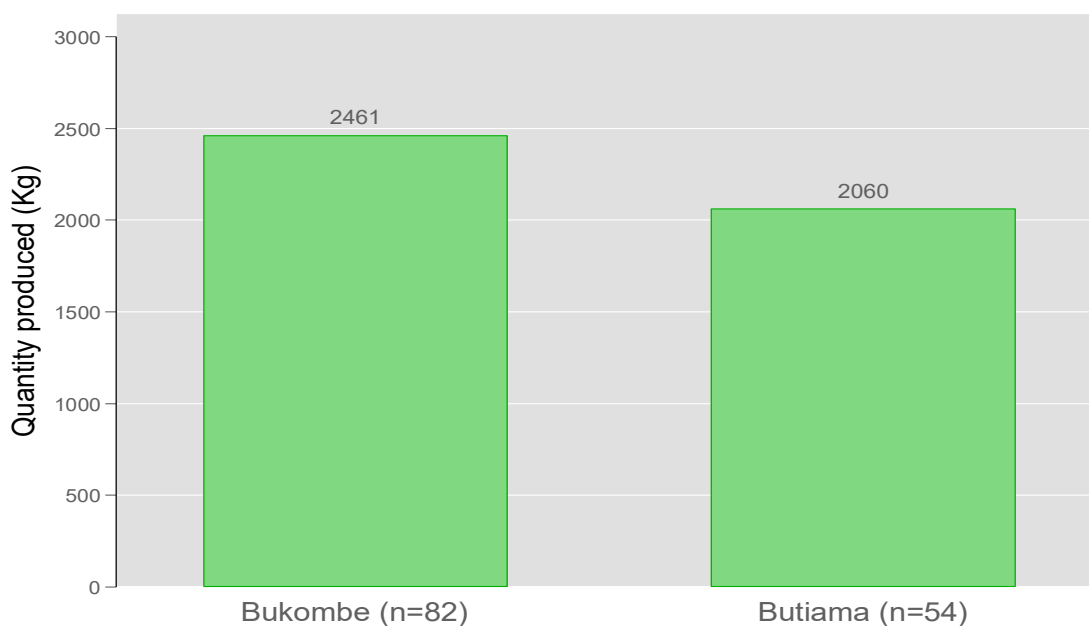


Figure 22. Average quantity(kg) of sweetpotato produced per acre of a plot (n=136)

3.2.13 Seed production of varieties

Table 21 shows the various varieties for which seed is produced at the plot level in Bukombe and Butiama districts. Overall, Polista, Ukimwi, Mage, and Ukerewe were the most common varieties for which seed was produced. Ukimwi (46.2%), Polista (23.1%), Mage (20.5%) were the three most common seed varieties in Bukombe, whereas Polista (59.1%) and Ukerewe (36.4%) were the most common varieties in Butiama. The results reveal differences in variety preference or availability in the two districts. For instance, Ukimwi and Mage were common varieties in Bukombe but not available in Butiama. Similarly, Ukerewe was the second most common variety in Butiama after Polista but was not available in Bukombe. So, those varieties are dominant for the seed production, it indicates that there is a market for those varieties particularly in Bokombe i.e., Ukimwi and Polista.

Table 21. Sweetpotato seed production for sweetpotato root production (n=61)

Variety name		Number of plots (%)		
Common name	Other names used by farmers	Bukombe (n=39)	Butiama (n=22)	Overall (n=61)
Polista	Polista/Tunja murume/Buhama/Butiama	23.1	59.1	36.1
Ukimwi	Ukimwi/Rangi Mbili	46.2	0.0	29.5
Mage	Mage/Sirare/Sirari/Tarime/Manjano	20.5	0.0	13.1
Ukerewe	Ukerewe/Rwamkoma/Balozi	0.0	36.4	13.1
Unkwown	Unkwown	15.4	0.0	9.8
Uso wa mchina	Uso wa mchina	12.8	0.0	8.2
Mwana nzoza	Mwana nzoza	12.8	0.0	8.2
Pisi tatu	Pisi tatu/ Ukimwi feki	10.3	0.0	6.6
Mugumu	Mugumu	0.0	18.2	6.6
Nyangubo	Nyangubo	0.0	18.2	6.6
Lyaga na lukulu	Lyaga na lukulu	7.7	0.0	4.9
Umeme	Umeme/Bhumeme	7.7	0.0	4.9
Mwezi gumo	Mwezi gumo	7.7	0.0	4.9
Sugute	Sugute	5.1	0.0	3.3
Kasinia	Kasinia/Mukombozi	0.0	9.1	3.3
Kiroba	Kiroba	5.1	0.0	3.3
Kisasa	Kisasa	5.1	0.0	3.3
Toniki	Toniki	2.6	0.0	1.6
Mweneyo kaya	Mweneyo kaya	2.6	0.0	1.6
Paracetamol	Paracetamol	2.6	0.0	1.6
Kabode	Kabode	0.0	4.6	1.6
Utitiri	Utitiri	2.6	0.0	1.6
Bakhresa	Bakhresa	2.6	0.0	1.6
Uchungu_wa nyau	Uchungu_wa nyau	2.6	0.0	1.6
Mhwaya	Mhwaya	2.6	0.0	1.6
Usungu wa mbwa	Usungu wa mbwa	2.6	0.0	1.6
Budagala	Budagala	2.6	0.0	1.6
Mwagira	Mwagira	0.0	4.6	1.6
Simama	Simama	0.0	4.6	1.6
Lumala	Lumala	0.0	4.6	1.6
Gairo	Gairo	2.6	0.0	1.6

3.2.14 Sweetpotato seed production

The average land allocated exclusively for sweetpotato seed production is relatively small. Table 22 shows the average plot size for seed production is about 0.6 and 0.8 ha in Bukombe and Butiama, indicating producers in Butiama allocated slightly more land to seed production than Bukombe. However, Figure 24 shows that seed productivity is higher in Bukombe where an average of 5,695kg/acre was produced compared to 3,140 kg/acre in Butiama.

Table 22. Area under sweetpotato seed production in acres (n=61 plots)

District	Mean	Median	Min	Max
Bukombe (n=39)	0.60	0.25	0.01	5.00
Butiama (n=22)	0.84	0.50	0.07	3.00

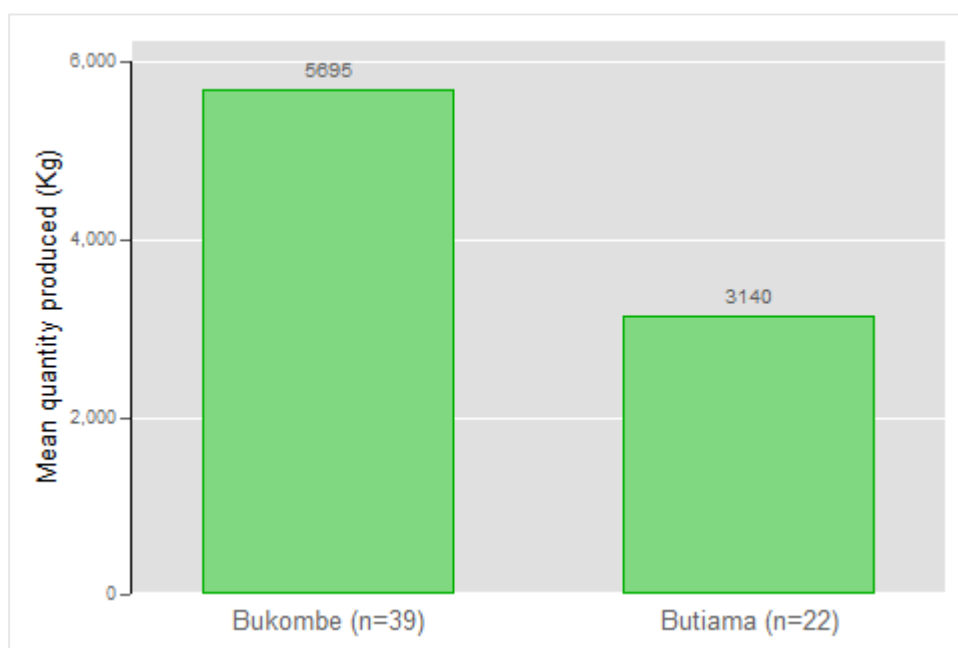


Figure 23. Average quantity of seed produced in Kg/acre (n=61 plots)

3.2.15 Varietal Preference

Table 23 presents the three most preferred sweetpotato varieties in Bukombe and Butiama. Overall, Polista, Ukimwi and Mage are the three most preferred varieties. Ukimwi (27.1%) was the most preferred in Bukombe followed by Polista (16.7%) and Uso wa mchina (11.46%), whereas Polista (39.29%) was most preferred in Butiama, followed closely by Ukerewe and Nyangubo 14.29% each. We notice that Polista is highly preferred in the wholesale and retail markets in both districts.

Table 23. The three most preferred varieties

Three most preferred varieties	Bukombe (n=96)	Butiama (n=84)	Overall (n=180)
Polista	16.67	39.29	27.22
Ukimwi	27.08	0	14.44
Mage	10.42	4.76	7.78
Ukerewe	0	14.29	6.67
Nyangubo	0	14.29	6.67
Uso wa mchina	11.46	0	6.11
Mwana nzoza	6.25	0	3.33
Kasinia	1.04	5.95	3.33
Pisi tatu	5.21	0	2.78
Lyaga na lukulu	4.17	0	2.22
Berita	0	4.76	2.22
Mugumu	0	4.76	2.22
Kabode	0	3.57	1.67
Simama	0	3.57	1.67
Gairo	2.08	0	1.11
Mwezi Gumo	2.08	0	1.11
Katebe	1.04	1.19	1.11
Sugute	2.08	0	1.11
Uchungu wa nyau	2.08	0	1.11
Unknown	2.08	0	1.11
Kisasa	2.08	0	1.11
Toniki	1.04	0	0.56
Mweneyokaya	1.04	0	0.56
Paracetamol	1.04	0	0.56
Usungu wa mbwa	1.04	0	0.56
Kalamu	1.04	0	0.56
Bakhresa	1.04	0	0.56
Umeme	1.04	0	0.56
Utitiri	1.04	0	0.56
Mhwaya	1.04	0	0.56
Jewel	0	1.19	0.56
Mataya	0	1.19	0.56
Mwagira	0	1.19	0.56
Lumala	0	1.19	0.56
Magimbi	0	1.19	0.56
Matunja	0	1.19	0.56

Table 23 shows the three most preferred traits for Polista, Ukimwi, and Mage varieties. Sweetpotato producers preferred the Polista variety because of its high dry matter content, relatively good taste, and high market demand. Men also valued long shelf life (postharvest) as a good attribute of the Polista variety. However, there were traits that farmers disliked. The Polista variety matures late, has low yield, and is not resistant to SPW.

Ukimwi was preferred because it matures early, has high market demand, high dry matter, high yield, and has high dry matter content (Table 24). Women also ranked good taste and flesh sweetness as important traits. The producers also stated the three traits that farmers disliked about the Ukimwi variety. The variety is less resistant to SPVD and stress such as drought, had a short shelf life, and the access to planting material was limited (Table 25).

The Mage variety has high market demand, has a good color of the flesh, matures early, and has high root yield (Table 24). However, the variety is late maturing, has low dry matter content, has a shorter shelf life, and is less resistant to stress such as drought and poor soils (Table 25).

Table 24. Three main things you and customer like about this variety

Three most common variety	The main traits producers like about this varieties		
	Men	Women	Overall
Polista	<ul style="list-style-type: none"> i. High dry matter content ii. High market demand iii. Long shelf life 	<ul style="list-style-type: none"> i. High dry matter content ii. Good taste iii. Flesh sweetness iv. High market demand 	<ul style="list-style-type: none"> i. High dry matter content ii. Good taste iii. High market demand
Ukimwi	<ul style="list-style-type: none"> i. High demand/marketable ii. High dry matter content iii. Early maturing 	<ul style="list-style-type: none"> i. Flesh sweetness ii. High dry matter content iii. Good taste 	<ul style="list-style-type: none"> i. Early maturing ii. High market demand iii. High root yield iv. High dry matter content
Mage	<ul style="list-style-type: none"> i. High demand/marketable ii. Good color of the flesh iii. Early maturing 	<ul style="list-style-type: none"> i. High market demand ii. Good color of the flesh iii. Good taste 	<ul style="list-style-type: none"> i. High market demand ii. Good color of the flesh iii. Early maturing iv. High root yield

Table25: Three main things you and customer dislike about this variety

Three most common variety	Three most common
Polista	<ul style="list-style-type: none"> i. Late maturing ii. Not resistant to SPW iii. Low root yield
Ukimwi	<ul style="list-style-type: none"> i. Short storage shelf life ii. Not stress resistance (drought, poor soils) iii. Not resistance to SPVD iv. Limited availability(supply) of planting material
Mage	<ul style="list-style-type: none"> i. Late maturing ii. Low dry matter content iii. Short shelf life iv. Not stress resistance (drought, poor soils)

3.2.16 Sweetpotato root provision

Figure 25 show that majority of the sweetpotato producers sell sweetpotato roots. The result shows that 88% and 92% of sweetpotato producers in Bukombe and Butiama, respectively, sell/share sweetpotato roots. The average number of transactions for sweetpotato provision in the last one year is slightly higher in Bukombe (2.58) than in Butiama (2.2) as illustrated in Table 27.

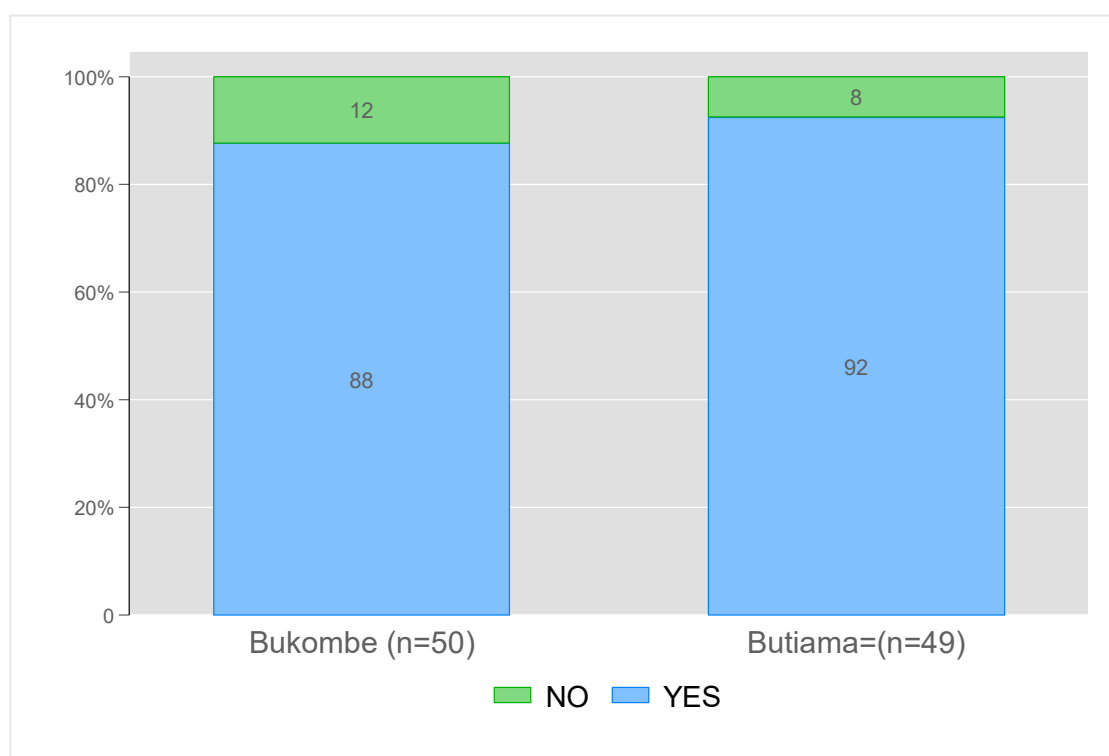


Figure 24. Did you share/sell sweetpotato roots in the last one year (n=110)

Table 26. Did you share/sell sweetpotato roots in the last one year, frequency count (n=110)

Did you share/sell sweetpotato roots in the last one year	Bukombe (n=57)	Butiama (n=53)
Yes	50	49
No	7	4
Total	57	53

Table 27: Number of transaction (sell/share roots) in the last one year (n=99)

District	Mean	Median	Min	Max
Bukombe (n=50)	2.58	2	1	15
Butiama(n=40)	2.2	1	1	18

Figure 26 present the type of customers for sweetpotato root provisioning. The majority of sweetpotato root producers sell to wholesale traders. The proportion of roots producers selling to Wholesale traders is higher in Butiama (67%) than Bukombe (58%), while producers in Bukombe (32%) sell more to commission agents than in Butiama (22%). Some producers sold to retailers in Bukombe (10%) and Butiama (8%). The results further show some farmers sell to NGOs in Butiama.

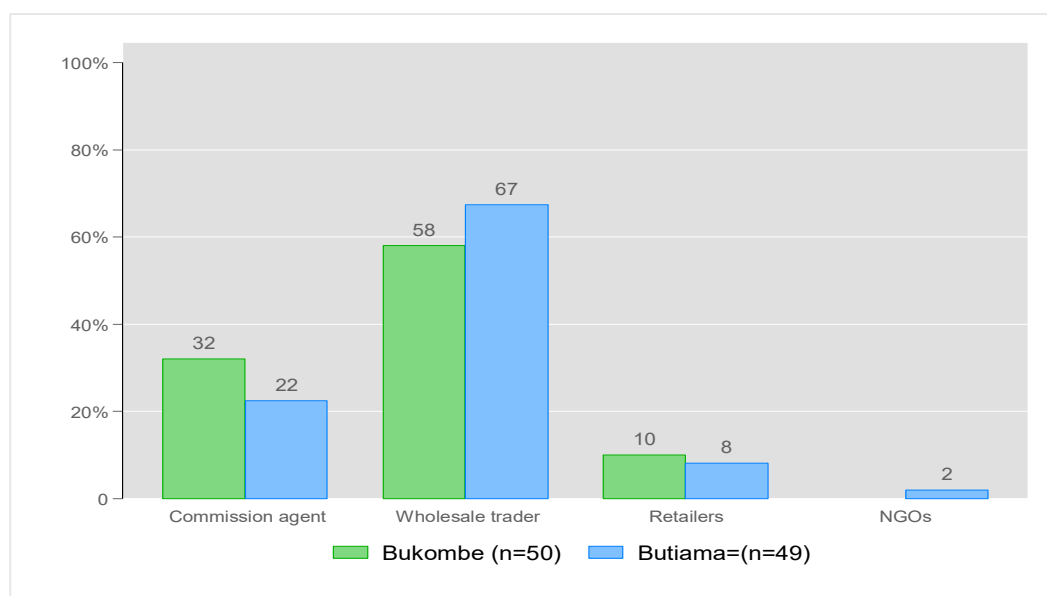


Figure 25. Type of customers for sweetpotato root provision (n=99)

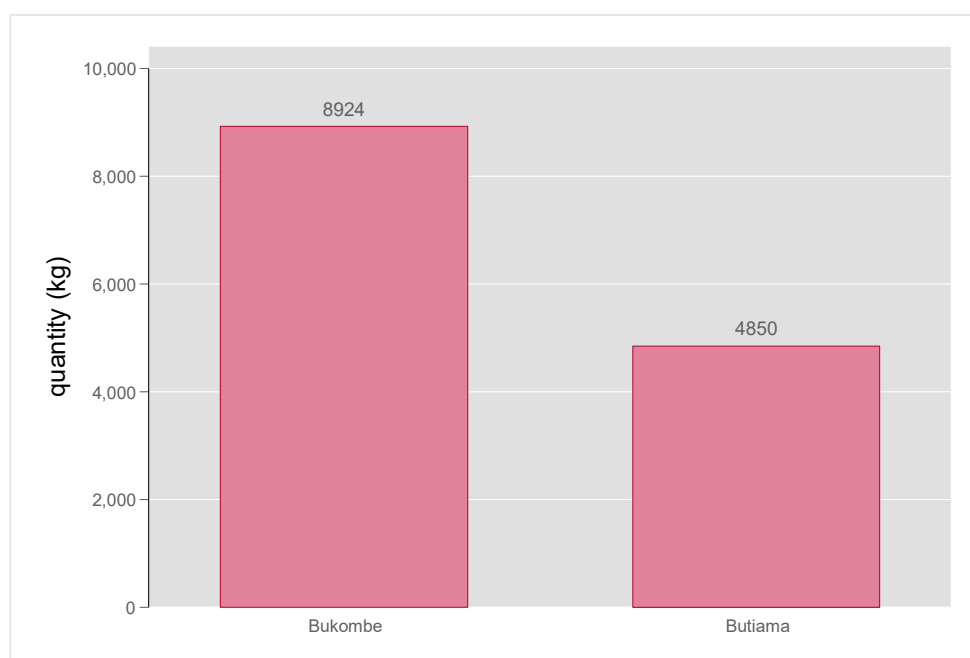
3.2.17 Regions where the customer received sweetpotato roots

The study also captured the regions where sweetpotato roots were marketed. The main market for sweetpotato roots from Bukombe district is Dar es Salaam whereas Butiama sells mostly to Mwanza and Mara regions (Table 28).

Table 28. Regions receiving sweetpotato roots from Bukombe and Butiama districts

Region	Bukombe (n=50)		Butiama (n=49)	
	Frequency	Percent	Frequency	Percent
Mwanza	5	10	28	57
Arusha	1	2	-	-
Dar es Salaam	36	72	-	-
Dodoma	2	4	-	-
Shinyanga	4	8	-	-
Singida	1	2	-	-
Tanga	1	2	-	-
Mara	-	-	20	41
Simiyu	1	2	1	2
Total	50	100	49	100

The respondents interviewed in Bukombe district sold an about 8924 kg of sweetpotato roots in the last one year while those in Butiama sold about 4850 kg (Figure 27). The main transaction periods were February – May in Bukombe (with a peak in February) and November – March (the following year) in Butiama with peaks in February and December (Figure 28).

**Figure 26.** Average sweetpotato root sold in the last one year by district-wise (n=90)

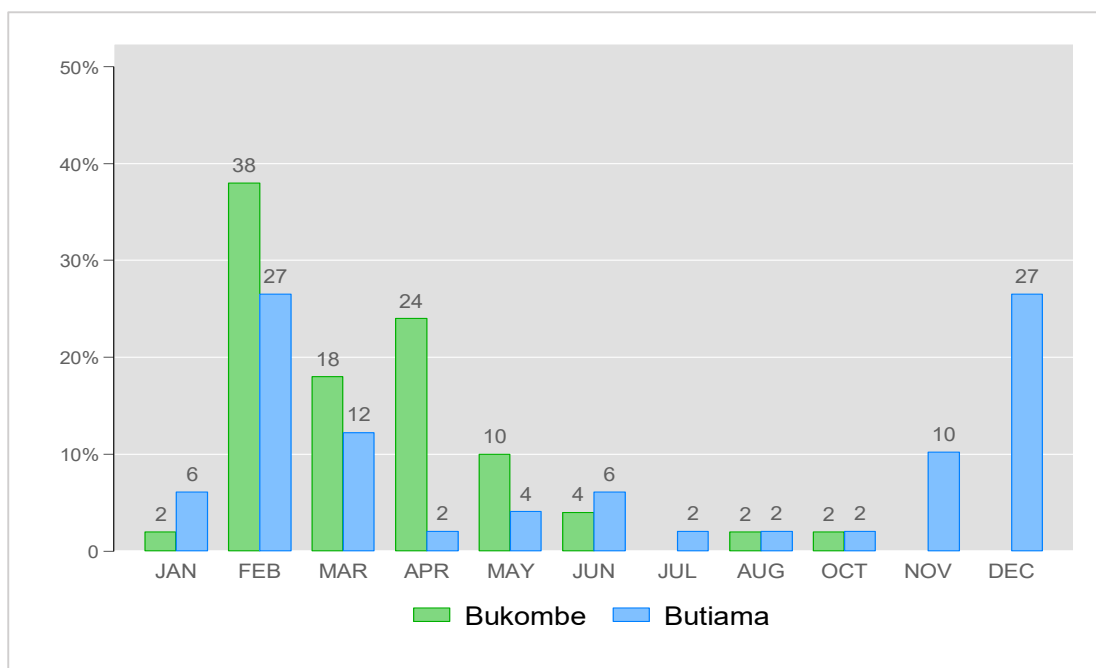


Figure 27. Months of transaction (sweetpotato root sale) in the last one year

3.2.18 Sweetpotato seed provision

Figure 29 presents seed provision in two districts i.e., Bukombe and Butiama. The proportion of respondents who share/sell seed varies substantially in Bukombe and Butiama. Seed provision is more established in Bukombe than Butiama in terms of trading of sweetpotato seed. Only 26% of respondents shared or sold seed in Butiama, while more than of the respondents had shared or sold seed in Bukombe.

The average number of seed sales transactions in the last year was 2.2 and 4.9 in Bukombe and Butiama, respectively (Table 29). Respondents in Butiama appear to make more transactions for seed provisioning.

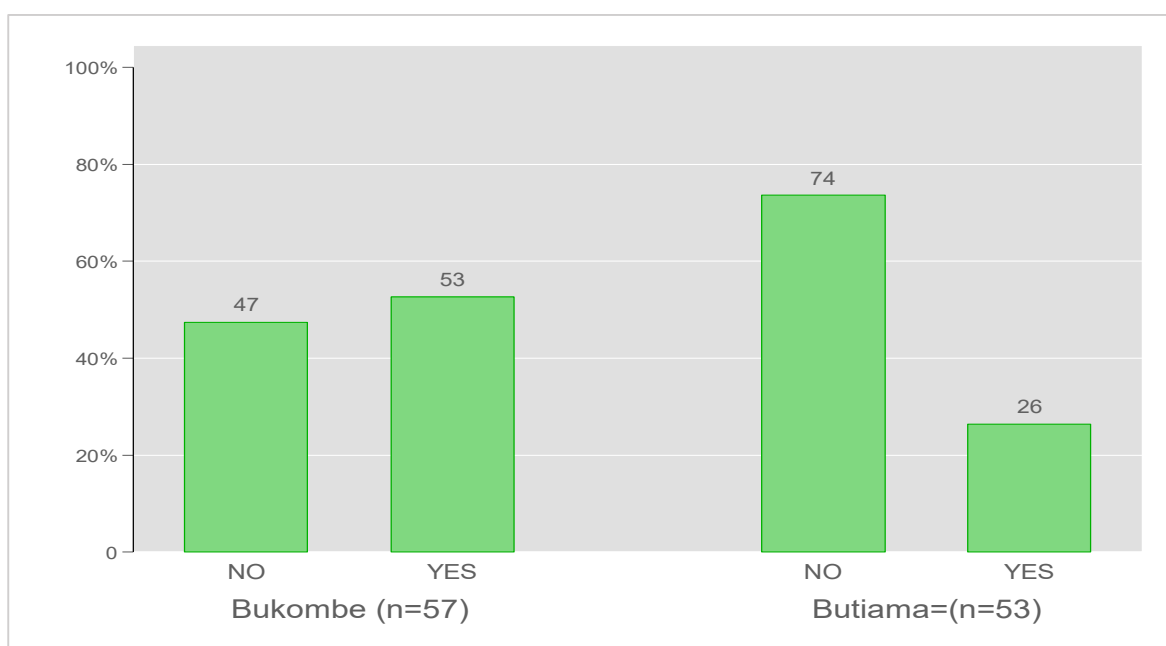


Figure 28: Sweetpotato seed provisioning(share/sell) (n=110)?

Table 29. Number of seed transactions (sell/share seed) in the last one year

District	Mean	Median	Min	Max
Bukombe (n=30)	2.17	2.00	0.00	8.00
Butiama (n=14)	4.86	3.00	1.00	20.00

The most common varieties provided by the respondents were Ukimwi (33%), Pisi tatu (27%), Uso wa mchina (20%) in Bukombe. Polista (57%) and Ukerewe (29%) were the most common varieties in Butiama. The seed provision was highest in December and January for Bukombe and Butiama, respectively (Table 30). The seed provision was low in March-June in Bukombe. there were no seed transactions(sell/share) in October, November, and December in Butiama (Figure 30).

Table 30. Name of the sweetpotato variety sold/shared in last year

Variety Name	Names used by farmers	% of responses	
		Bukombe District (n=30)	Butiama District (n=14)
Ukerewe	Ukerewe/Balozi	0	29
Kalamu	Kalamu/Kalamu ya nyerere	3	0
Kiroba	Kiroba	3	0
Polista	Polista/Tunjamurume/Buhama/Butiama	13	57
Kisasa	Kisasa	3	0
Nyangubo	Nyangubo	0	14
Ukimwi	Ukimwi/Rangi mbili/Ukimwi ndefu	33	0
Pisi_Tatu	Pisi Tatu/Ukimwi feki	27	0
Kabode	Kabode	0	14
Mataya	Mataya	0	7
Jewel	Jewel	0	7
Uso Wa Mchina	Uso Wa Mchina/Bhusowanchina	20	0
Gairo	Gairo	3	0
Unknown	Unknown	20	0

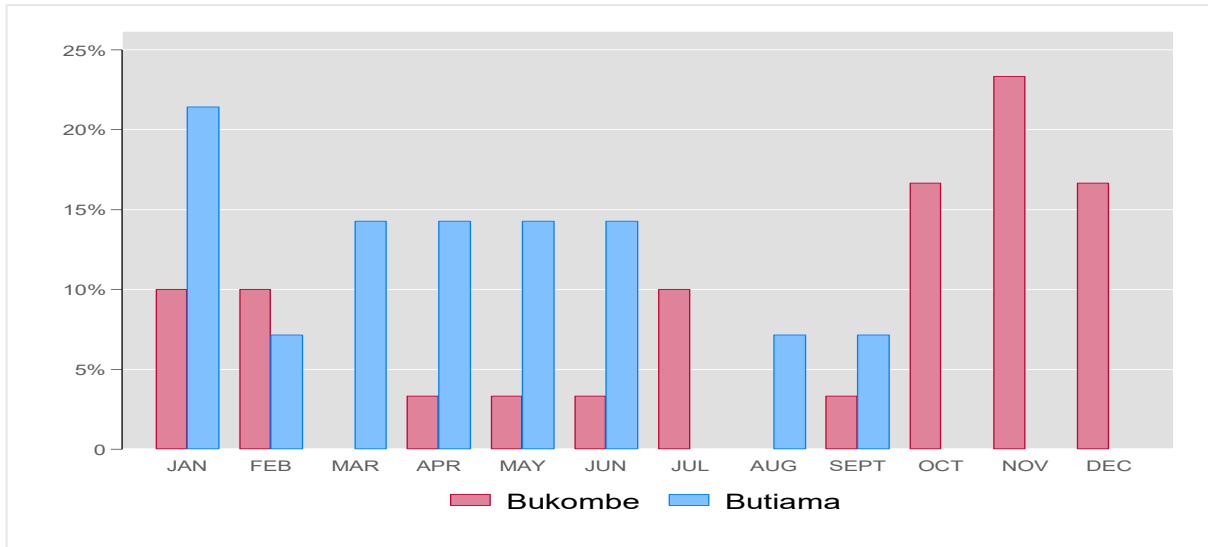


Figure 29: Months of seed transactions (selling/sharing)

The respondents in both Bukombe and Butiama largely shared/sold sweetpotato seed with root producers as shown in Figure 31. In Bukombe, seed was also shared to the small traditional multiplier. A seed producer also sold seed to a Local NGO and an International organization in Butiama. Table 31, 32 and 33 presents the quantity of seed shared or sold by the respondent.

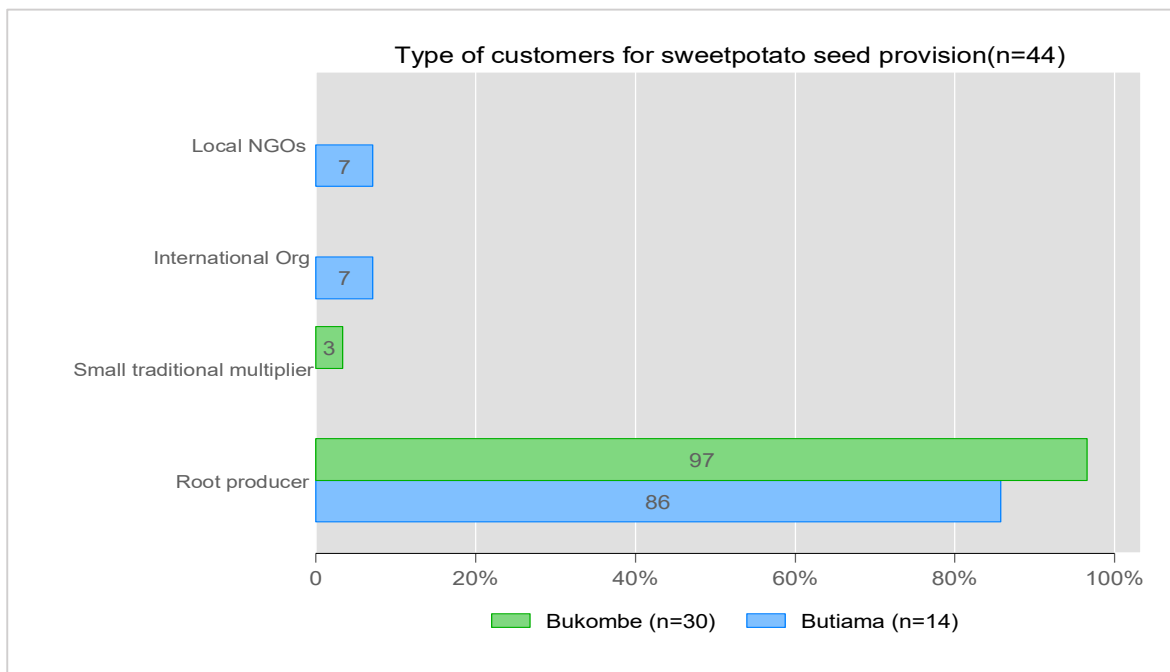


Figure 30: Type of customers for sweetpotato seed provision (n=44)

The seed producer exchanged seed freely to the root producer in Bukombe and Butiama (Table 31), but unlike Butiama the bigger share of seed provided to root producers was sold. The results indicate the root producers can play a major role in sweetpotato seed market development.

The average quantity freely exchanged was higher in Butiama (318250) than Bukombe (133,002 cuttings). In contrast, the average quantity sold was higher in Bukombe (24929 cuttings) than Butiama (7507 cuttings). Generally, the volume of seed exchanged freely is greater in Butiama, while the volume of seed sold greater in Bukombe. In Bukombe the seed was sold to the small traditional supplier at a higher price than the root producers (Table 32). Similarly, respondent sold to local NGO and international organization at a much higher price than the root producers (Table 33)

Table 31. Total quantity (number of 30-cm cuttings) seed provided for free

Type of customer	Bukombe			Butiama		
	n=20	Mean (Qty)	Total (Qty)	n	Mean	Total
Local NGOs	0	0	0	0	0	0
International NGO	0	0	0	0	0	0
Small seed multiplier	0	0	0	0	0	0
Root producers	10	13300.2	133002	11	28932	318250

Table 32. Total quantity (number of 30-cm cuttings) seed sold in Bukombe

Type of customer	n=13	Mean (Qty)	Total (Qty)	Total Revenue (TSH)	Average price (TSH)
Local NGOs	0	0	0	0	-
International NGO	0	0	0	0	-
Small seed multiplier	1	2000	2000	56000	28
Root producers	12	24787	347022	3328000	10

Table 33. Total quantity (number of 30-cm cuttings) seed sold in Butiama

Type of customer	n=3	Mean (Qty)	Total (Qty)	Total Revenue (TSH)	Average price (TSH)
Local NGOs	1	15000	15000	750000	50
International NGO	1	7500	7500	750000	100
Small seed multiplier	0	0	0	0	-
Root producers	1	20	20	200	10

3.2.19 Reasons for the choice of customer for seed provision

Table 34 presents the major reasons for the choice of customers by the sweetpotato seed producers. Apart from root producers, respondents mainly cited higher prices as the major reason for the choice of local NGOs, International organizations, TARI, and small traditional multiplier. The choice of root producers was mainly because of friendship without expectation (27%), a relative without any expectation (15%), immediate payment (12%), and lack of other options (12%). The results clearly show there is a niche market (i.e., NGOs and international organizations) in Butiama for the particular variety(s) which can fetch more price per unit but total market size is smaller as compared to other market segment i.e., local landrace traded with root producers. Further, the results also clearly indicate that market segment for Bukombe is a local landrace with root producers whereas for Butiama is niche market i.e., NGOs and international organizations (Table 33).

Table 34. The major reason for the choice of customer for seed provision

Major reasons	Root producers (n=33)	Local NGOs (n=1)	International Org (n=1)	TARI (n=1)	Small seed multiplier (n=1)
Gives higher prices	3%	100%	100%	-	100%
Accepts large quantities	3%	-	-	-	-
Accepts small quantities	3%	-	-	-	-
Gives advances when needed	6%	-	-	-	-
Pays immediately	12%	-	-	-	-
Close by	6%	-	-	-	-
Always available when I need	9%	-	-	-	-
No other option	12%	-	-	-	-
Relative without any expectation	15%	-	-	-	-
Friend without any expectation	27%	-	-	100%	-
Others	3%	-	-	-	-
Total	100%	100%	100%	100%	100%

3.2.20 Sweetpotato producers' seed acquisitions

Figure 32 shows the differences in seed acquisition in the two districts. The use of acquired seed was limited in the Butiama district compared to Bukombe. Forty-seven percent of respondents and 26% of respondents received seed from elsewhere in Bukombe and Butiama, respectively (Figure 32). Interestingly, the mean number of transactions for seed acquisition was greater in Butiama (2.1) than Bukombe (1.6) (Table 35).

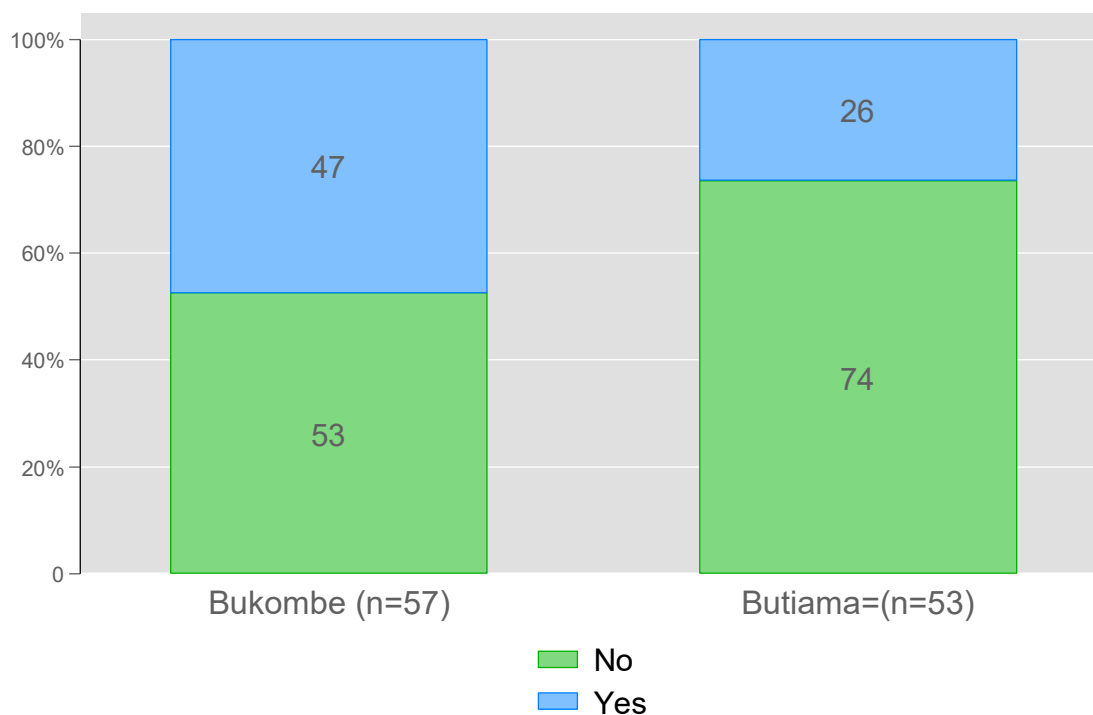


Figure 31: Did you receive seed from anyone in the last one year (n=110)

Table 35. Number of transaction (seed acquisition) in the last one year

District	Mean	Median	Min	Max
Bukombe (n=27)	1.56	1	1	10
Butiama (n=14)	2.14	1	1	7

3.2.21 Seed variety acquired

Ukimwi was the most dominant seed variety acquired in Bukombe, whereas Polista (57) and Ukerewe (28.6%) were the most dominant seed acquired in Butiama (Table 36).

Table 36. Name of the seed variety acquired, % of responses

Variety Name	Bukombe (n=27)		Butiama (n=14)	
	Frequency	% of responses	Frequency	% of responses
Ukerewe	0	0	4	28.57
Ukimwi	12	44.44	0	0
Umeme	1	3.7	0	0
Kalamu	1	3.7	0	0
Polista	2	7.41	8	57.14
Kiroba	1	3.7	0	0
Berita	0	0	1	7.14
Pisi tatu	3	11.11	0	0
Naspot2	0	0	1	7.14
Uso wa mchina	2	7.41	0	0
Kasinia	0	0	1	7.14
Simama	0	0	1	7.14
Magimbi	0	0	1	7.14
Unknown	9	33.33	0	0
Kakamega	0	0	1	7.14
Gairo	1	3.7	0	0
Uchungu wa nyau	1	3.7	0	0
Dimbuka	1	3.7	0	0
usungu wa mbwa	1	3.7	0	0

Table 37 presents reasons for acquiring these varieties. Ukimwi is market preferred, high yielding, and is readily available. Similarly, Ukerewe is market preferred and freely available. Respondents considered Polista because it is market preferred, freely available, and the price is low. High market demand and seed availability appear to be the major reasons the respondents chose a particular variety. December appears to be the month with most seed acquisition transactions in Bukombe, while May and June were the months with most seed transactions in Butiama. In Bukombe, the seed acquisition transactions were all the month except March and September. In contrast, seed acquisition was only in 6 months (Figure 33).

Table 37. The major reason for selecting the three most common varieties acquired (%)

Major reason for selecting this variety	Ukimwi		Ukerewe		Polista	
	Freq	Percent	Freq	Percent	Freq.	Percent
High yield	2	17	-	-	-	-
Readily available when it is required	1	8	-	-	1	10
Market preferred	9	75	2	50	5	50
Freely available	-	-	2	50	3	30
Low price	-	-	-	-	1	10
Total	12	100	4	100	10	100

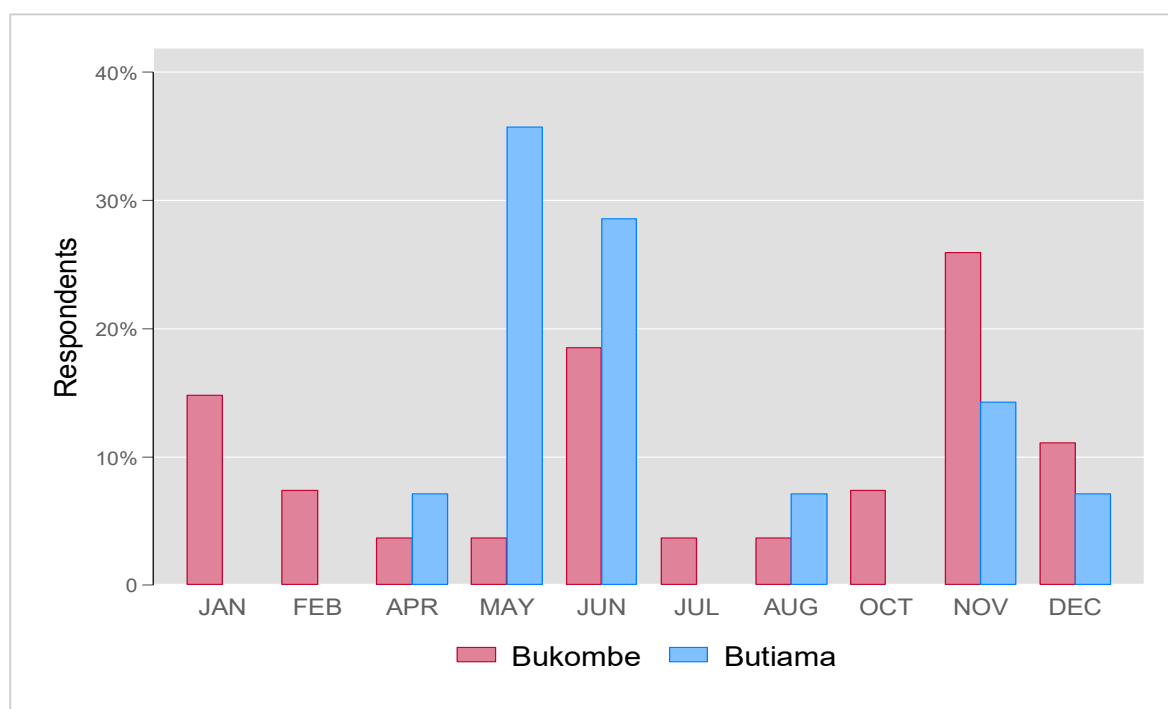


Figure 32. Months of transaction for sweetpotato seed acquisition (n=41)

In the last one year, respondents received seed from Root producers, small traditional multipliers and TARI. Most of the seed received came from root producers. Small traditional multiplier also supplies a considerable proportion of the respondents in Bukombe (Figure 34).

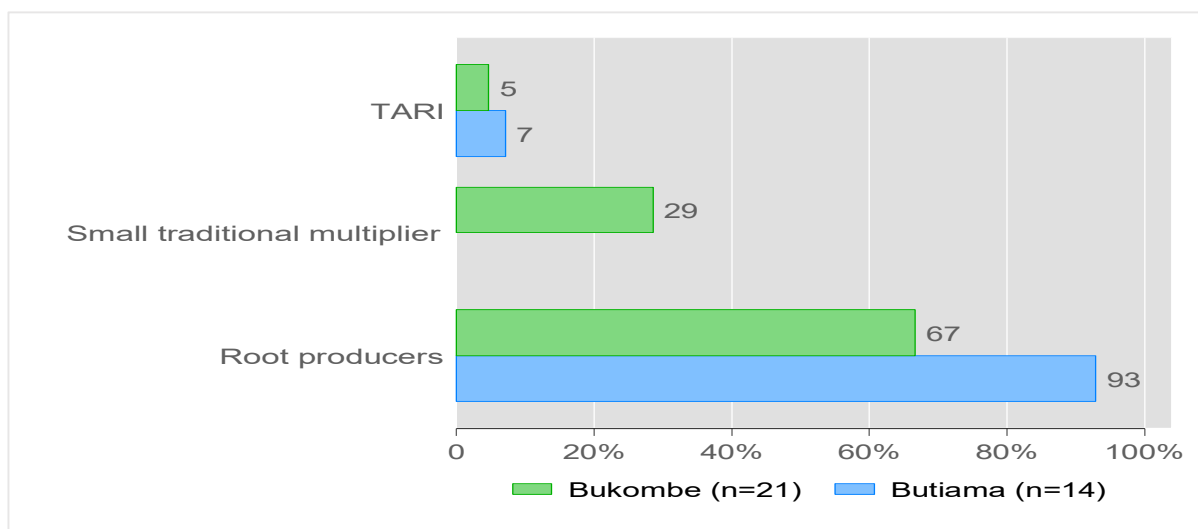


Figure 33. Type of sweetpotato seed providers

Table 38 presents the number of seeds acquired from different types of seed providers. The largest quantity of seeds acquired was freely shared by root producers (338,150 cuttings). However, the biggest share of seeds bought came from small traditional multipliers (175,400 cuttings) followed by root producers (42,000 cuttings). The findings highlight the important role of seed traditional multipliers in the supply of quality seed and creating better seed markets.

Table 38. Quantity of seed acquired by seed providers

Seed providers	Seed acquisition quantity (30-cm cuttings)			
	n	Free	n	Bought
Small traditional multiplier	0	0	6	175400
Root producers	17	338150	4	42000

3.2.22 Reason for the choice of seed providers

The reasons for the choice of seed providers are highlighted in Table 39. Over half of the respondents who chose root producers cited close relationships, especially from friends and relatives, as the main reason for their choice. A considerable proportion of respondents also cited variety options (19%) as the reason for choosing root producers. Variety options were also a major reason for the choice of TARI and small traditional multipliers (Table 39).

Table 39. The major reason for the choice of seed providers

Reason	Root producers		TARI		Small seed multiplier	
	Freq	Percent	Freq	Percent	Freq	Percent
Gives lower prices	1	4	-	-	1	17
Large quantity	2	7	-	-	-	-
Consistent supply	1	4	-	-	-	-
Variety options	5	19	1	50	3	50
Close relationship (relatives, friend)	14	52	-	-	1	17
Others (specify)	4	15	1	50	1	17
Total	27	100	2	100	6	100

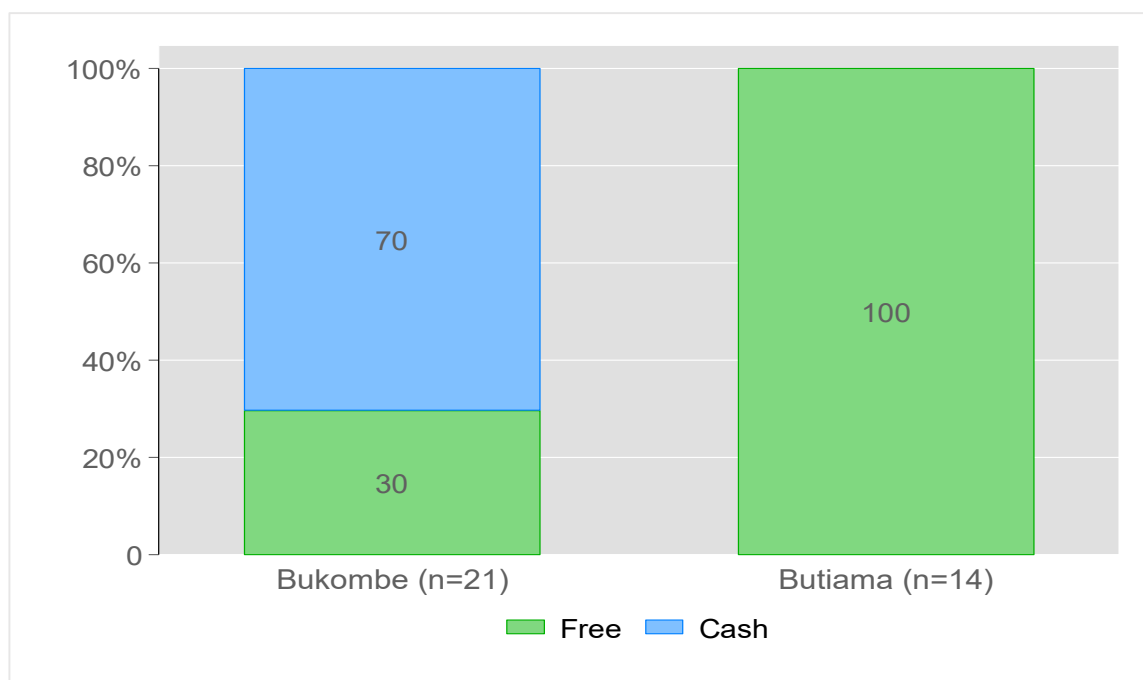


Figure 34. Mode of transaction for seed acquisition

The average quantity of seed share for free is substantially higher in Butiama than Bukombe (Figure 35). This is likely because the main seed acquisition transactions in Bukombe are monetary unlike in Butiama where all the transaction is free.

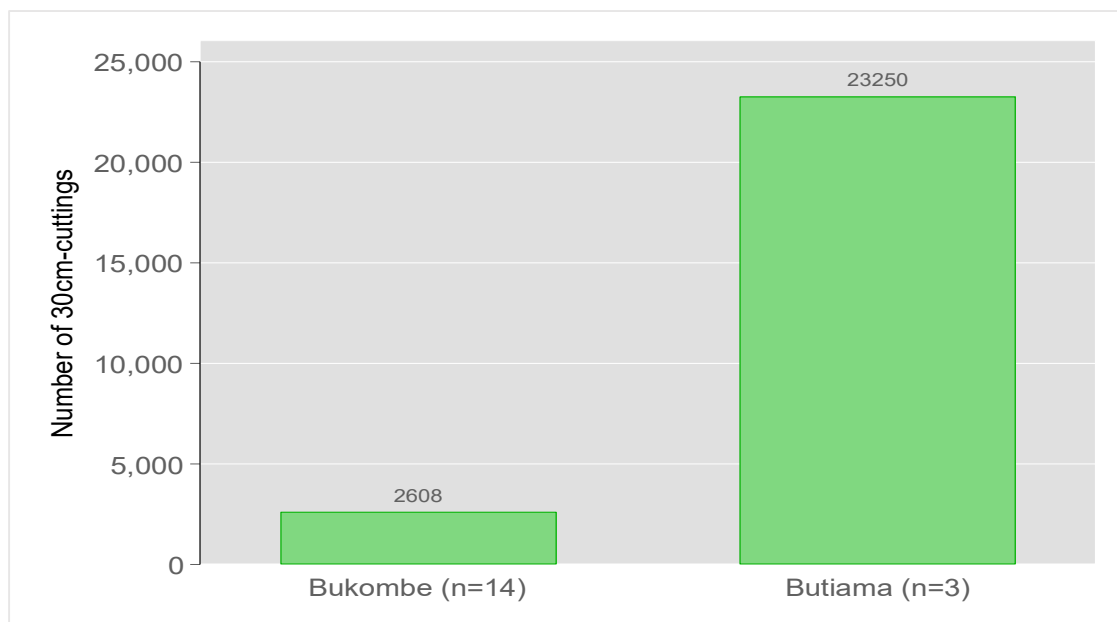


Figure 35. Average quantity of 30 cm-cuttings acquired for free

3.2.23 Seed acquisition

Small-scale seed traditional multipliers¹¹ and root producers were the main seed providers in Bukombe. The respondents mainly acquired Ukimwi and Polista varieties from small traditional multipliers. The small traditional multiplier also provided mixed varieties (different varieties in the same bundle/sack) including Kiroba, Kalamu, and Umeme varieties.

Root producers in Bukombe mainly acquired mixed varieties from root producers. As shown in Table 38, root producers freely exchanged seed. The varieties provided by farmers include Pisi tatu, Ukimwi, Uso wa mchina, and Uso wa mbwa.

In sum, Ukimwi variety is highly traded as compared other variety. Second most important variety was traded is Polista. Interestingly, the trading of seed is carried by the traditional seed multipliers, whereas root producers often they like to share seed for free, very little quantity was traded but those varieties are all mixed varieties (Table 40).

¹¹ They are root producers who have access to irrigation and multiply the seed from the root production, mostly during dry season and sell them to other root producers

Table 40. Quantity of seed acquired in last season, by type of seed producers and variety

Type of seed producers	Bukombe District		
	Variety Name	Total Quantity (30-cm cuttings)	Total Amount paid (TZS)
TARI	NA	NA	NA
Small Traditional multipliers (non-trained seed multipliers)	Ukimwi	87000	270000
	Polista	60000	50000
	Kiroba	400	6000
	Mixed (ukimwi, umeme, kalamu, polista)	15000	90000
	Unknown	13000	60000
Root producers	Ukimwi	3000	20000
	Pisi tatu	6000	0 (free)
	Mixed (pisi tatu, ukimwi, sirare)	1500	0 (free)
	Mixed (sirare, usungu wa mbwa, uso wa mchina)	15000	40000
	Mixed variety (ukimwi, gairo)	24000	36000
	Uchungu wa nyau	6500	0 (free)

Table 41 shows the seed producers that exist in Butiama District. Root producers were the main seed providers but mostly shared the seed with other sweetpotato producers for free. Polista variety (157000 - 30cm cuttings) was the most acquired variety, followed by Ukerewe (114500- 30cm cuttings). The results also show that some sweetpotato producers received very small number of seed i.e., Naspot 2 and Kakamega variety from TARI.

Table 41. Quantity of seed acquired, by type of seed producers and variety (Butiama District)

Type of seed producers	Butiama District		
	Variety Name	Total Quantity (30 cm-cutting)	Total Amount paid
TARI	Mixed (Naspot 2, Kakamega)	6	0 (Free)
Small Traditional multipliers	NA	-	-
Root producers	Ukerewe	114500	0 (Free)
	Polista	157000	0 (free)
	Tunja murume	36000	0 (free)
	Mixed (berita, kasinia, simama, magimbi)	18000	0 (free)

3.2.24 Crop production and business challenges and suggestions before and during COVID19

Table 42 show that the majority of farmers in both Bukombe and Butiama acquired new seed of the existing varieties from Agrovets/agricultural shops (56% and 37%). Neighbors were also a common source of new seed varieties for all the crops. Twenty-one percent of farmers in Bukombe and 24% in Butiama sourced their new seed varieties from the neighbors. Own-conserved seed was a more common source of seed in Butiama (28%) as compared to Bukombe (5%) while fellow farmers were a common source of new seed varieties for the crops in Bukombe (16%) as compared to Butiama (2%). Stores had almost the same percentage of farmers acquiring new seed through them in both districts; 12% in Bukombe and 13% in Butiama.

Relatives, auctions, markets, cooperatives, SACCOs, extension officers, input suppliers, and stockists were cited as the least source of new varieties farmers used with less than 5% of the farmers using these sources in both districts.

Table 42. Sources of new variety for all the crops

Source of new varieties (for all crops)	Bukombe (n=57)		Butiama (n=53)	
	Frequency	Percent	Frequency	Percent
Agrovets/shops/agricultural shops	32	56%	17	37%
Friends	6	11%	6	13%
Conserve their own seed	3	5%	13	28%
From neighbors	12	21%	11	24%
From relatives	2	4%	1	2%
Auction	1	2%	0	0%
markets	1	2%	0	0%
Cooperative	0	0%	1	2%
SACCO	0	0%	1	2%
From extension officers	1	2%	0	0%
From farmers	9	16%	1	2%
Input suppliers	1	2%	3	7%
Store bought	7	12%	6	13%
Stockists	2	4%	0	0%
dvn	0	0%	1	2%

3.2.25 Frequency of acquiring new varieties

We also assessed the number of times farmers acquired a new variety (Figure 37). Generally, more than 50% of farmers reported that there was no specific time period before obtaining a new variety. New varieties were acquired every year by 25% and 26% of farmers in Bukombe and Butiama.

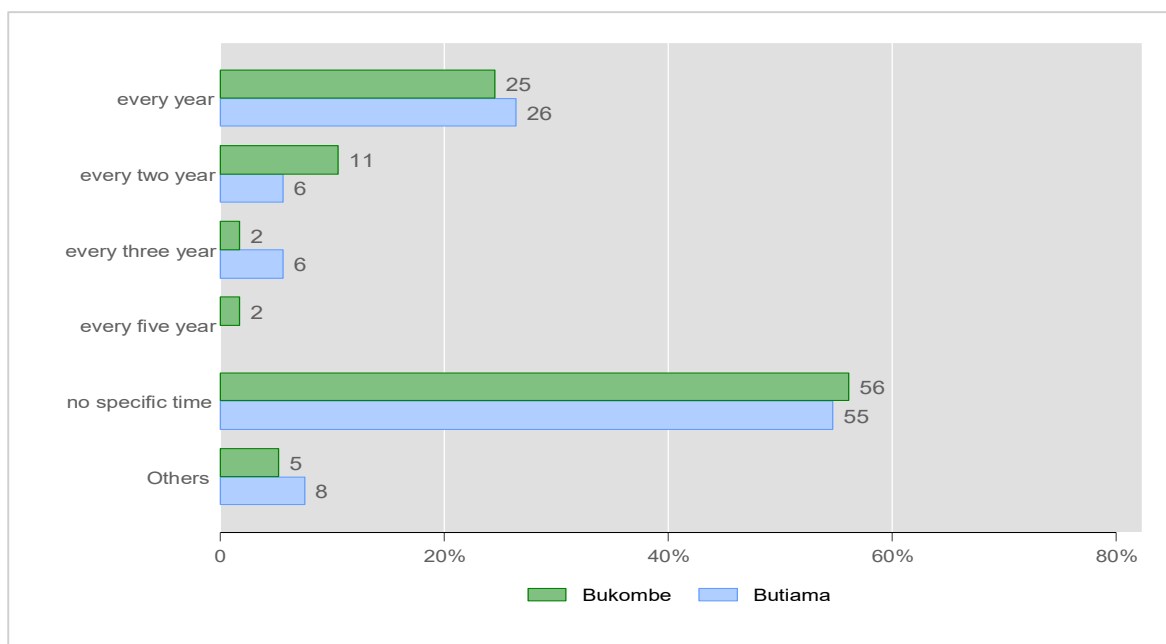


Figure 37. Frequency of acquiring new variety

3.2.26 Sources of information for the varieties

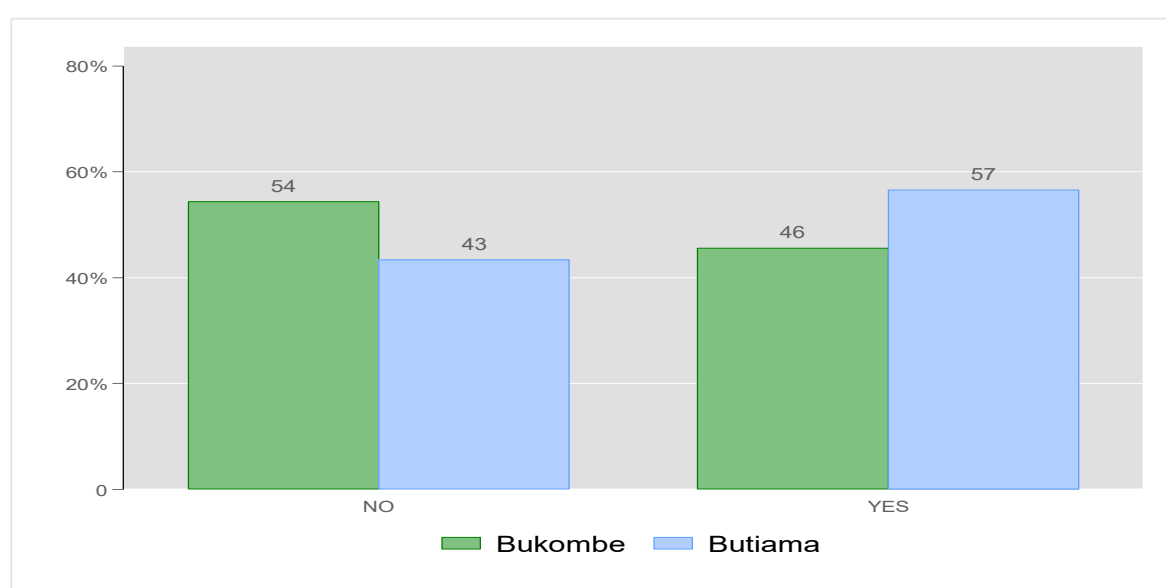
Table 43 illustrates the sources of information for the varieties grown in Bukombe and Butiama districts. Neighbors were a major source of information in both districts, 34% in Bukombe and 26% in Butiama. Fellow farmers as a source of information were also common in both districts.

The most commonly used source of information was agricultural professionals or extension agents (30%) in Butiama, while neighbors (34%) were the most common source of information in Bukombe. NGOs, SACCOs, relatives, and PCI were not a common source of information in both districts with less than 2% of farmers relying on these information sources.

Table 43. What are the sources of information for the varieties?

Sources of information	Bukombe (n=53)		Butiama (n=48)	
	Frequency	Percent	Frequency	Percent
Friend	4	8.51	5	10.87
Fellow farmers	14	29.79	9	19.57
NGOs	0	0	1	2.17
SACCO	0	0	1	2.17
Relatives	1	2.13	0	0
PCI	0	0	1	2.17
Seed producers	1	2.13	0	0
Neighbors	16	34.04	12	26.09
Village meetings	2	4.26	3	6.52
Village leaders	4	8.51	5	10.87
Phone	1	2.13	4	8.7
Media (Radio/TV)	2	4.26	6	13.04
Villagers	2	4.26	0	0
Input agents	3	6.38	0	0
Agricultural professionals/extension agents	1	2.13	14	30.43

Results in Figure 38 show that more farmers in Butiama (57%) acquired new seeds for varieties they already had compared to Bukombe (46%). Overall, most farmers reported there was no specific time for acquiring new planting materials as illustrated in Figure 39. More farmers in Butiama (37%) reported receiving new planting material every year as compared to farmers in Bukombe (27%). A small proportion of farmers receive new planting material every two or three years in both districts.

**Figure 38.** Did you get new seed for the variety you already have

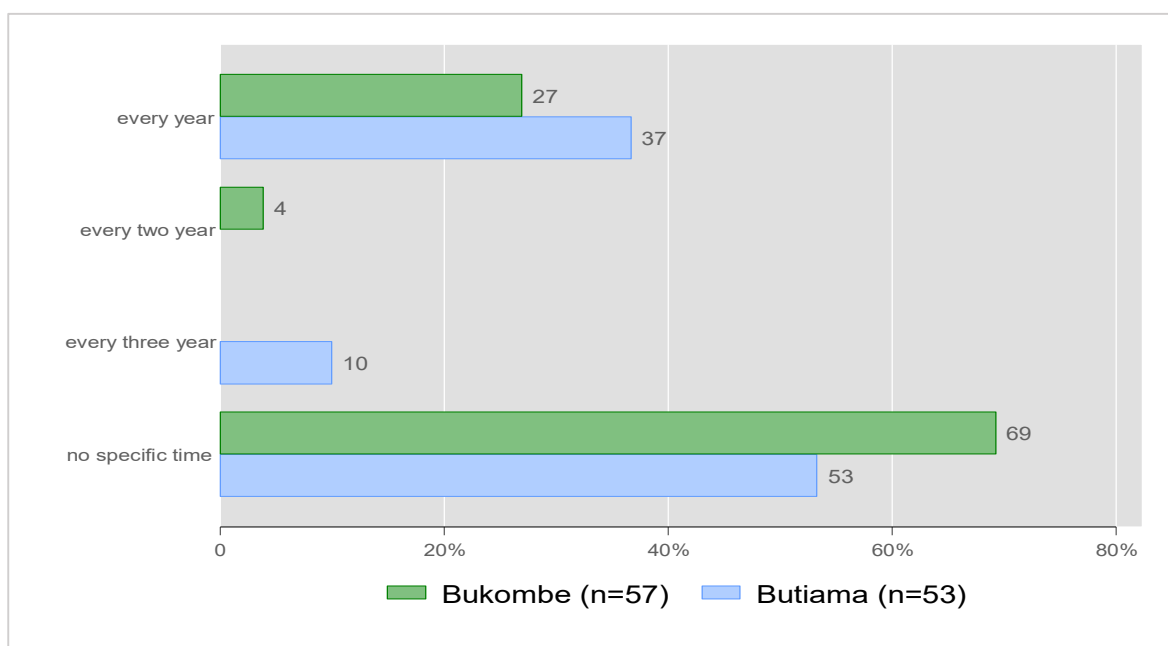


Figure 39. How often do you get the new planting materials for variety you already have?

Figure 40 illustrates the response of Bukombe and Butiama farmers whether they faced challenges in obtaining seeds. Less than 40% of farmers in each district had challenges in obtaining seeds. Bukombe district had more farmers facing challenges in seed acquisition as compared to farmers in Butiama. Though majority of farmers did not face challenges in obtaining seed, but as per quality seed and preferred variety is concerned, during the key informant interview, the study found that they do face challenges in obtaining quality seed that they like to grow, particularly during planting seasons.

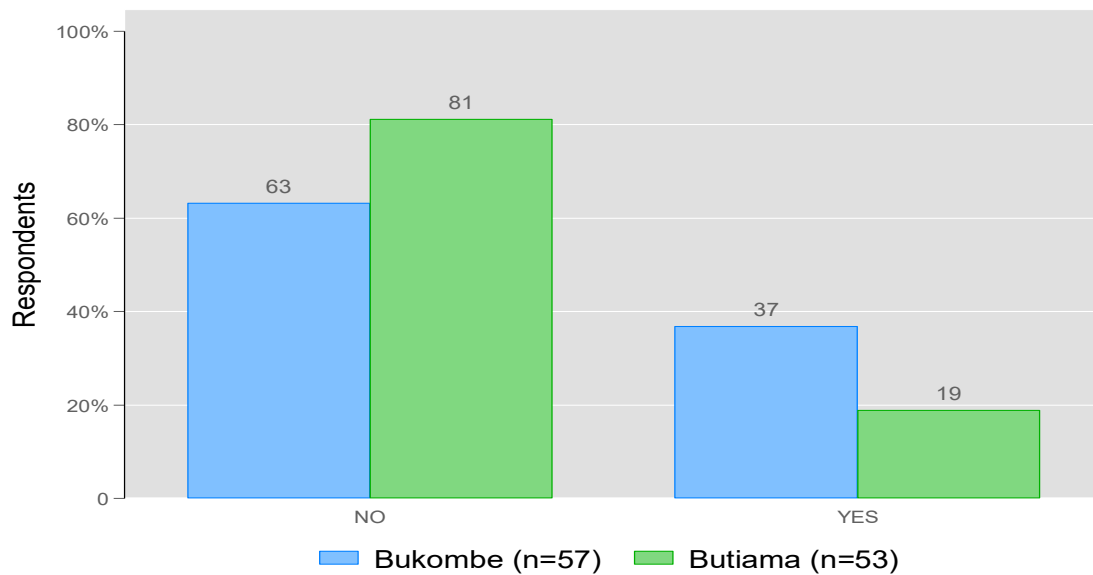


Figure 40. Did you face challenges in obtaining seeds?

3.2.27 Seed conservation

As shown in Figure 41, farmers were asked about conserving seeds in the last year. Generally, more than 70% of farmers conserved seed in the last year, 82% in Bukombe and 70% in Butiama. Forty percent of these farmers in Bukombe and 38% in Butiama reported facing challenges in seed conservation as illustrated in Figure 42. The challenged include lack of quality seeds, high cost of acquiring new seed, droughts, unavailability of seeds during the start of the season, and disease.

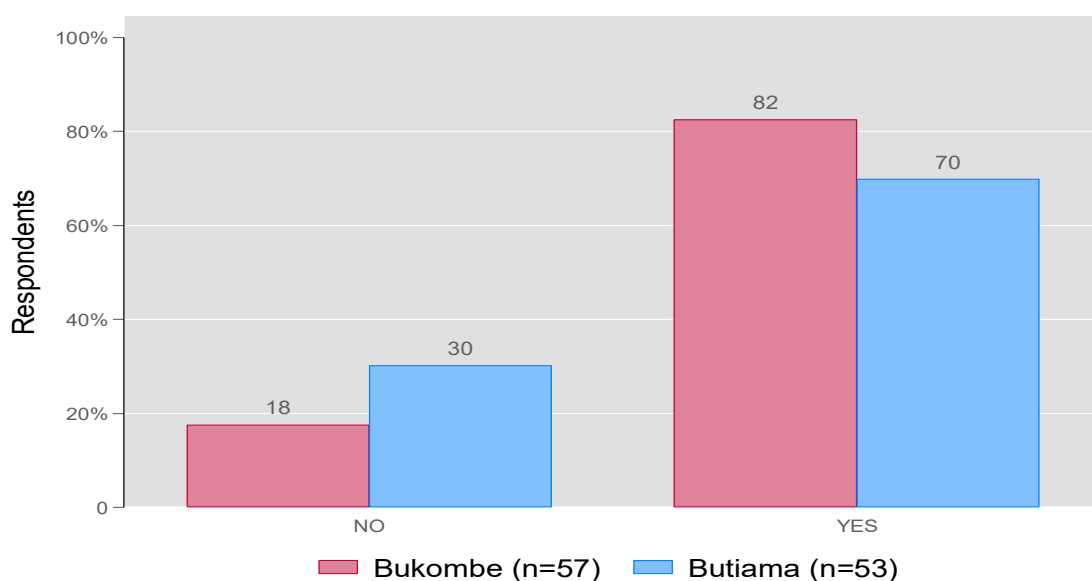


Figure 41. Did you conserve seed in the last one year?

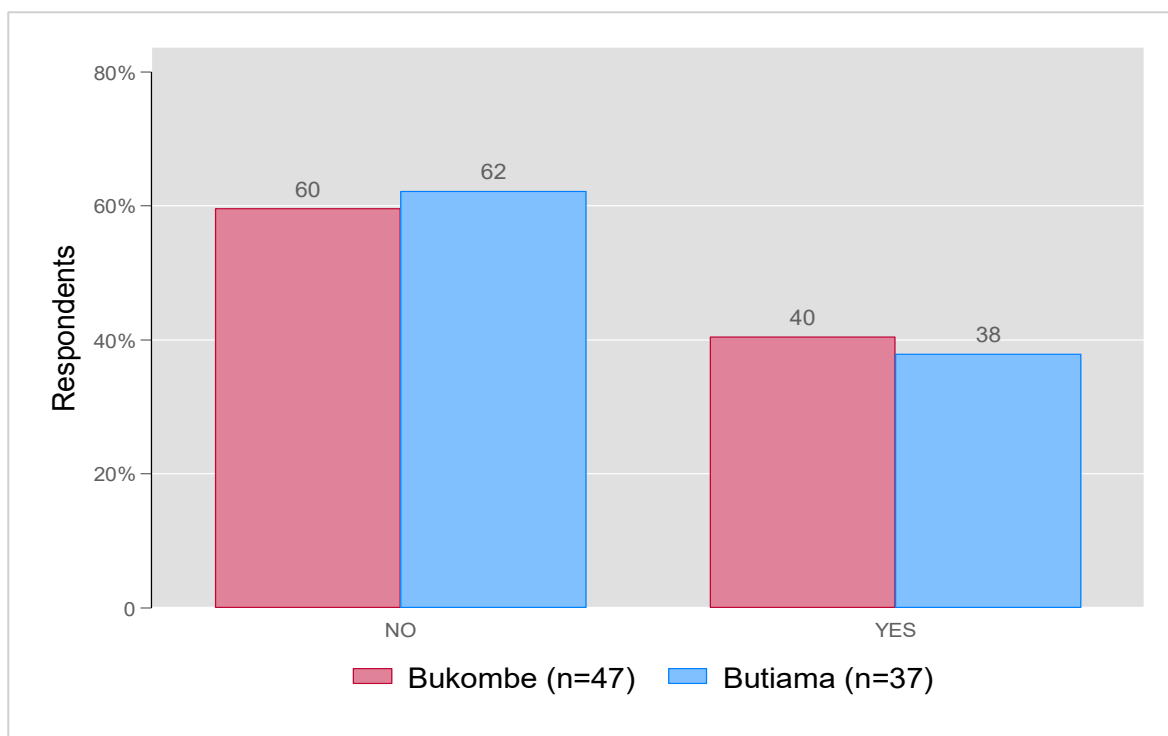


Figure 42. Did you face any challenges in conserving seed?

Farmers were also asked about challenges in selling sweetpotato roots during COVID-19 as illustrated in Figure 43. Generally, less than 41% of farmers in each district had challenges in selling sweetpotato roots during the pandemic.

The farmers experienced more than one challenge in selling the sweetpotato roots. A majority (98.39%) of the farmers indicated lack of customers followed by restricted movement (38.71%) and low price (16.67%) as challenges faced during the sale of sweetpotato roots. Closure of markets was the least mentioned challenge faced in selling sweetpotato roots during the pandemic (Table 44).

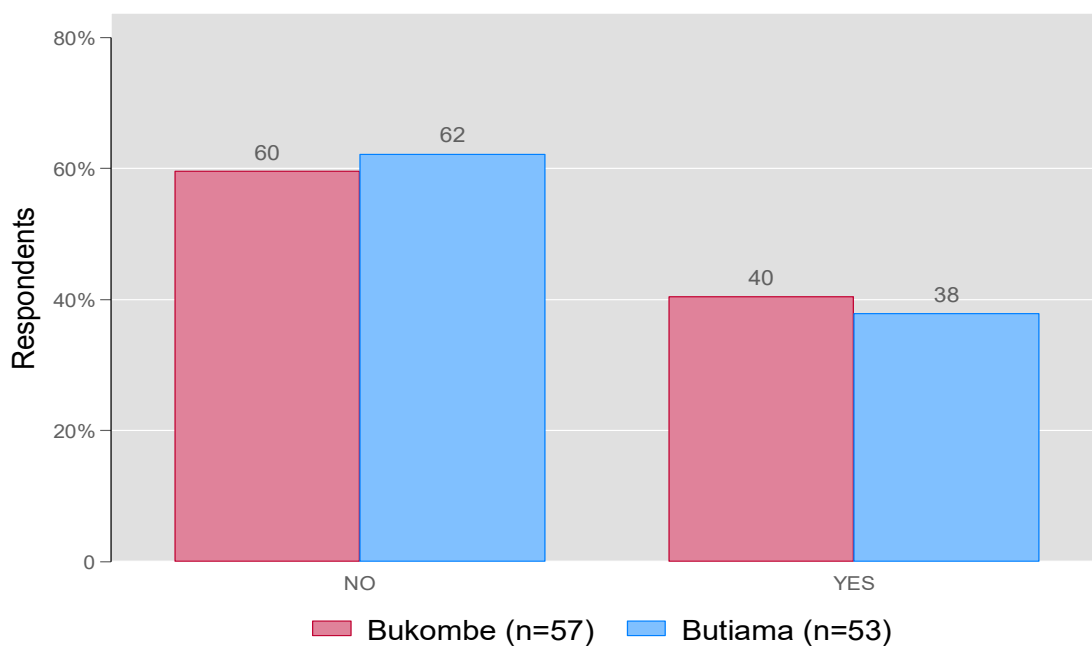


Figure 43. Have you faced challenges in selling sweetpotato roots during COVID-19?

Table 44. Challenge faced during the sale of sweetpotato (roots) under COVID-19 restrictions (n=66)

Challenge	Frequency	Percent
Low demand for roots/or lack of customers	61	98.39
Restricted movement	24	38.71
Closure of markets	2	3.23
Low price	11	16.67

Table 45. The suggestions to solve the challenges faced during the sale of sweetpotato roots under the COVID-19 restrictions

Challenges	Bukombe (n=38)		Butiama (n=23)	
	Count	Percent	Count	Percent
None	10	26.32	2	8.7
Praying	1	2.63	2	8.7
They should lift the lockdowns	2	5.26	2	8.7
Provide alternative markets/new market opportunities	7	18.42	6	26.09
Input prices should be lowered	1	2.63	0	0
Regular visit from experts	1	2.63	0	0
Get the COVID-19 vaccine	2	5.26	0	0
Improve the marketing strategy	3	7.89	0	0
Should have known buyers/reliable market	2	5.26	2	8.7
The infrastructure should be improved	3	7.89	3	13.04
Provide market information	5	13.16	1	4.35
Provide information on improved seed	1	2.63	0	0
Have a storage system for the sweetpotato roots	1	2.63	0	0
Provide monetary support	1	2.63	0	0
Organized market for sweetpotato	0	0	2	8.7
Observe measures to control COVID-19 spread	1	2.63	0	0
Increase consumption of sweetpotato	1	2.63	0	0
Control or remove middlemen	1	2.63	0	0
Provide alternative option for sweetpotato use	2	5.26	0	0
Grow the customers preferred variety	1	2.56	1	4.35
Establish sweetpotato processing factories	4	10.53	3	13.04
Provide education on business practices	1	2.63	0	0

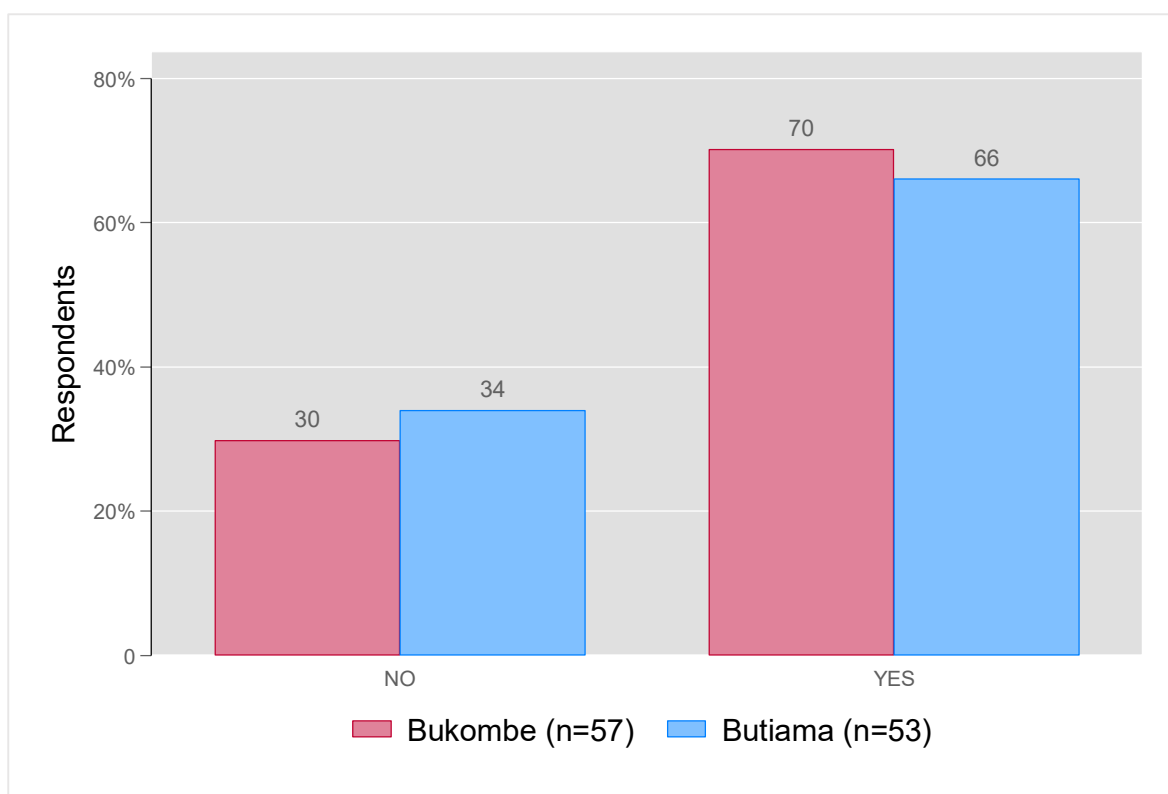


Figure 44. Did you conserve seed during covid-19?

3.2.28 Information needed for improving sweetpotato production

Table 46 show that most of farmers needed information on improved varieties that can compete or replace with their market preferred varieties and training on seed multiplication process along with good agricultural practices to produce more roots and quality seeds. In addition, market information for roots was mentioned as a key to improve sweetpotato production.

Table 46. What information do you need the most to improve your sweetpotato production?

Information needed	Bukombe district (n=57)	Butiama district (n=53)
Information agronomic practices	8%	10%
Support on capital	10%	14%
Improved seed variety	28%	27%
Training on pest and diseases management	4%	8%
Seeds availability	10%	0%
Training on good agricultural practices	14%	20%
Training on fertilizer use	4%	4%
Training on sweet potato(root) production	16%	12%
Train on seed production /seeding multiplication	30%	12%
Information of seed quality	6%	4%
Need for extension visit	2%	2%
Information of value addition	2%	4%
Information on market/marketing	22%	41%

3.2.29 Level of decision capabilities of the respondent

Table 47 shows the level of decision capacity of the farmers. It indicates that most of the farmers plan in advance for the crop selection and plant more than one crop to mitigate risks. Further they always find a way out to reduce the costs to increase net profit margin. Over 70 percent of the respondents do not record income and expenditures on agricultural activities.

Table 47. Level of decision capabilities of the respondent, % of responses

Decision making capabilities	Strongly Agree	Agree	Neither Agree nor disagree	Disagree	Strongly Disagree
I always plan my crop selection well in advance	55	24	11	9	2
For making profitable crop choices, I analyze the market trends before sowing	18	17	5	22	38
I always grow more than one crop in a year	65	32	-	-	3
I usually go for soil testing before sowing	-	-	-	24	76
I usually use certified seeds for sowing	12	40	8	25	15
I follow proper plant nutrient management practices	4	15	12	47	23
I irrigate my field based on prescribed methods of irrigation	1	7	1	44	47
I always try to minimize the cost of production of different crops	41	30	6	22	1
I usually avail credit facilities available by the bank to increase my saving	-	8	1	24	67
I properly record my incomes and expenditure on agricultural activities	7	16	5	26	45
I store my agricultural produce and sell it at higher prices	18	45	5	24	7
I sort and grade my agricultural produce before selling	15	45	4	18	18
I always analyze the market trend before selling the produce	22	35	5	9	30
I am aware of biofertilizers	5	10	3	25	57
I use crop insurance to mitigate risk?	-	-	1	17	82
I am aware of appropriate harvesting timing and methods of different crops?	21	42	9	25	4
I know how to minimize the post-harvest losses of different agriculture pro	23	30	15	25	7

3.2.30 Information sources related to agriculture

Most of the respondents did not seek information from other sources and depended on the knowledge they already have to make decisions related to agriculture (Table 48). Relatives/friends were a significant source of information, particularly in selection of new sweetpotato varieties, sweetpotato seeds, crop sales, and market selection. The Input dealers were key in the selection of fertilizer and pesticides. Most farmers did not use mobile phones or receive agricultural information from the media (radio/television).

Table 48. Sources of information in the last one year, % of respondents

Source of information	Own decision	Agricultural extension officers	Media	Mobile phone	Friends/ relatives	Input dealers
Agricultural information	81	29	0	1	43	10
Selection of new sweetpotato varieties	80	13	0	1	66	2
Sweetpotato seeds	85	6	0	0	58	3
Selection of fertilizer	61	20	0	0	17	41
Selection of pesticides	43	39	0	0	18	43
Timing of crop sales	90	11	0	2	41	3
Market selection	86	2	0	8	53	0
Crop selection	85	26	2	1	34	12

3.3 Results from Tanzania Agricultural Research Institute (TARI)

3.3.1 Background of TARI's seed business network

The main sweetpotato seed supplier for TARI who is personally known and has regular contact is one private company who are located in Tanzania. Their two main buyers of sweetpotato seed whom they know and have regular contact were 20 Decentralized Vine Multipliers (DVMs) and about 30 farmers. However, TARI also sells their materials to NGOs through a project.

Table 49. Number of seed suppliers and buyers you personally know and you have regular contact

Seed suppliers		Seed buyers	
Type of supplier	Number of suppliers	Type of buyer	Number of buyers
Private companies	1.0	Decentralized Vine Multipliers (DVM)	20
		Farmers	30

3.3.2 Sweetpotato seed business environment

The sweetpotato seed business is mainly through public-private partnerships, farmers, and partnering with NGOs. The main source of capital is donor funding. The use of fertilizers, farmyard manure, fertilizer, improved seed, irrigation, and protected structure are the main technologies utilized in sweetpotato seed production.

3.3.3 Sweetpotato seed production

The plots used for seed production in TARI are public land. Some plots were rainfed, while others were under irrigation. As presented in Table 50a, the planting was in August and November 2019. In August 2019, Kabode, Kakamega, Naspot12, and Mataya improved varieties were produced using rapid multiplication technique in screen houses, and the seed class was pre-basic. The same varieties were produced in November 2019 in open-field plots using the conventional method, where the seed class was basic. The yield produced is presented in Table 50b.

Table 50a. Sweet potato seed production at plot-level

Variety	Seed class	Type of plot	Period of planting	Method of production
Kabode	Pre-basic	Screenhouse	August 2019	Rapid
Kakamega	Pre-basic	Screenhouse	August 2019	Rapid
Naspot12	Pre-basic	Screenhouse	August 2019	Rapid
Mataya	Pre-basic	Screenhouse	August 2019	Rapid
Kabode	Basic	Open-field	November 2019	Conventional
Kakamega	Basic	Open-field	November 2019	Conventional
Naspot12	Basic	Open-field	November 2019	Conventional
Mataya	Basic	Open-field	November 2019	Conventional

Table 50b. Sweet potato seed production at plot-level

Variety	Plot size	Unit	Quantity produced	Unit
Kabode	1.25	Acre	712	Bundle (100 cuttings of 30CM size)
Kakamega	0.63	Acre	305	Bundle (100 cuttings of 30CM size)
Naspot12	0.35	Acre	160	Bundle (100 cuttings of 30CM size)
Mataya	0.16	Acre	70	Bundle (100 cuttings of 30CM size)
Kabode	90	SQM	55	Bundle (100 cuttings of 30CM size)
Kakamega	90	SQM	57	Bundle (100 cuttings of 30CM size)
Naspot12	90	SQM	40	Bundle (100 cuttings of 30CM size)
Mataya	12	SQM	7	Bundle (100 cuttings of 30CM size)

3.3.4 Varietal Preference

Kabode, Naspot12, and Mataya were the three most preferred varieties by TARI as presented in Table 51. All of them were early maturing, high root yield, big size roots, better nutritional and health benefits, and liked by children. Kabode and Naspot 12 are both resistant to SPVD and SPW. Since majority of the sales happening through developmental projects and have mission towards developing seed systems and providing nutritional benefits to poor, they prefer such varieties and hence TARI fills the demand. Despite being one of the most preferred, Naspot12 is susceptible to pest and disease, not resistant to stress, and low yielding. Mataya variety is also not stress-resistant (Table 52).

Table 51. Three most preferred varieties and their traits

Variety	
Kabode	Early maturing
	Long shelf life
	Resistance to SPVD
	Resistance to SPW
	Stress resistance (drought, poor soils)
	High vine yielding
	High root yield
	Big size of the root
	Better nutritional & health benefits e.g Vitamin A
	Liked by children
Naspot 12	Early maturing
	Resistance to SPVD
	Resistance to SPW
	High root yield
	Big size of the root
	Flesh sweetness
	Better nutritional & health benefits e.g Vitamin A
	Liked by children
	Low water content
	High demand/marketable
Mataya	Early maturing
	Long shelf life
	High vine yielding
	High root yield
	Big size of the root
	Better nutritional & health benefits e.g Vitamin A
	Liked by children
	Low water content
	High demand/marketable

Table 52. Characteristics disliked in the three most preferred varieties

Variety	Characteristics
Kabode	NA
Naspot 12	Have disease and pests
	Not stress resistance (drought, poor soils)
	Low vine yielding
Mataya	Not stress resistance (drought, poor soils)

Table 53. Preferred characteristics missing in these varieties

Variety	Characteristics
Kabode	High dry matter content
Naspot 12	Stress resistance (drought, poor soils)
	High vine yielding
Mataya	Stress resistance (drought, poor soils)
	Resistance to SPW

Naspot13 and SPKBH03/03 were the least preferred variety. As shown in Table 54, Naspot13 is low yielding, SPKBH03/03 has low market demand, while secondary is not resistant to SPVD. However, these least preferred have some characteristics have that customer like. For example, Naspot13 has better nutritional and health benefits, low water content, flesh sweetness, and high vine yield. SPKBH03/03 is high yielding and has a big root size. The secondary variety also has characteristics liked by customers including, high market demand, high yielding, and high dry content matter.

Table 54a. Three least preferred varieties and their characteristics

Variety	Characteristics
Naspot13	Low root yield
SPKBH03/03	Low marketable demand

Table 54b. What do you or your customers like about this variety?

Variety	Characteristics
NASPOT 13	Better nutritional & health benefits e.g Vitamin A
	Low water content
	Flesh sweetness
	High vine yielding
SPKBH03/03	High vine yielding
	Big size of the root
Secondary	High vine yielding
	High root yield
	Flesh sweetness
	Good taste
	High dry matter content
	High market demand

3.3.5 Seed provision by the TARI

The five types of varieties that TARI provided were Kabode, Kakamega, Naspot12, Mataya, and Ijumla, where the seed class was basic. TARI provided a total of 1257 bundles to local NGOs in February at TSH 2500 for each bundle of 100 cuttings of 30cm size (Table 55).

Table 55. Seed provision

Seed varieties	Kabode, Kakamega, Naspot12, Mataya, Ijumla
Month of transaction	February
Seed class	Basic
Type of customer	Local NGO
Number of transactions	10
Quantity sold	1257 bundles (100 cuttings of 30 cm size)
Price per bundle	TSH 2500
Total revenue	TSH 3142500

3.3.6 Seed acquisition

TARI did not receive sweetpotato seed from anyone in the last year. New seed varieties are mainly acquired through crossing experiments, local germplasm collection and, germplasm exchange.

4. Conclusion

The majority of the sweetpotato root traders in the targeted regions were male with the exception of Ilemela. The majority of the root traders belonged to traders' associations and benefited from the credit, joint marketing, access to market information, and encouraging each other to save. Overall, Polista, Mage, and Ukimwi were the three most traded varieties in the market, but there were district differentials in the traded varieties. For instance, Ukerewe was the most common variety in the Butiama district. The attributes traders liked by these varieties include high dry matter, longer postharvest life, and high market demand. Similarly, the root and seed producers liked these varieties because of their high dry matter content, better taste, and high market demand. The most common attributes disliked on these preferred varieties were susceptibility to pests and diseases.

The supply of sweetpotato roots in the market was high between February and June (major season) and low in supply from July to November (minor season). The average prices were higher in the minor season (US\$ 0.16-0.23 per kg) than in the major season (US\$ 0.1-0.16 per Kg). The traders had no binding agreement when buying and selling sweetpotato roots and relied on oral contracts during their transactions, with the price either set by the traders or through negotiations.

The median size of land allocated for root production was 0.8 ha in Bukombe and Butiama. The proportion of farmers who participated in seed production was substantially higher in Bukombe than in Butiama. The average yield of both seed and roots was higher in Bukombe. Most root producers in Bukombe and Butiama depend on own-conserved seed or seed from fellow farmers within the village, with NGOs and research organizations playing a minimum role in the supply of seed. However, most root producers face challenges in obtaining quality seeds of their preferred varieties, particularly during planting seasons.

5. Recommendations

The study highlights some gaps in the provision and acquisition of quality sweetpotato seed varieties in the target areas in Tanzania. There were weak linkages between the root producers and the potential suppliers of quality seeds that are free from pests and diseases (NGOs and TARI). These linkages can be strengthened through Decentralized Vine multipliers (DVMs) who can ensure quality seed varieties reach sweetpotato producers. However, for this dissemination channel to be sustainable, it is important to consider policies and programs that support a business model that will enable the distribution of seed by DVMs to be commercially viable.

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