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Small-scale farmers' market constraints in Ghana: influential farm-level contingencies

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ABSTRACT

This study sought to identify significant barriers to market access and marketing connections for small-scale rural farmers, evaluating the impact of demographic factors (gender, education level) and operational factors (years in farming, distance from home, type of commodity) on these constraints. The research employed a cross-sectional descriptive and inferential quantitative approach to examine the barriers to market access and marketing connections among small-scale rural farmers in Ghana's Volta area. The conceptual framework is based on a multi-theory approach. The contingency theory elucidates the significance of farm size, resource availability, and geographic location; the human capital theory delineates the impact of education level and years of farming experience; and the logistics and spatial analysis framework examines how transportation infrastructure, geographic location, and commodity type affect market access and connections. The investigation indicated that inadequate road infrastructure and elevated transportation expenses were the primary obstacles for small-scale rural farmers in accessing markets, with notable disparities based on gender and educational attainment. The commodity kind, years of cultivation, and distance from home substantially influenced limitations. The study concentrated on the Volta region, however the results are probably relevant to other regions in Ghana because of comparable agro-ecological zones and rural socio-economic traits. The rigorous research design, data collection techniques, and comprehensive analysis guarantee dependable and valid outcomes. Notwithstanding possible constraints in generalisability, the research provides comprehensive insights into the distinct issues encountered by small-scale farmers. It emphasises socio-economic factors affecting market access, illustrates the impact of farm-level contingencies on market access and linkages, identifies both diversity and uniformity among small-scale farmers, and addresses a gap in the literature by offering empirical evidence on market access constraints specific to the Volta region that may have global relevance. These contributions are significant for both academic comprehension and practical initiatives aimed at assisting small-scale rural farmers in Ghana and analogous environments worldwide.

Introduction

Ghana's public expenditure on agriculture ranks among the lowest in Africa (Ghana Statistical Service (GSS), 2017; FAO, 2016). These austerity measures significantly impact rural inhabitants, whose primary economic activity is small-scale farming for both subsistence and commercial purposes. Fortunately, akin to many African nations, Ghana has emerged from its complacency and is committed to increasing public expenditure on agricultural. This advancement corresponds with the Maputo/Malabo recommendations aimed at ensuring sustainable and enhanced agricultural productivity that fosters national progress (Kolavalli, Silver, Benin, & Johnson, 2015).

This realisation occurs when the growth of the agricultural sector is perceived as essential for socio-economic advancement (Tanko et al., 2019). The heightened focus on enhancing agricultural productivity in Ghana is warranted for alleviating poverty, augmenting GDP, serving as the principal economic activity for impoverished individuals, and acting as the foremost employer of the labour force in Ghana (Ansah et al., 2020; Tanko et al., 2019; World Bank, 2018).

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Notwithstanding these favourable advancements, there is apprehension that less investment has been allocated to enhancing the agricultural value chain in rural regions where agricultural activity is prevalent (MoFA, 2017). This circumstance unequivocally impacts small-scale farmers' access to Ghana's wholesale markets, compelling them to sell at proximate local, diminutive, unregulated markets (Agrilinks, 2019). While these markets provide farmers with more revenues by selling directly to customers rather than to wholesalers and food processors, farmers frequently incur losses on unsold produce due to inadequate storage facilities (Agrilinks, 2019).

Market access can be improved by disseminating market information to small-scale farmers via the establishment of farmer organisations (Ansah et al., 2020). It is anticipated that access to precise market information facilitates the connection between buyers and sellers. To augment their export capabilities, it is recommended that small-scale rural farmers be formed into cooperatives to maximise their selling potential (Suzuki & Nam, 2019). Export corporations may get agricultural products directly from farmers for the purposes of storage and resale (Suzuki & Nam 2019). In this regard, entities like Ghana Export Trade Company, concentrating on the ECOWAS sub-region (Suzuki & Nam, 2019), may assume a pivotal role.

From the standpoint of a small-scale rural farmer, a paramount problem that should be emphasised in any efforts to enhance production is market connectivity. A robust market connection would resolve their upstream and downstream market access issues (MoFA, 2017). According to MoFA (2017), this would guarantee that heightened output is not squandered and that surplus yield can be marketed at appropriate prices, resulting in improved economic outcomes for small-scale rural farmers and, consequently, their capacity to generate employment. Nonetheless, akin to any undertaking, numerous potential hurdles must be surmounted.

The challenge of this research is to identify these impediments. The enquiries for investigation are: What are the primary limitations to market access for rural small-scale farmers? What is the impact of selected farm and farmer-level parameters, including farmer gender, education level, years of farming experience, distance from home, and kind of commodity cultivated, on the primary restrictions that restrict rural small-scale farmers' market access and linkages? The research sought to identify primary barriers to market access and marketing connections, as well as evaluate the impact of demographic and operational features on these factors.

Literature Review

Theoretical and conceptual background

The underlying theories

A plethora of frameworks exist to guide the study, and we have chosen a combination of some of them, believing that combining insights from these frameworks can offer a thorough insight into the multifaceted constraints on market access and linkages for small-scale rural farmers in Ghana. Firstly, we have chosen the contingency theory proposed by Lawrence and Lorsch (1967) to identify and understand how critical farm-level contingencies affect the ability of small-scale farmers to access markets and establish linkages. Lawrence and Lorsch (1967) posited from a contingency perspective that there is no universally best management method. Instead, the ideal approach is to consider the organisation's environment or contingencies. Among others, the theory emphasises situational variables. For our purpose, we chose farm-level contingencies or variables, namely (i) gender, (ii) education level, (iii) years in farming, (iv) distance from home, and (v) type of commodity to analyse and comprehend small-scale rural farmers' key constraints to market access and marketing linkages because these variables have recently been used by researchers such as Oyetunde-Usman and Shee (2023); Valdes, Gómez and Barrantes (2023); Haile, Gebre and Workye (2022); and Atube, Malinga, Nyeko, Okello, Alarakol and IOkello-Uma (2021) in investigating small scale agricultural businesses. The second is the human capital theory (Smith, 1776; Marshal, 1890; Becker, 1964), which emphasises the role of individual skills, knowledge, and experiences in economic performance. This framework can help analyse how gender, education level, and years in farming impact market access and linkages. Application of this theory helps assess how education levels and years of farming experience influence farmers' ability to access markets and form linkages. It also considers the gender dimension by evaluating how male and female farmers differ in education and experience and how these differences affect their market participation. The third part of the theoretical framework is the Logistics and Spatial Analysis Framework (Christaller, 1933; Alonso, 1964; Hägerstrand, 1967). This theory considers how transportation infrastructure, geographic location, and the type of commodity influence farmers' ability to reach markets. This framework focuses on the geographic and logistical aspects of market access and helps analyse the impact of farm distance from home on market access.

Market access and linkage constraints

Market access constraints refer to the barriers and challenges that impede producers, particularly small-scale farmers, from effectively reaching and participating in markets. Normative assertions suggest that these constraints can be economic, social, institutional, logistical, or environmental and can significantly impact farmers' sales. In the context of small-scale rural farmers, these constraints could manifest in several specific ways. Regarding economic constraints, small-scale farmers will likely lack access to formal financial institutions and credit facilities (Oyetunde-Usman & Shee, 2023). This limitation could restrict them from procuring inputs such as storage and vehicles, leading to prohibitively high costs of transporting goods to distant markets, reducing profitability, and discouraging market participation. Social constraints can manifest in the form of educational barriers and gender differences. For instance, small-scale farmers may have low education levels, limiting their access to market information, while cultural norms and discriminatory practices often obstruct female farmers access to markets (Oyetunde-Usman & Shee, 2023). Another critical constraint

is institutional contingencies, such as weak or non-existent cooperatives and networks (Oyetunde-Usman & Shee, 2023). While farmer cooperatives might exist, they often suffer from poor management and limited support resources such as extension services and financing (Oyetunde-Usman & Shee, 2023; Valdes et al., 2023; Haile et al., 2022; Atube et al., 2021), reducing their effectiveness in market access. Similarly, farmers might receive insufficient or inadequate agricultural extension services (Oyetunde-Usman & Shee, 2023; Valdes et al., 2023; Haile et al., 2022; Atube et al., 2021), leading to gaps in knowledge and skills necessary for improving marketability. One of the prominent and crucial problems for rural farmers is logistical constraints. This factor is critical because inadequate or poor rural infrastructure, including roads and transportation networks, could make it difficult for farmers to transport their produce to urban markets. Linked to this is the geographic isolation due to rural farmers and their farms being in remote areas with typically bad roads, which introduce additional challenges in reaching markets and likely lead to increased transportation costs. Finally, one cannot forget environmental factors such as climate change impacts causing variability in weather patterns, including unpredictable rainfall, which naturally affects crop yields and quality, making it harder for farmers to meet market demands consistently and natural resource degradation issues such as soil erosion and depletion of soil fertility that reduce agricultural productivity and limit market access opportunities.

Besides the above normative assertions, several studies in other contexts have empirically explored factors influencing small-scale farmers' access to the market and identified various constraints. For example, Regasa, Negash, Bekele, Nemera, and Yildiz's (2020) study in Southwest Ethiopia revealed that age, household size, education level, and distance are obstacles to market participation. Hagos, Dibaba, Bekele, and Alemu's (2019) research, also in Ethiopia, identified resource ownership (land allocated), household assets ownership, access to institutions, social networks, and economic factors like previous income from farm produce and market price emerged as the significant obstacles to market participation. A study by Mmbando and Baiyegunhi (2015) in Tanzania identified transportation, market information, and financial services as significant market access constraints for small-scale farmers. The study suggests improving rural infrastructure and providing better financial and information services to enhance market access.

Effect of farm-level contingencies on market access and linkage constraints

Studies have also empirically explored the influence of farm and farmer contingencies on market access constraints of rural farmers. Recently, Oyetunde-Usman and Shee (2023), Valdes et al. (2023), Haile et al. (2022), and Atube et al. (2021) have added to the empirical literature connecting farm-level contingencies to constraints to market access and linkage. Oyetunde-Usman and Shee (2023) examined decisions and practices for the adoption of agricultural innovation among rural farmers in Nigeria. The results highlight the importance of innovation adoption in agricultural practices in rural areas, supported by farm and farmer-level characteristics like education, household wealth and access to extension services, in enhancing market access and productivity in developing countries. Valdes et al.'s (2023) study in Chile highlighted farmer characteristics like education that improve market access and productivity in developing countries. In the case of Atube et al. (2021), they found that in Uganda, farm-level contingencies such as marital status, gender, household size, and experience in farming are intricately related to market access constraints. Haile et al. (2022) examined the factors influencing market participation among small-scale farmers in Southwest Ethiopia. They found that education level, farming experience, distance to market, access to finance, gender, and family size influenced market access. The researchers, therefore, concluded that understanding socio-economic factors like farm-level contingencies and their extent is essential for addressing constraints to market access.

These studies provide valuable insights into the various farm and farmer contingencies that influence market access constraints, offering evidence-based recommendations for improving market participation among rural farmers. They highlight the farm and farmer contingencies that constrain market access. They suggest that addressing these factors through targeted interventions can significantly improve market access for rural farmers.

The conceptual framework

The discussion so far leads to the conceptual framework depicted in Figure 1. The thesis statement is that the various factors limit small-scale rural farmers' market access and marketing linkages and are contingent on farmer gender, education level, years in farming and farm distance from home and commodity type. These assertions are based on normative assertions alluded to in the literature review above (see Oyetunde-Usman & Shee, 2023; Valdes et al., 2023; Haile et al., 2022; Atube et al., 2021) foundational theories (see Smith, 1776; Marshal, 1890; Christaller, 1933; Alonso, 1964; Becker, 1964; Hägerstrand, 1967; Lawrence & Lorsch 1967) and empirical evidence (see Oyetunde-Usman & Shee, 2023; Valdes et al., 2023; Haile et al., 2022; Atube et al., 2021; Regasa et al., 2020; Hagos et al., 2019; Mmbando & Baiyegunhi, 2015).

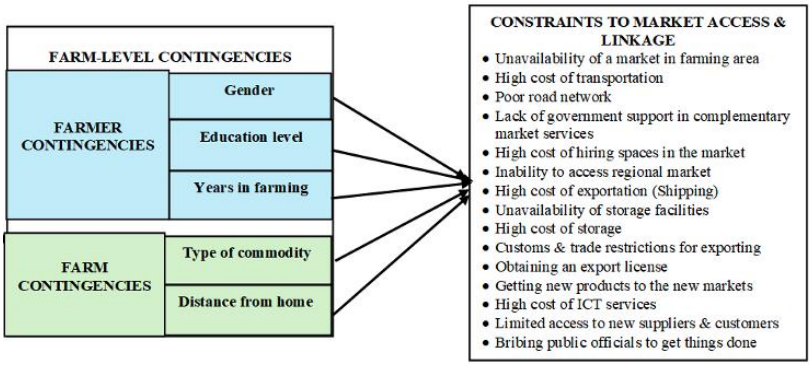

Figure 1: The conceptual framework

Methodology

This study adopted a cross-sectional, descriptive and inferential quantitative research design to systematically quantify and analyse the constraints to market access and marketing linkages among small-scale rural farmers in Ghana. The sample consisted of farmers selected through stratified random sampling to ensure representation across demographics (gender, education level) and operational characteristics (years farming, distance from home, commodity type). Data was collected via a structured questionnaire capturing farmers' perceptions of market access constraints severity using Likert scales and demographic and operational details. Descriptive statistics summarised sample characteristics and ranked constraints. Inferential analyses included independent t-tests to assess gender differences, ANOVA for education level and commodity type, and linear regression to examine associations between years of farming and distance from home. This multi-pronged quantitative approach allowed for the comprehensive identification of key constraints and the influence of demographic/operational factors on perceived market access barriers among small-scale Ghanaian farmers.

The sample consisted of small-scale rural farmers selected through stratified random sampling to ensure representation across various demographics (gender, education level) and operational characteristics (years in farming, distance from home, type of commodity). This sampling method will facilitate the comparison and analysis of the influence of these variables on market access constraints.

A structured questionnaire was developed to collect quantitative data on farmers' perceptions of the severity and importance of various market access constraints. The questionnaire also gathered demographic information and details about the farmers' operations to analyse the influence of gender, education level, years in farming, distance from home, and type of commodity on perceived constraints. Likert-scale questions were used to rank the severity and importance of various market access constraints. Multiple-choice and demographic questions were used to gather information on gender, education level, years in farming, distance from home, and type of commodity produced.

Data was analysed using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive and inferential statistical analyses were implemented to examine the constraints to market access and their associations with demographic and operational variables among small-scale rural farmers. Descriptive statistics, including means and standard deviations, were used to rank the severity of various market access constraints, providing an overview of the most pressing issues faced by the farmers. Inferential statistics included several methods to test the relationships between identified constraints and influencing factors. Independent t-tests were performed to assess the differences in market access constraints between male and female farmers, revealing statistically significant differences in constraints such as the unavailability of a market in the farming area, high transportation costs, and lack of government support in complementary market services. Analysis of Variance (ANOVA) was used to compare means among different educational levels and types of commodities, uncovering significant differences in several constraints, indicating that education level and type of commodity significantly influence perceived constraints. Linear regression analyses evaluated the relationship between years of farming, distance from home, and market access constraints. The results highlighted significant associations, such as the influence of years of farming on the severity of poor road networks and high cost of storage, and the impact of distance from home on constraints like unavailability of storage facilities and high cost of transportation. These inferential statistical techniques helped identify the key factors influencing market access constraints and provided a comprehensive understanding of the challenges faced by small-scale rural farmers. A p-value ≤ 0.05 was considered statistically significant.

Results and Discussion

This section presents the findings and discussion based on the analysis of market access constraints among small-scale rural farmers, as detailed in Tables 1 to 6. The study aimed to identify key constraints and explore how demographic and operational variables influence these constraints.

Descriptive analysis of market access constraints

As can be seen in Table 1, the analysis revealed that "poor road network" and "high cost of transportation" were the most pressing constraints, with mean scores of 4.20 and 4.17, respectively. Other significant constraints included "high cost of storage" (mean = 3.55), "unavailability of storage facilities" (mean = 3.75), and "lack of government support in complementary market services" (mean = 3.53). These findings indicate that infrastructural issues and financial burdens significantly impede market access for small-scale farmers.

The findings underscore the multifaceted nature of market access constraints among small-scale rural farmers. Infrastructural deficits, particularly poor road networks and high transportation costs, emerge as primary barriers. These findings are consistent with similar studies in rural development, which emphasise the critical role of infrastructure in enabling market access and reducing operational costs for farmers((Edeme, Nkalu, Idenyi & Arazu, 2020; Kaiser & Barstow, 2022). These infrastructural challenges limit farmers' ability to reach markets and inflate the costs of getting their products to buyers, reducing their profitability(Wu, Guan, Zhang & Xu, 2019; Bonuedi, Kornher & Gerber, 2022).

Table 1: Constraints to market access by ranking

Constraints to Market Access	Range	Min, Max	Mean ± SD	St. Error	Variance
Bribing public officials to get things done	5	1,5	2.79±1.29	0.068	1.653
High cost of ICT services	5	1,5	2.83±1.01	0.053	1.013
Getting new products to the new markets	5	1,5	2.90±1.00	0.053	1.008
Limited access to new suppliers and customers	5	1,5	2.99±0.89	0.047	0.799
High cost of hiring spaces in the market	5	1,5	3.05±0.85	0.045	0.726
Inability to access regional market	5	1,5	3.11±1.06	0.056	1.124
Customs and trade restrictions for exporting	5	1,5	3.24±1.04	0.055	1.074
High cost of exportation (Shipping)	5	1,5	3.32±1.14	0.061	1.302
Obtaining an export license	5	1,5	3.33±1.12	0.059	1.255
Unavailability of a market in farming area	5	1,5	3.38±1.11	0.059	1.225
Lack of government support in complementary market services	5	1,5	3.53±1.08	0.057	1.159
High cost of storage	5	1,5	3.55±0.92	0.049	0.841
Unavailability of storage facilities	5	1,5	3.75±0.92	0.049	0.851
High cost of transportation	5	1,5	4.17±0.76	0.04	0.578
Poor road network	5	1,5	4.20±0.87	0.046	0.754

***Min**=Minimum; **Max**=Maximum; **SD**=Standard Deviation; **St. Error**= Standard Error*

Influence of gender on market access constraints

The independent t-test results showed significant gender differences in several market access constraints. Male farmers reported greater challenges with the unavailability of a market in the farming area (mean = 3.47, SD = 1.13) than female farmers (mean = 3.20, SD = 1.01; p = 0.043). Similarly, males perceived the high cost of transportation more severely (male mean = 4.23, SD = 0.78; female mean = 4.02, SD = 0.81; p = 0.018). Additionally, males reported higher scores for lack of government support in complementary market services (male mean = 3.91, SD = 1.20; female mean = 3.40, SD = 1.07; p = 0.001). These results suggest that male farmers experience higher barriers to market access than their female counterparts.

The gender disparity in perceived constraints highlights the need for targeted interventions that address male farmers' unique challenges. Enhanced support and tailored policies are crucial to mitigate these gender-specific barriers and promote equitable market access. Research indicates that gender-sensitive policies and programs can significantly improve rural farmers' market participation and income levels (Bello, Baiyegunhi, Danso-Abbeam & Ogundeji, 2021; Adeyeye, Fabusoro, Sodiya & Fapojuwo, 2021).

This finding also aligns with Lawrence and Lorsch's (1967) contingency theory by demonstrating how farm-level factors like gender influence market access. It emphasises the need for gender-specific or sensitive interventions.

Table 2: Association between the constraints to market access and gender

Constraints to Market Access	Gender		t-test	p-value
	Male	Female		
	Mean ± SD	Mean ± SD		
Unavailability of a market in farming area	3.47±1.13	3.20±1.010	2.029	**0.043***
High cost of transportation	4.23±0.670	4.02±0.947	2.370	**0.018***
Poor road network	4.15±0.889	4.32±0.819	1.640	0.102
Lack of government support in complementary market services	3.40±1.063	3.91±1.011	4.102	**0.001***
High cost of hiring spaces in the market	3.03±0.886	3.10±0.776	0.683	0.495
Inability to access regional market	3.20±0.992	2.85±1.190	2.801	**0.005***
High cost of exportation (Shipping)	3.34±1.096	3.27±1.268	0.494	0.621
Unavailability of storage facilities	3.75±0.938	3.71±0.872	0.366	0.714
High cost of storage	3.54±0.906	3.55±0.929	0.073	0.942
Customs and trade restrictions for exporting	3.12±0.993	3.55±1.100	3.517	**0.001***
Obtaining an export license	3.35±1.167	3.28±1.011	0.487	0.627
Getting new products to the new markets	2.92±0.979	2.85±1.082	0.639	0.523
High cost of ICT services	2.79±1.001	2.93±1.033	1.192	0.234
Limited access to new suppliers and customers	2.93±0.835	3.12±1.033	1.776	0.077
Giving gifts to public officials to get things done	2.83±1.240	2.74±1.382	0.610	0.542
Overall Intensity of constraints	3.24±0.695	3.26±0.679	0.311	0.756

**Statistically significant (p≤0.05); t-test=Independent t-test*

Influence of education level on market access constraints

ANOVA analysis indicated significant differences in perceived constraints based on education level. Farmers with Elementary Education faced more severe constraints, such as the unavailability of a market in the farming area (mean = 3.56) compared to those with higher education levels ($p < 0.05$). The high cost of transportation was significantly high across all educational levels. Notably, those with elementary education reported higher mean scores for the high cost of exportation (mean = 3.61) and obtaining an export license (mean = 3.62) than those with tertiary education. These findings highlight that educational attainment is crucial to farmers' ability to navigate market access challenges.

Educational attainment significantly influences farmers' perceptions of market access constraints. Farmers with higher education levels generally reported fewer constraints, suggesting that education enhances farmers' ability to navigate and mitigate market challenges. This finding aligns with studies demonstrating the positive impact of education on farmers' productivity and market engagement (Asfaw, Shiferaw, Simtowe & Lipper, 2012; Wossen et al., 2017). This result emphasises the importance of educational programs and extension services to empower farmers with the knowledge and skills necessary to overcome market barriers.

The finding also aligns with human capital theory (Smith, 1776; Marshal, 1890; Becker, 1964), which emphasises the role of individual skills and knowledge in economic performance. The significant differences based on education level highlight the importance of human capital in improving market access. More educated farmers are better equipped to navigate market constraints.

Table 3: Association between the constraints to market access and educational level

Constraints to Market Access	Educational Level				ANOVA	p-value
	No formal education	Elementary Education	Senior High	Tertiary		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Unavailability of a market in farming area	2.75±0.914	3.56±0.968	3.43±1.104	3.54±1.215	8.586	**0.001***
High cost of transportation	4.05±0.699	4.29±0.633	4.01±0.917	4.30±0.692	3.855	**0.010***
Poor road network	4.37±0.688	4.04±0.972	4.14±0.745	4.31±0.955	2.538	0.056
Lack of government support in complementary market services	2.78±0.885	3.60±1.030	3.75±1.166	3.70±0.942	13.103	**0.001***
High cost of hiring spaces in the market	3.23±0.767	3.15±0.703	3.03±0.789	2.87±1.046	2.908	**0.035***
Inability to access regional market	3.15±1.087	3.01±1.141	3.21±0.871	3.07±1.145	0.624	0.600
High cost of exportation (Shipping)	2.88±0.904	3.61±1.322	3.13±1.123	3.51±0.994	7.084	**0.001***
Unavailability of storage facilities	3.97±0.736	3.84±0.954	3.76±0.720	3.51±1.119	3.828	**0.010***
High cost of storage	3.63±1.119	3.88±0.505	3.23±0.984	3.53±0.907	9.168	**0.001***
Customs and trade restrictions for exporting	3.10±0.706	3.51±1.242	3.16±1.032	3.14±0.958	3.072	**0.028***
Obtaining an export license	3.12±0.958	3.62±1.069	3.15±1.155	3.36±1.173	3.807	**0.010***
Getting new products to the new markets	2.87±0.676	3.33±1.121	2.77±0.922	2.66±1.022	8.778	**0.001***
High cost of ICT services	2.87±0.566	3.12±1.135	2.57±0.907	2.80±1.116	5.071	**0.002***
Limited access to new suppliers and customers	2.85±0.860	3.28±0.944	2.81±0.931	2.97±0.762	5.228	**0.002***
Bribing public officials to get things done	2.65±1.338	2.80±1.396	2.74±1.258	2.92±1.175	0.631	0.595
Overall Intensity of constraints	3.07±0.516	3.55±0.633	3.10±0.711	3.20±0.714	10.047	**0.001***

**Statistically significant (p≤0.05); ANOVA=Analysis of variance*

Influence of commodity type on market access constraints

Farmers involved in crop and livestock production reported lower mean scores for several constraints than those engaged solely in crop or livestock farming. For instance, the mean score for the unavailability of a market in the farming area was highest among livestock-only farmers (mean = 4.00) and lowest among those involved in crop and livestock farming (mean = 3.20; p = 0.001). Additionally, the mean score for the high cost of transportation was highest among livestock-only farmers (mean = 5.00) and lowest among those involved in both crop and livestock farming (mean = 4.11; p = 0.044). Furthermore, the mean score for lack of government support in complementary market services was highest among livestock-only farmers (mean = 4.00) and lowest among those involved in both crop and livestock farming (mean = 3.42; p = 0.040). This finding suggests that diversified farming might mitigate some market access challenges.

The type of commodity produced also affects market access constraints, with diversified farmers facing fewer challenges. This suggests that diversification in farming operations can be a viable strategy to mitigate risks and enhance market access. Studies have shown that diversification helps spread risk and improve resilience against market and climate shocks (Thornton & Herrero, 2015; Barman, Saha, Patel & Bera, 2022; Tacconi, Waha, Ojeda & Leith, 2022). Policies encouraging diversification and providing support for mixed farming systems could be beneficial.

The finding supports Lawrence and Lorsch's (1967) contingency theory by demonstrating how farm-level factors like commodity type influence farmers' market access. It emphasises the need for commodity-specific interventions.

Table 4: Association between the constraints to market access and type of commodity

Constraints to Market Access	Type of commodity			ANOVA	p-value
	Crop only	Livestock only	Both Crop and Livestock		
	Mean ± SD	Mean ± SD	Mean ± SD		
Unavailability of a market in farming area	3.66±1.069	4.00±0.000	3.20±1.102	7.713	**0.001***
High cost of transportation	4.25±0.832	5.00±0.000	4.11±0.709	3.162	**0.044***
Poor road network	4.39±0.758	4.00±0.000	4.09±0.917	4.967	**0.007***
Lack of government support in complementary market services	3.70±0.817	4.00±0.000	3.42±1.200	3.247	**0.040***
High cost of hiring spaces in the market	3.14±0.987	3.00±0.000	3.00±0.765	1.062	0.347
Inability to access regional market	3.08±1.067	2.00±0.000	3.14±1.057	1.813	0.165
High cost of exportation (Shipping)	3.32±1.168	1.00±0.000	3.35±1.102	6.469	**0.002***
Unavailability of storage facilities	3.81±0.934	1.00±0.000	3.75±0.865	14.670	**0.001***
High cost of storage	3.28±1.128	4.00±0.000	3.71±0.726	9.845	**0.001***
Customs and trade restrictions for exporting	3.33±1.001	3.00±0.000	3.18±1.061	0.961	0.384
Obtaining an export license	3.56±1.093	5.00±0.000	3.16±1.102	8.942	**0.001***
Getting new products to the new markets	3.09±0.992	4.00±0.000	2.78±0.993	5.993	**0.003***
High cost of ICT services	2.92±1.077	3.00±0.000	2.77±0.967	0.887	0.413
Limited access to new suppliers and customers	3.08±0.905	4.00±0.000	2.92±0.882	3.269	**0.039***
Giving gifts to public officials to get things done	3.20±1.363	2.00±0.000	2.55±1.179	11.958	**0.001***
Overall Intensity of constraints	3.42±0.689	4.00±0.000	3.12±0.661	10.294	**0.001***

**Statistically significant (p≤0.05); ANOVA=Analysis of variance*

Influence of years of farming on market access constraints

Linear regression analysis (see Table 5) demonstrated that years of farming significantly influenced several market access constraints. Notably, longer years of farming experience were associated with greater challenges related to poor road network ($\beta = 0.116$, $p = 0.031$) and high cost of storage ($\beta = 0.128$, $p = 0.025$). Conversely, experienced farmers reported fewer problems with a lack of government support in complementary market services ($\beta = -0.288$, $p = 0.001$) and unavailability of storage facilities ($\beta = -0.168$, $p = 0.004$) (see Table 5). These findings suggest that while more experienced farmers face persistent infrastructural issues, they may have developed better strategies or resources to cope with certain logistical and support-related challenges.

Experience in farming correlates with certain constraints (see Table 5), indicating that seasoned farmers might have developed better coping mechanisms over time. However, persistent infrastructural challenges suggest that long-term solutions require substantial rural infrastructure and logistics investment. This aligns with literature emphasising the need for sustained investment in rural infrastructure to improve market access and economic outcomes for farmers (IFAD, 2019).

The finding also aligns with human capital theory (Smith, 1776; Marshal, 1890; Becker, 1964), emphasising individual experiences' role in economic performance. The significant differences based on years of farming highlight the importance of human capital in improving market access. More experienced farmers are better equipped to navigate market constraints.

Table 5: Association between the constraints to market access and years of farming

Constraints to Market Access	Years of farming		95% CI		p-value
	Coefficients[a]				
	Unstandardised	*Standardised*	Lower	Upper	
Unavailability of a market in farming area	0.029	0.019	-0.168	0.225	0.775
High cost of transportation	0.040	0.018	-0.207	0.288	0.748
Poor road network	0.227	0.116	0.021	0.434	**0.031***
Lack of government support in complementary market services	-0.453	-0.288	-0.654	-0.252	**0.001***
High cost of hiring spaces in the market	0.228	0.115	0.003	0.453	**0.047***
Inability to access regional market	-0.039	-0.025	-0.217	0.138	0.663
High cost of exportation (Shipping)	0.023	0.015	-0.155	0.201	0.800
Unavailability of storage facilities	-0.310	-0.168	-0.520	-0.100	**0.004***
High cost of storage	0.237	0.128	0.029	0.444	**0.025***
Customs and trade restrictions for exporting	0.142	0.087	-0.071	0.355	0.190
Obtaining an export license	-0.092	-0.061	-0.325	0.140	0.436
Getting new products to the new markets	0.333	0.197	0.119	0.547	**0.002***
High cost of ICT services	0.081	0.048	-0.114	0.275	0.415
Limited access to new suppliers and customers	-0.054	-0.028	-0.270	0.162	0.623
Giving gifts to public officials to get things done	-0.187	-0.142	-0.362	-0.013	**0.035***
Overall Intensity of constraints	0.712	0.288	0.254	1.169	**0.002***

**Statistically significant (p≤0.05); a. Estimated linear regression coefficients: Unstandardised & Standardised.*

Influence of distance from home on market access constraints

The regression analysis also highlighted the significant impact of the distance from home to the market on several constraints (see Table 6). Farmers located further from the market faced increased difficulties with the unavailability of a market in the farming area ($\beta = 0.235$, $p = 0.001$) and poor road network ($\beta = 0.175$, $p = 0.002$). Conversely, those further from the market reported fewer issues with lack of government support in complementary market services ($\beta = -0.295$, $p = 0.001$) and unavailability of storage facilities ($\beta = -0.190$, $p = 0.002$) (see Table 6). This indicates that proximity to markets exacerbates certain logistical challenges but might provide better access to government support and storage facilities.

Finally, the distance from home to the market plays a critical role in shaping market access constraints. Proximity to markets provides better access to support services but also exacerbates logistical issues. This finding is supported by studies that highlight the impact of distance on market participation and the importance of improving rural transportation networks (Stifel & Minten, 2017; Manda, Azzarri, Feleke, Kotu, Claessens & Bekunda, 2021). This calls for a balanced approach in rural development policies, ensuring that farmers, irrespective of their location, have adequate access to infrastructure and support services.

This finding aligns with the Logistics and Spatial Analysis Framework (Christaller, 1933; Alonso, 1964; Hägerstrand, 1967). The impact of transportation infrastructure and geographic location on market access underscores the relevance of logistics and spatial analysis in agricultural economics. This reinforces the need to consider physical and logistical barriers when developing market access strategies.

Table 6: Association between the constraints to market access and distance from home

Constraints to Market Access	Distance from home		95% CI		p-value
	Coefficients[a]				
	Unstandardised	*Standardised*	Lower	Upper	
Unavailability of a market in farming area	0.284	0.235	0.124	0.444	**0.001***
High cost of transportation	-0.177	-0.100	-0.378	0.024	0.084
Poor road network	0.270	0.175	0.102	0.437	**0.002***
Lack of government support in complementary market services	-0.367	-0.295	-0.531	-0.204	**0.001***
High cost of hiring spaces in the market	-0.080	-0.051	-0.263	0.103	0.390
Inability to access regional market	-0.072	-0.057	-0.217	0.072	0.325
High cost of exportation (Shipping)	0.067	0.057	-0.078	0.212	0.365
Unavailability of storage facilities	-0.276	-0.190	-0.446	-0.105	**0.002***
High cost of storage	0.127	0.087	-0.041	0.296	0.138
Customs and trade restrictions for exporting	0.099	0.077	-0.074	0.272	0.262
Obtaining an export license	-0.362	-0.303	-0.552	-0.173	**0.001***
Getting new products to the new markets	0.075	0.056	-0.099	0.249	0.397
High cost of ICT services	-0.005	-0.004	-0.163	0.153	0.951
Limited access to new suppliers and customers	-0.062	-0.041	-0.237	0.114	0.491
Giving gifts to public officials to get things done	0.051	0.049	-0.091	0.193	0.481
Overall Intensity of constraints	-0.079	-0.041	-0.451	0.293	0.676

**Statistically significant (p≤0.05); a. Estimated linear regression coefficients: Unstandardised & Standardised.*

Value of the study

Even if context specificity compromises generalisability, the research provides a detailed and nuanced understanding of the unique challenges faced by small-scale farmers in the Volta region by highlighting the specific socio-economic factors influencing market access in the Volta region. It shows how farm-level contingencies such as farm size, resource availability, and individual farmer characteristics impact market access and linkages. It further identified both heterogeneity and homogeneity among small-scale farmers and how different factors contribute to their ability to access markets. The study further fills a gap in the existing literature by providing empirical evidence on market access constraints specific to the Volta region of Ghana. These contributions make the research valuable to both academic understanding and practical efforts to support small-scale rural farmers in Ghana and similar contexts globally.

Implications

For theory

This research result has various implications for theory, practice, and policy. Firstly, the findings support the contingency theory by demonstrating how farm-level factors like farm size, resource availability, and geographic location influence market access. It emphasises the need for context-specific interventions tailored to these contingencies. The significant differences based on education level highlight the importance of human capital in improving market access. More educated farmers are better equipped to navigate market constraints. The impact of transportation infrastructure and geographic location on market access underscores the relevance of logistics and spatial analysis in agricultural economics. This reinforces the need to consider physical and logistical barriers when developing market access strategies.

In terms of practice, the results show that road networks and transportation infrastructure are crucial for enhancing market access for small-scale rural farmers. This is necessary to reduce transportation costs and facilitate more accessibility to markets. It also shows

that investing in farmer education and training programs can empower farmers with the knowledge and skills needed to overcome market access barriers. This includes training on market information, financial literacy, and business management. Tailoring support programs to specific types of commodities can address unique challenges associated with different crops or livestock. This ensures more effective interventions catering to diverse farming operations' needs.

For policy and practice

First is the need to improve rural Infrastructure. The government needs to invest in constructing and maintaining rural roads and transportation facilities to reduce costs and improve market access for small-scale farmers. Secondly, farmer education and training need to be introduced. The need to develop and implement comprehensive training programs focused on market access, business management, and financial literacy, with special emphasis on reaching women and less-educated farmers, is critical. We also recommend that relevant government agencies introduce commodity-specific support programs. These programs must cater to the unique needs of different commodities, ensuring that interventions are appropriate and effective for various farming operations. Policy reforms are also required for inclusive growth. In this regard, advocacy groups must lobby for policy reforms that address gender and educational disparities in agriculture, ensuring that all farmers have equal opportunities to access markets and benefit from agricultural development programs. Last but not least is the need to strengthen market linkages for small-scale farmers. To this end, programs like planting jobs and food must be supported to facilitate the establishment of cooperatives and farmer associations that can enhance collective bargaining power, reduce transaction costs, and improve market linkages for small-scale farmers.

Conclusion

The study aimed to identify the primary constraints faced by small-scale rural farmers in accessing markets and establishing marketing linkages, as well as to examine how these constraints are affected by farmer-level factors (gender, education, years of farming experience) and farm-related factors (distance from home and type of commodity). Additionally, the findings were analysed in light of existing empirical research and through the lens of three complementary theories: contingency theory, human capital theory, and the logistics and spatial analysis framework.

Infrastructural deficiencies and financial impediments, including inadequate road networks, elevated transportation costs, substantial storage expenses, and a lack of storage facilities, are identified as the primary barriers to market access for small-scale rural farmers. Furthermore, it is determined that farmer-specific factors (gender, educational attainment, years of farming experience) and farm-related factors (proximity to home and commodity type) significantly affect the nature and intensity of market access and linkage limitations. The findings align with existing literature. Moreover, it is determined that the results align with theoretical frameworks. Firstly, it corresponds with human capital theory (Smith, 1776; Marshall, 1890; Becker, 1964), which underscores the significance of individual skills, knowledge, and experience in economic performance; hence, more educated farmers are better prepared to address market restrictions. This corresponds with Lawrence and Lorsch's (1967) contingency theory by illustrating how farm-level variables, such as farmer gender and commodity type, affect farmers' market access. In conclusion, it is consistent with the Logistics and Spatial Analysis Framework (Christaller, 1933; Alonso, 1964; Hägerstrand, 1967). The influence of transportation infrastructure and geographic location on market access highlights the importance of logistics and spatial analysis in agricultural economics, emphasising the necessity of addressing physical and logistical constraints in the formulation of market access strategies.

The study underscores the necessity for comprehensive, multidimensional efforts to enhance market access for small-scale rural farmers. Mitigating infrastructural deficiencies, advancing educational initiatives, fostering diversification, and delivering specialised assistance to male farmers are crucial measures for improving market connections and comprehensive agricultural progress. These initiatives must be integrated into a comprehensive framework for rural development focused on alleviating poverty and enhancing livelihoods in rural regions.

Limitations

Geographical specificity fosters a more refined comprehension of a phenomenon. Nonetheless, restricting the sampling to the Volta area may prompt detractors to argue that it may impact the generalisability of the findings to other regions of Ghana. Nonetheless, this may not hold true, as farm-level contingencies in Ghana exhibit minimal variation owing to the similarities in the nation's agro-ecological zones and rural socio-economic attributes. The meticulously chosen research design, rigorous data gathering techniques, and comprehensive analysis utilised in the study have facilitated the acquisition of dependable and legitimate results.

Future research

Considering the results and the evident potential constraints of the study, the subsequent research choices arise. The initial requirement is for an enlarged geographic scope. Comparable studies may be undertaken in other regions of Ghana to evaluate restrictions and see if the findings from the Volta region are applicable to areas with varying agro-ecological zones and socio-economic situations. Longitudinal studies may be employed to monitor alterations in market access limitations across time. This can elucidate the long-term effects of interventions and policies, if applicable, on small-scale rural farmers. Comprehensive qualitative analysis can enhance quantitative studies through qualitative research methodologies, including interviews and focus group discussions, to obtain profound insights into farmers' personal experiences and perceptions of market access obstacles. Future

research may examine the impact of digital technology, like mobile phones and internet connectivity, on improving market access for small-scale farmers. This may encompass examining the efficacy of digital marketplaces and information distribution platforms.

Subsequent research may investigate the influence of farmer cooperatives and associations on market access and connections by evaluating how collective action might alleviate individual limitations and enhance bargaining strength. Future researchers should consider conducting gender-specific studies to investigate the distinct obstacles encountered by women farmers and to formulate focused solutions that address their particular needs and limitations. Another intriguing research domain pertains to the effects of climate change on market access limitations. This involves evaluating the impact of shifting weather patterns and environmental variables on transportation infrastructure and agricultural profitability. Cost-benefit assessments can be conducted on interventions like employment creation and food production in Ghana to enhance market access and assess economic efficiency. Examining the complete supply chain from production to market to uncover bottlenecks and inefficiencies that hinder small-scale farmers' market access is a compelling idea. A pertinent inquiry is the effectiveness of current rural agriculture promotion initiatives in Ghana. Addressing this question necessitates the evaluation of policy impacts. Future study may concentrate on evaluating current agricultural and rural development programs to determine their efficacy in mitigating market access barriers. This can enhance policy frameworks to more effectively support small-scale rural farmers. By examining these domains, forthcoming research can yield a more thorough comprehension of the determinants influencing market access for small-scale rural farmers and aid in formulating more efficacious strategies and policies.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions.

Conflicts of Interest: In the interest of full transparency, the authors of this study declare that there are no competing interests, either financial, personal, or professional, that might be perceived to have influenced the research. This declaration covers potential conflicts such as financial stakes in entities involved in the study, advisory roles, personal relationships, or affiliations that could be seen to affect the objectivity of the research. This study was conducted independently, with no external funding or influence that could have swayed the design, analysis, interpretation, or reporting of the findings. The authors are solely responsible for the content and writing of this paper. This disclosure is in accordance with ethical standards of research and publication.

Anonymity and Confidentiality: *T*o safeguard the personality of participants, items that can be used to identify them were kept hidden from everyone. Deliberate measures were taken to ensure that participants could not be linked to their data. The researcher was certain that the data collected did not contain personal information that could be used to identify respondents elsewhere. This level of anonymity protects their interests and personalities.

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