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SUPPLY CHAIN ISSUES AFFECTING MARKET ACCESS AMONG SMALLHOLDER MAIZE FARMERS IN MBOZI DISTRICT, TANZANIA

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Abstract

This study investigates the issues that affect market access among smallholder maize farmers from a supply chain perspective. A cross-sectional questionnaire survey was used to test the relevance of access theory in assessing the effect of supply chain issues on market access. A total of 359 smallholder maize farmers were sampled randomly from Mbozi district in Tanzania for analysis. The effect of supply chain issues on market access were estimated by using marginal effects based on binary logit model. The study's findings indicate that supply chain-related issues are significant predictors of market access among smallholder maize farmers in the surveyed area. Issues like long marketing and distribution channels, deficient supply chain infrastructure and intensive competition between the supply chains revealed a negative and significant effect on market access among smallholder maize farmers. Besides, better collaborations and networking, appropriate marketing skills and smallholders' ability in meeting customers' requirements revealed a positive and significant effect. Based on these results, authors recommend streamlined coordination and collaboration among agricultural multi-tiers, improve supply chain infrastructure and better quality of agricultural products as the important drivers toward enhanced market access among smallholder maize farmers. More specifically, this study enriches scholars and policymakers with information on the supply issues that affect market access among smallholder farmers, offers some managerial implications and direction for further studies.

Keywords: *Supply chain, supply chain issues, market access, maize crop, smallholder farmers.*
Jel Codes: *Q11, Q13; D13; M31*.

1. Introduction

Market access is the ability of individuals or a company to enter local, regional and global markets and be able to sell their goods or services (ILO, 2017; FAO, 2022). Among smallholder farmers, the concept of market access is very diversified and is influenced by several factors. According to the International Labour Organisation (ILO) (2017) and Mchopa *et al.* (2020), smallholder farmers are those who own an average of 1-5 acres of land for agricultural activities. About 80% of farmers in Sub-Saharan Africa are smallholder farmers who depend on agriculture to generate income and support their livelihood (World Bank, 2019). The coherent

objectives of the agricultural sector are to increase crops production at cost-effective whilst enhancing market access for agricultural products at better prices. Despite the coherent objectives, low productivity and limited access to markets have remained the major contemporary issues which face the agricultural sector (FAO, 2022; ILO, 2017; Ismail, 2021). These deficiencies are quite alarming among smallholder farmers. Experience reveals that only 35% of global smallholder farmers have access to reliable markets for agricultural products (ILO, 2017). Again, only 2% of agricultural products are sold through formal market channels (URT, 2021). Smallholder farmers are marginalised out of lucrative markets, as a result, they produce and commercialise their agricultural products through barter systems and informal markets at low prices.

In the last two decades, market access and commercialisation of agricultural products were mainly sought for and focused on cash crops. The major cereal crops such as maize were primarily cultivated for home consumption as food crops. In today's era, cereal crops (maize inclusive) have been grown as both food and cash crops. In Tanzania particular, maize is one of the staple food crops. It accounts for about 62.6% of staple food crops before rice (21.6%), pulses (15.1%), and wheat (0.7%) (URT, 2021). The main markets for maize are millers, schools, prisons, local traders, the World Food Program (WFP) and the National Food Reserve Agency (NFRA) (URT, 2021; Wilson and Lewis, 2015). These individual traders, agencies and institutions buy directly from farmers in rural areas or nearby markets. Some maize, however, is exported to the neighbouring countries such as Kenya, Malawi, Democratic Republic of Congo and Mozambique (URT, 2021; FAO, 2022). Like other supply chains, a supply chain for maize is complex in nature as it involves several actors with different conflicting objectives. It comprises of suppliers of agricultural inputs, farmers, collectors, distributors, processors, retailers and the ultimate customers. Farmers and traders aim at selling agricultural products in any condition at the highest possible price. Customers on the other hand aim purchasing better quality products at the lowest possible prices (Megerssa *et al.,* 2020; Tuomala & Grant, 2022). With these complexities, marketing and commercialisation of maize require solid pathways and effective supply chain platforms, systems, designs, processes and infrastructures.

Access to markets of agricultural products varies significantly among smallholder maize farmers due to the complexities involved. Its root causes and effects are shaped by several factors. Rashid *et al.* (2020) and Osmani and Hossain (2015) connected the limited access to markets among smallholder farmers as the result of the low quality of agricultural products and lack of formal platforms that integrate and connect farmers to lucrative markets. Generally, customers strive to get better quality products at cost-effective. However, it is less likely that smallholder farmers are capable of meeting these requirements, which in turn impedes them from market access. Again, lack of coordination and networking platforms such as farmers' associations limit access to market information, which is an essential aspect that enhances markets access (Fan and Salas, 2018; Megerssa *et al.,* 2020). Besides, economic, legal and political factors such as high tariffs, quotas and political unrest adversely affect smallholder farmers' ability towards market participation in urban and rural areas (Slamet *et al.,* 2017; Maziku & Mashenene, 2020). This is due to the fact that smallholders are less likely to afford and comply with legal, economic and tariff barriers. Subsequently, limited access to markets results into economic crisis among smallholders, getting competed out of the lucrative markets and poor income generation. Moreover, limited access to markets discourages farmers from production, leading to scarcity of agricultural supplies and food insecurity (Tuomala and Grant, 2022). On the other hand, access to reliable market fosters economic transformation through revenue and employment creation, continued production and availability of agricultural products and food security.

This study approaches the issues that affect market access for agricultural commodities from a supply chain perspective. It is grounded on a view that, apart from the aforementioned legal, political and socio-economic factors, market access among smallholder maize farmers is

affected by supply chain-related issues. As a part of this conception, experiences show that China, Myanmar and South Africa have achieved significant market access for agricultural products among smallholder farmers due to well-streamlined supply chain systems in terms of distribution channels, proper co-ordination, networking, improved supply infrastructure and better-quality products (Kyaw *et al.,* 2018; Matsane Oyekale, 2014; Zhang *et al.,* 2019). The situation is almost the same in Kenya, Ethiopia and Mali where dairy, coffee and cotton farmers have experienced sustainable farming, distribution and marketing through a collaborative supply chain (Bolton, 2019; Mojo *et al.,* 2015). The other factors that affect market access among smallholder farmers are the extent of competition, long distance, roads condition and transportation costs (Changalima & Ismail, 2022). However, the issues that affect market access among smallholder maize farmers in Tanzania context from a supply chain perspective have not been systematically researched and documented. Previous studies assess the determinants of market participation among smallholder farmers from social, economic and legal perspectives (Mchopa, *et al.,* 2020; Ouma *et al.,* 2020; Rashid *et al.,* 2020; Maziku *et al.,* 2015). Therefore, the current study investigates how supply chain design, process, systems and infrastructures affect market access among smallholder maize farmers taking the Mbozi district in Tanzania as a case study.

2. Literature Review and Hypotheses Development

2.1. Theoretical Perspective

Improved market access is a driver to socio-economic development and sustainable growth among smallholder farmers (Osmani & Hossain, 2015; Mahuwi, 2022). Scholars have identified several determinants of market participation and access among smallholder farmers from different perspectives. From literature, the pertinent role of supply chain-related issues on market access among smallholders has not been documented. To address this gap, authors deploy access theory to examine the influence of supply chain-related issues on market access among smallholder maize farmers. Access theory was developed by Ribot and Peluso in the 1970s to establish a comprehensive framework and understanding of how individuals and groups benefit from the available opportunities and resources. In its setting, the theory of access regards "the ability of individuals rather than the rights" as the pre-requisite for improved access to the available resources and opportunities (Ribot & Peluso, 2003). Access is defined as the ability to exploit the benefits from available resources and opportunities based on endowed and entitled capabilities. This study puts a full spectrum on the ability to access market opportunities for agricultural products among smallholder maize farmers with Ribot and Peluso's theory of access. From the access theory and agricultural marketing perspectives, the ability to access and exploit the available market opportunities is extended to the adequacy, affordability, availability and accessibility of supporting supply chain systems, design, structures and processes. These issues can either enhance or constrain the efforts toward market access and participation among smallholder farmers (Changalima & Ismail, 2022).

The study develops a novel approach towards market access among smallholder maize farmers from a supply chain perspective. To do so, we identify nine (9) supply chain-related issues in the context supply chain of design, process and structure and assess their adequacy, affordability and availability in supporting market access among smallholder maize farmers. Among others, the study assesses the adequacy, availability and affordability of transportation and infrastructure facilities, distribution strategies, marketing skills, quality of agricultural products and networking and collaboration in enhancing market access among smallholder maize farmers. Since access to market among smallholder farmers is faced with intensive competition and complexities, having the required capabilities and streamlined supply chain design, structures and processes for marketing and distribution of agricultural products are

important pillars for improved market access (Kyaw *et al.,* 2018; Matsane & Oyekale, 2014). It is theorised that streamlined marketing and supply chain structure, process and design improve smallholder farmers' ability towards market access for agricultural products.

2.2. An Overview of the Agricultural Supply Chain

The main objective of the agricultural supply chain is to produce, process, distribute and market better quality products at cost-effective. This is can be achieved through streamlined agricultural supply chain designs, networks, processes and infrastructure. A supply chain is a network of individuals or companies which is linked through upstream and downstream activities to facilitate the efficient flow of goods, information and funds from the producer to the ultimate customer (Zhang *et al.,* 2021; Zhang *et al.,* 2019). The network of supply chains begins with the supplier of raw materials or inputs and ends with customers. From agricultural perspective, supply chain means a network of individuals or activities that are involved in the production and distribution of agricultural products from the farm to the end customers. The major activities along the agricultural supply chain are farming, transportation, purchasing, processing, marketing, storage and order fulfilment (Osmani and Hossain, 2015; Slamet *et al.,* 2017). Agricultural supply chain is linked by several actors who fulfil these activities. These are the inputs suppliers, farmers, collectors, distributors or wholesalers, processors, retailers and the end customers. Each actor plays a significant role in facilitating the movement of agricultural products from the farm to the ultimate customers. Access to lucrative markets is the prime objective of smallholder farmers and traders of agricultural products. However, there are some deficiencies along the supply chain of agricultural products which mediate effective distribution and marketing of agricultural products. The next parts provide empirical overview of supply chain issues that affect market access among smallholder farmers.

2.3. Supply Chain Issues and Market Access Among Smallholder Farmers

2.3.1. Distribution Strategies, Distance to the Markets and Transportation Costs

One of the contemporary issues that face the supply chain of agricultural products is the participation of multiple actors, long distance from the farm to the markets and high transportation costs. A study by Slamet *et al.* (2017) reveals that agricultural producers mostly strive to push their products to the markets through intermediaries. This includes the use of collectors, wholesalers, distributors and retailers. This create long marketing channels and give less opportunities for smallholder farmers from having direct access to the markets. In some cases, agricultural products are sold through informal channels. Only few smallholder farmers are capable of selling their products through formal and direct channels. Andaregie *et al.* (2021) and Kyaw *et al.* (2018) connected the dominant use of intermediaries by smallholder farmers to long distances from the farm to the market areas and high transportation costs. Long distance discourages market participation among smallholders due to high transportation costs. Most smallholder farmers are less likely to afford the transportation costs of moving agricultural products directly to the markets due to the long distance and high transportation costs involved (Changalima & Ismail, 2022; Megerssa *et al.,* 2020). This makes smallholder farmers prefer selling their products through intermediaries at relatively low prices. These issues are more noticeable in rural areas where farming takes place, markets are distantly located from the farm areas and roads are in bad condition (Andaregie *et al.,* 2021; Slamet *et al.,* 2017). These make transportation difficult and expressive. Based on this literature, the study hypothesises as follows: -

H_1: Agricultural marketing and distribution channel significantly and negatively affect market access among smallholder maize farmers.

H_2: Long distances from the farm to the market areas significantly and negatively affect market access among smallholder maize farmers.

H_3: Transportation and distribution cost significantly and negatively affect market access among smallholder maize farmers.

2.3.2. Products' Quality, Collaboration and Competition between Supply Chains

Collaboration and networking, quality of agricultural products and the extent of competition between the supply chains are important drivers toward enhanced market access among smallholder farmers. These three attributes complement each other towards increasing the odds of market access among smallholders. For instance, better product quality and collaboration enhance smallholders' competitive advantages (Megerssa *et al.,* 2020; Nguyen and Kingsbury, 2020). Intensive competition between supply chains shapes smallholders' ability and focus towards production and delivery of better-quality products. Experience reveals that smallholder farmers who produce better quality products, collaborate and share market information with other actors along the supply chain are more likely to be competitive and have access to market for agricultural products (Osmani & Hossain, 2015; Fan *et al.,* 2018). High-quality products keep customers satisfied, thus increases the odds of market access by attracting and retaining new customers (Andaregie *et al.,* 2021; Ouma *et al.,* 2020). Conversely, poor quality of agricultural products impedes smallholder farmers' competitive advantage and drives away existing customers due to the perceived effect of customer dissatisfaction.

In the supply chain of agricultural products, the extent of competition is accounted for in terms of the number of farmers or producers of related agricultural products. With many producers, it means intensive competition and thus limited access to markets by smallholder farmers. Moreover, fewer producers result in less competition thereby increasing the likelihood of market participation. Regarding the influence of collaboration on market access, studies by Zhang *et al.* (2021) and Nguyen *et al.* (2020) recommended networking and collaboration as the best practices toward enhanced collective marketing and performance of agricultural supply chain. Networking and collaboration uphold a sense of joint farming, processing, marketing and distribution of agricultural products to a lucrative market. Moreover, networking and collaboration eliminates the deficiencies in market access by making transportation easier and cost-effective. Therefore, product's quality, networking and collaboration are one of the pre-requisite requirements for increased market access among smallholder farmers. To smallholder farmers, these have been regularly reported as the contemporary issues because are less competitive and unable to meet market requirements (Mesic *et al.,* 2018; Osmani & Hossain, 2015). Based on these arguments, the study hypothesizes that: -

H_4: Better quality of agricultural products significantly and positively affect market access among smallholder maize farmers.

H_5: Networking and collaboration significantly and positively affect market access among smallholder maize farmers.

H_6: Intensive competition between supply chains significantly and negatively affect market access among smallholder maize farmers.

2.3.3. Marketing Skills, Market Requirements and Transportation Facilities

Delivery of the products of the right quality and quantity to the final customers within a specified time and at cost-effective are the core objectives of supply chains. These attributes have significant impact on agricultural marketing and sustainability of agricultural supply chain. Meeting these objectives enhances customer satisfaction which is one of the important drivers of market access (Andaregie *et al.,* 2021; Mesic *et al.,* 2018). Therefore, smallholder farmers' ability in meeting the market requirements (cost-effectiveness, timely delivery and quality

standards) is an integral part of competitive advantages between the supply chains which increases the odds of market access among smallholder farmers (Kyaw *et al.,* 2018). In order to enhance effective marketing of agricultural products, smallholder farmers need to use appropriate marketing skills and supply chain infrastructures. Road transportation is the most used supply chain infrastructure in moving agricultural products from the farm to the market areas. Studies by Matsane and Oyekale (2014) and Changalima and Ismail (2022) revealed that the marketing and transportation of agricultural products are coupled with several deficiencies which adversely affect market participation among smallholder farmers. These include long distances, poor roads condition, inefficient transport facilities and inappropriate marketing skills.

A study by Slamet *et al.* (2017) also asserted that inappropriate marketing skills and deficient supply chain infrastructures are one of the barriers that hinder smallholder farmers' efforts towards market participation. However, with good road condition and efficient means of transport (carriers), transportation costs tend to decrease, thus enhancing timely delivery of agricultural products to the markets. This argument is supported by Zhang *et al.* (2019) who revealed that improved transport facilities and infrastructure increases the likelihood of market participation among smallholders due to easier transportation of agricultural products from the farms to the market areas. Good supply chain infrastructures encourage smallholder farmers to transport their products to lucrative markets despite the long distances (Kyaw *et al.,* 2018; Changalima & Ismail, 2022). Conversely, poor roads condition, defective transport facilities and long distances make transportation difficult, and thus reduce the odds of market access among smallholder farmers. This discourages smallholder farmers from transporting their products, especially to a distantly located market which is associated with high transport costs. We therefore hypothesise that: -

H_7: Agricultural marketing skills significantly and positively affect market access among smallholder maize farmers.

H_8: The ability to meet customers' and market requirements significantly and positively affect market access among smallholder maize farmers.

H_9: Better transport facilities significantly and positively affect market access among smallholder maize farmers.

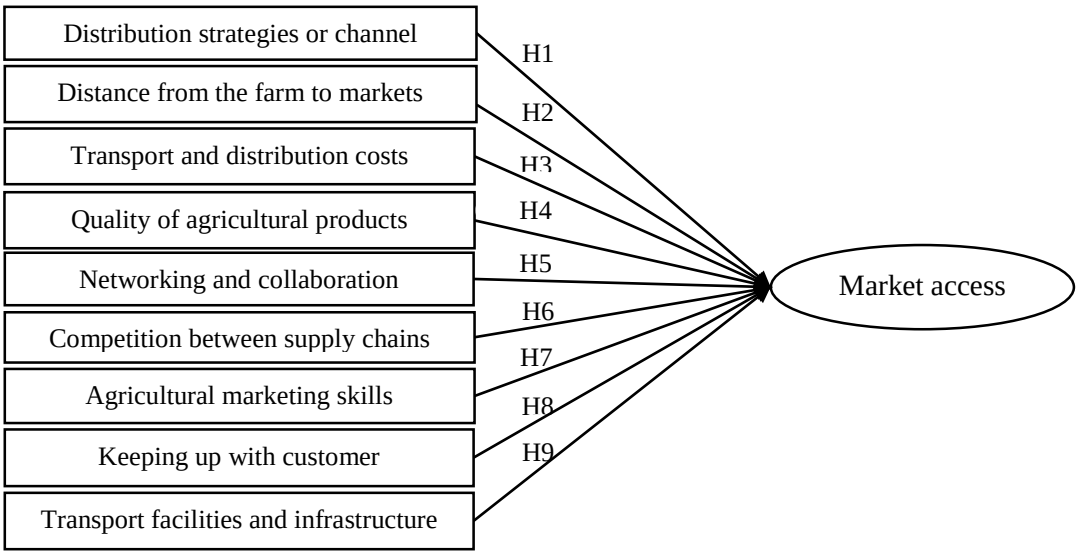

Figure 1. Conceptual framework

2.4. The conceptual framework

Figure 1 is the conceptual framework of this study which demonstrates the relationships between supply chain-related issues and market access among smallholder maize farmers. The framework was developed based on literature review conducted and the nine-hypothesis formulated. The conceptual framework hypothesises that market accesses among smallholder maize farmers is a function of supply chain related issues (H1, H2, H3, H4, H5, H6, H7, H8 and H9).

3. Methods and data

The target population for this study were smallholder maize farmers who were pulled from three wards in Mbozi district, Tanzania. Mbozi district is one of the administrative districts of the Songwe region in Tanzania with high potential in maize production. The other districts of Songwe region are Momba, Ileje Songwe and Tunduma. A multi-stage sampling procedure was employed in selecting maize-producing households from the study area for analysis. In the stage, the district with high potentials in production and marketing of maize crop was selected. It is from this criterion, Mbozi district was selected. Mbozi district produces and markets about 50% of all maize in the region compared to the remaining four districts (URT, 2021; Maziku, 2019; Osmani and Hossain, 2015). In the second stage, three wards from Mbozi district which predominantly grow and produce maize were selected. These were Itaka, Isongole, and Nambizo wards. Finally, a total of 384 smallholder maize farmers were randomly sampled from the three wards as the unit of analysis. Daniel's (2009) formula for the infinite population was used to determine the sample size. Due to the infinite population of maize producers in the three wards, respondents were sampled equally from each ward. However, due to non-response rate, only 93.5% (n = 359) were successfully returned (Itaka - 119, Isongole 123, and Nambizo – 117).

A cross-sectional research design was employed to establish the effect of supply chain issues on market access among smallholder maize farmers. Data was collected, analysed and reported at a single period in time. Only primary and quantitative data were sourced from smallholder maize farmers at the household level. A questionnaire survey, containing a set of closed and structured questions was used to collect the data and test the relevance of access theory in assessing the effect of supply chain issues on market access among smallholder maize farmers. A theory of access provides a framework for better understanding how individuals or groups of individuals can gain and benefit from available resources and opportunities. The theory advocates that access to available resources and opportunities is the result of the ability, process, structure, agency and design rather than the rights (Ribot & Peluso, 2003). In this study, access theory was used to ascertain how supply chain issues form an integral part of the process, design, structure, agency and ability which affect market access among smallholder maize farmers in the study area.

The data requested from the respondents included specific information on the types of strategies used in the distribution of maize to the ultimate customers, distance from the farm to nearby markets and total transport costs incurred per trip. Moreover, knowledge of marketing skills, the ability in meeting market requirements, the condition of roads and transport facilities, the number of maize producers, participation in farmers' associations and the ability in accessing reliable markets for maize crop were also requested. Binary Logit model was used to establish the probability of market access among smallholder maize farmers from a supply chain perspective. The binary logit model is primarily used to assess the relationship between the variables when the outcome variable is dichotomous and not linearly related to the independent variables (Gujarati 2003). The Binary logit model, and the nature of dependent and independent variables adopted in this study are operationalised in equation 1 and Table 1.

$$\text{Logit}\,[\text{p(x)}] = \text{Log}\left[\frac{\text{p(x)}}{1-\text{p(x)}}\right] = \beta_0 + \beta_1 x_1 \ldots\ldots \beta_p x_{p+e} \quad (1)$$

In the context of this study P_x is the probability of having access to reliable markets, X represents a set of explanatory variables, β are the parameters estimates of the likelihood increase in market access and ε is a disturbance term. The marginal effect of the supply chain issues affecting market access among smallholder maize farmers were estimated based on the following expression derived from the binary logit model as follows: -

$$\frac{dy}{dx} = \beta_1\{P(1 - P_1) \quad (2)$$

From equation 2, β_1 is the coefficient estimated from the binary logit regression with respect to the i[th] factor and P_1 is the estimated probability of smallholder maize farmers' access to markets.

Table 1. Variables definitions and unit of measurement

Variable		**Unit of measurement**
Dependent Variable: Market access		Binary: 1 = have access to reliable markets, 0 = otherwise
Independent Variables:		
X1	Marketing and distribution strategies (1 = indirect channel, 0 = direct channel)	
X2	Distance from the farm to the markets (Distance in km from the farm to the markets)	
X3	Transportation and distribution costs (Cost in Tsh for moving maize per trip from the farm to the markets)	
X4	Quality of agricultural products (1 = if meets quality standards, 0 = otherwise)	
X5	Networking and collaborations (1 = if members of farmers association, 0 = otherwise)	
X6	The extent of competition between supply chains (Number of maize or producers of substitute products)	
X7	Agricultural marketing skills (1 = if have marketing skills, 0 = otherwise)	
X8	Keeping up with customer requirements (1 = if capable, 0 = otherwise)	
X9	Transport facilities and infrastructure (1 = if available in good condition, 0 = otherwise)	

4. Results and Discussion

4.1. Descriptive analysis

Table 2 is the demographic characteristics of household maize farmers sampled for analysis. About 64.12% of household heads were male and 35.88% were female. This analysis implies that the majority of households in the study area are headed by men who are active participants in the production and marketing of agricultural products. Despite a large number of male respondents, agricultural activities in Tanzania context is managed by both males and females (Mchopa *et al.*, (2020; Changalima & Ismail, 2022). The age of respondents ranges between 22 and 76 years. The average age of the sampled households was 48.56 years. This means that agricultural activity is dominated by young and energetic individuals. The sampled households had an average of 6 family members. This may imply either more consumption of maize at home rather than commercialization or more production using available family labour. The analysis further shows that the sampled households were primarily smallholder farmers owing an average of 4.5 acres of land where they grow maize.

Table 2. Characteristics of sampled households

Characteristics	**Mean**	**Minimum**	**Maximum**	**Std. Dev.**
Sex of household head (1 = male, 0 = female)	0.6412	-	-	0.1805
Age of household head (years)	48.5609	22	76	15.0515
Family size (number of household members)	5.5513	3	8	2.9503
Farm size (Acres)	4.7876	2	5	1.9304
Land ownership (1 = own, 0 = otherwise)	0.8675	-	-	0.0189
Farming experience (years)	31.8512	4	51	12.0372
Distance to the farm to the market (Km)	82.40	26.85	120.45	33.0657
Membership of farmers association (1 = yes, 0 = no)	0.4957	-	-	0.1508
Level of education (%):				
Illiteracy	18.11% (n = 65)			
Primary **e**ducation	34.26% (n = 123)			
Secondary **s**chool	38.16% (n = 137)			
Bachelor **d**egree +	9.47% (n = 34)			

About 86.75% of the sampled households own land for agricultural activities while 13.25% depend on hiring. Nevertheless, the sampled households have been involving in the production and marketing of maize crop for an average of 31.85 years. This infers that the sampled households had adequate experience and understanding of the issues that affect market access from different perspectives. The average distance from the farm to the nearby markets is 82.40km. This implies that most of the households are distantly located from the markets. The analysis also shows that only 49.57% of the sampled households are active members of farmers' associations. Lastly, 38.16% (n = 137) as the majority of the sampled smallholder maize farmers had a secondary school education followed by 34.26% (n = 123) with primary education. Only 9.47% (n=34) were bachelor degree holders. This analysis concurs with Osmani and Hossain's (2015) and Changalima and Ismail's (2022) findings that most smallholder farmers possess primary and secondary education.

4.2. Supply Chain Issues and Market Access among Smallholder Maize Farmers

Table 3 presents the parameter estimates which show the relationship between the explanatory variables (supply chain-related issues) and the outcome variable (market access). It is clearly seen that all the supply chain-related issues adopted in this study revealed a significant effect on market access. Four out of nine variables have negative coefficients which imply negative relationships. The remaining five variables have positive coefficients which imply positive relationships. The model fitting information reveals that the model used fits well with the study and explains significant variation in market access among smallholder farmers from a supply chain perspective ($\chi 2 = 0.0001 < \alpha$; LR chi^2 (9) = 35.56; Pseudo $R^2 = 0.556$; Log likelihood = -75.91106). The Variance Inflation Factor (VIF) and Tolerance were carried out to test for multicollinearity across the explanatory variables. A value above 0.1 for tolerance and below 10 for VIF is recommended (Sheskin, 2011). Looking at Table 3, it is shown that the

value of VIF and tolerance were within the recommended thresholds. The average VIF was 1.9858 and the values of tolerance were between 0.4568 and 0.8764. With these results, it can be noted that multicollinearity was not a problem among the explanatory variables. The contribution of supply chain issues on market access among smallholder maize farmers was ascertained using the marginal effects (Table 4). The marginal effects tell the likely effects of the explanatory variables on the outcome variable.

Table 3. Parameter Estimates for Supply Chain Issues Affecting Market Access

Variable	Coefficients	z	Collinearity Statistics	
			Tolerance	VIF
Marketing and distribution strategies	-1.1845*	-3.7635	0.8764	1.9012
	(0.0175)			
Distance from the farm to the market	-0.3477***	-2.9885	0.6563	2.0205
	(0.0534)			
Transportation and distribution costs	-2.5403**	-2.0902	0.7650	2.2523
	(0.0713)			
Quality of agricultural products	0.7055**	4.7613	0.5575	2.0750
	(0.0098)			
Networking and collaborations	4.1359*	3.0117	0.6869	1.8506
	(0.0189)			
Extent of competition between supply chains	-1.0233***	-3.2421	0.8565	1.5875
	(0.0930)			
Agricultural marketing skills	3.0015**	4.1098	0.5995	2.1533
	(0.0158)			
Keeping up with customer requirements	2.6307*	2.7206	0.4568	2.1554
	(0.0265)			
Transport facilities and infrastructure	0.5654***	2.5501	0.6077	1.8763
	(0.0339)			
Constant	1.0835*	4.0323	-	-
	(0.9465)			

Notes: Legends: *, **, *** Donates statistical significance level at $p < 0.1$; $p < 0.05$ and $p < 0.01$ respectively. Standard errors are in parentheses. $\chi 2 = 0.0001 < \alpha$; LR chi^2 (9) = 35.56; Pseudo $R^2 = 0.556$, Log likelihood = -75.91106; Average VIF = 1.9858.

The use of indirect channels in the marketing and distribution of maize revealed a negative and significant effect on market access among smallholder maize farmers ($p = 0.0002$). The findings indicate that indirect marketing and distribution channel decreases the relative probability of market access among smallholder farmers by 8.46%. Therefore, the alternative hypothesis (H1) was supported at a 10% confidence level. This argument is supported by Zhang (2021) and Israel (2022) who regarded the long marketing and distribution channel as one of the contemporary issues which impede effective operation of the agricultural supply chain and market access among smallholder farmers. Indirect marketing and distribution channel limit the opportunity for direct interaction between farmers and customers or retailers and selling agricultural products at higher prices (Changalima and Ismail, 2022; Zhang *et al.,* 2019).

Distance from the farm areas to the markets revealed a negative and significant effect on market access ($p = 0.0018 < 0.01$). A relatively long distance from the farm to the market areas decreases the likelihood of market access among smallholder maize farmers by 4.54%. This led us to accept the alternative hypothesis (H2). The findings are in line with Andaregie *et al.*'s

(2021) and Maziku's (2019) findings who found and posted that the majority of smallholders are distantly located from the market areas. This reduces the chance for market participation and market access among smallholder farmers due to the high costs involved in transportation of agricultural products from the farm to the markets.

Again, the study's findings indicate that higher transportation and distribution costs of maize from the farm decrease the odds of market access by a factor of 4.98% at 0.05 significant level ($p = 0.0004$). The H3 alternative hypothesis was therefore accepted with an assumption that transportation and distribution costs significantly and negatively affect market access among smallholder maize farmers. Studies by Osmani and Hossain (2015) and Nguyen and Kingsbury (2020) also revealed an inverse relationship between transportation costs and market participation among smallholder farmers. Long distances from the farm to the market areas and bad road conditions are the prime issues which significantly contribute to high transportation costs of agricultural products, thus making transportation difficult and costly.

Furthermore, the findings revealed a positive and significant relationship between the quality of maize and market access ($p = 0.0001 < 0.1$). It is shown that better quality of maize increases the probability of market access among smallholders by 9.97%. Therefore, we failed to reject the H4 alternative hypothesis. Smallholder maize farmers can choose to increase the odds of market success by producing, processing, marketing and distributing high-quality maize (Andaregie *et al.,* 2021; Ouma *et al.,* 2020). This can be enhanced by ensuring high quality of agricultural inputs, better control of pesticides and adoption of post-harvest management techniques.

Table 4. Marginal Effects for Supply Chain Issues Affecting Market Access

Variable	Marginal effects (dy/dx)	z	**p>|z|**
Marketing and distribution strategies	-0.0846**	-2.0835	0.0002
	(0.0057)		
Distance from the farm to the market	-0.0454*	-2.1006	0.0018
	(0.0043)		
Transportation and distribution costs	-0.0498***	-3.3115	0.0004
	(0.0217)		
Quality of agricultural products	0.0997*	2.9835	0.0001
	(0.0650)		
Networking and collaborations	0.0425**	5.3094	0.0012
	(0.0086)		
Intensive competitions between supply chains	-0.0256***	-3.5912	0.0030
	(0.0339)		
Agricultural marketing skills	0.0376**	3.1955	0.0001
	(0.0095)		
Keeping up with customer requirements	0.0763***	4.3438	0.0003
	(0.0198)		
Transport facilities and infrastructure	0.0645*	2.8467	0.0004
	(0.0056)		

Notes: Legends: *, **, *** Donates statistical significance level at $p < 0.1$; $p < 0.05$ and $p < 0.01$ respectively. Standard errors are in parentheses.

Networking and collaboration are positive and statistically significant ($p = 0.0012 < 0.05$). It is shown that enhanced collaboration among smallholder maize farmers and other agricultural

supply chain actors increases the possibility of market access by 4.25%. With these results, we accepted the H5 hypothesis. The findings are consistent with Fan and Salas's (2018) and Mesic *et al.'*s (2018) findings. Collaboration and networking help smallholder farmers produce high-quality products and jointly share demand and market information related to quality, price, legal and standards which are vital for market access. Literature regards agricultural marketing co-operatives (AMCOs) as one of the best platforms which foster collaboration, networking and market access among smallholder farmers (Osmani & Hossain, 2015; Zhang *et al.*, 2021).

Further, the findings revealed that the presence of large numbers of maize farmers or producers of substitute products decreases the chance for market access among smallholder maize farmers by 2.56%. Therefore, we rejected the H6 hypothesis at a 0.01 confidence level. Many producers result in plenty supply of maize or related products, thus reducing the likelihood of market access due to intensive competition (Megerssa *et al.*, 2020; Ouma *et al.*, 2020). Farmers who meet the market requirements in terms of cost-effective, quality and timely delivery are more likely to win the markets. To smallholder farmers, this has been one of the contemporary issues because smallholders are less likely to meet these pre-requisite market requirements.

From Table 4, agricultural marketing skills is positive and statistically significant ($p = 0.0001$). This finding suggests that when smallholder maize farmers possess appropriate marketing skills, the possibility for accessing the market increases by 3.76%. Thus, the H7 was supported. Marketing skills specifically on how to attract and retain customers, establish a long-term relationship, market entry strategies and pricing strategies are essentially needed by smallholder farmers to increase the odds of market access. Studies by Matsane and Oyekale (2014) and Ouma *et al.* (2020) revealed that lack of marketing skills impedes smallholder farmers from accessing and harnessing available market opportunities. This is based on the fact that smallholder farmers are less educated, mostly with primary and secondary education.

The study also found a positive and significant relationship between the ability for smallholder maize farmers to meeting customer requirements and market access ($p = 0.0003$). There is a possibility of 7.63% toward increased market access among smallholder maize farmers provided that they keep up with customers' requirements. This can be achieved by ensuring timely delivery and better quality of maize at cost-effective. From this ground, we therefore accepted the H8 hypothesis. The finding concurs with Abdulai *et al.* (2018) and Kyaw *et al.* (2018) who found and reported that smallholder farmers who are capable of meeting the specified objectives of customers along the agricultural supply chain are more likely to win and access the markets for their products.

In addition, good transport facilities and infrastructure revealed a positive and significant effect on market access ($p = 0.0004 < 0.1$). The findings imply that improved transport facilities increase the likelihood of market access by 6.45% at a 10% confidence level. This means that we accepted the H9 alternative hypothesis and reject the null hypothesis. Road transport is the most widely means of transporting agricultural products from the farm to the market areas. Good road condition makes transportation of agricultural products from the farm to the market areas much easier and less expensive. This encourages smallholder maize farmers in transporting their products to the lucrative markets despite the distance that may involve, which in turn increases the odds of market participation (Kyaw *et al.*, 2018; Changalima and Ismail, 2022). Conversely, poor road conditions and inefficient means of transport discourage smallholder farmers from transporting their products, especially to a distantly located market which is associated with high transport costs.

5. Conclusions and Managerial Implications

This study aims at assessing the effect of supply chain-related issues on market access among smallholder maize farmers in Mbozi district, Tanzania. The study's findings indicate

that supply chain-related issues play a significant role (both positive and negative) in influencing market access among smallholder maize farmers. Issues like long marketing and distribution channel, distance from the farm to the market areas, high transportation costs and intensive competition between the supply chains adversely affects market access among smallholder maize farmers. On the other hand, supply chain issues pertained to a better quality of agricultural products, streamlined networking and collaborations among the agricultural supply chain actors, and enhanced marketing skills with the ability to meet the markets and customers' requirements revealed a positive effect. Therefore, the study concludes that supply chain-related issues are important drivers which amplify the likelihood of market access among smallholder maize farmers.

Based on the study's findings, the study highlights some managerial implications. First, smallholder farmers should give due weight towards joining farmers' associations such as AMCOs as one of the essential platforms which enhance networking, collaboration, improved farming and market access capabilities. Farmers' associations eliminate the use of intermediaries and other deficiencies in market access especially when farmers are acting individually whilst enhancing joint problem-solving and market information sharing. Secondly, smallholder farmers should enhance of sense of responsiveness in meeting customers' and market requirements. This can be achieved by producing better quality products and timely delivery at cost-effective. In turn, this will attract and retain more customers. Lastly, the government should ensure road infrastructure is reliable and in good condition, especially in the rural areas where farming mostly take place. This will make transportation of agricultural products from the farm to the market areas easier and more cost-effective.

6. Contribution and Theoretical Implications

To the best of the authors' knowledge, this is the first study which examines the issues which impede market access among smallholder maize farmers in Tanzania context from a supply chain perspective. The subject matter has not been previously researched and documented. Previous studies address the determinants of agricultural and market participation from socio-economic, legal and political perspectives. Using the theory of access, this study addresses and enriches the existing literature on the issues which impede smallholder maize farmers toward market access from supply chain perspectives. The theory of access advocates the ability of individuals to have access to available opportunities or properties based on four dimensions. These are availability, affordability, acceptability and the adequate of the available opportunities, design, structure and process which either enhance or constrain smallholder farmers' efforts toward accessing available market and trade opportunities. From the study's findings, we found that stallholder maize farmers are constrained from accessing markets for their products by some supply chain processes, structures and designs. To smallholder maize farmers, some of the supply chain processes, designs and structures such as transport facilities and transportation costs, distribution channels, competitions, networking and the ability to meet the market requirements are not affordable, not available and acceptable. Therefore, smallholder maize farmers are less likely to meet the prime dimensions of access theory, which in turn affect their ability in accessing markets for their products.

7. Limitations and Suggestions for Future Studies

This study has some limitations despite being achieved the core objectives. Primarily, the study provides a holistic overview of the effect of supply chain-related issues on market access among smallholder maize farmers in the Tanzania context. Therefore, the findings of this study are limited to maize crops in Tanzania context. Other agricultural products than maize were not accounted for. Moreover, the study mainly employed a survey questionnaire and cross-sectional

research design with no consideration of qualitative methods of data collection and analysis. Based on the highlighted limitations, the authors hereby suggest some domains for future studies. First, an exploratory study with a mixed approach should be carried out to assess the influence of supply chain-related issues on market access. Second, the scope of future studies should be expanded to include other areas apart from Mbozi district, other agricultural products and factors that affect market access among smallholders such as socio-economic factors (age, sex, marital status, level of education, *among others*). Lastly, a longitudinal case study can be carried out to ascertain the influence of socio-economic on market participation while accounting for supply chain issues as the mediating variables. This will further enrich the literature on the factors that affect market access and participation among smallholders from different perspectives and approaches.

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