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FACTORS INFLUENCING PARTICIPATION OF SMALLHOLDER GREEN GRAM FARMERS IN WAREHOUSE RECEIPT SYSTEM IN MISUNGWI DISTRICT, TANZANIA

By

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Abstract

Purpose of the Study: *This study examined the factors influencing smallholder green gram farmers' participation in the Warehouse Receipt System (WRS) in Misungwi District, Tanzania, focusing on access to market information, distance from farms to warehouses, and selling price expectations.*

Methodology: *A cross-sectional survey design was used, targeting 172 registered smallholder farmers selected through simple random sampling from a population of 312. Data were collected using structured questionnaires and analyzed with descriptive statistics, correlation, and multiple regression techniques.*

Findings: *All three factors significantly influenced farmers' participation in the WRS. Selling price expectation had the strongest effect on participation ($\beta = 0.550$, $p < 0.001$), followed by access to market information ($\beta = 0.203$, $p < 0.001$) and distance from farms to warehouses ($\beta = 0.191$, $p = 0.001$). The results indicate that farmers who expect higher prices, have better access to reliable market information, and are located closer to warehouses are more likely to participate in the system. These findings highlight that economic incentives, information access, and logistical considerations are critical determinants of WRS adoption among smallholder green gram farmers.*

Originality: *Unlike prior studies focusing on coffee or grains, this research provides empirical evidence on determinants of WRS participation specifically for green gram farmers in Tanzania, using a mixed-methods approach for a comprehensive understanding of socio-economic factors.*

Practical Implications: *The findings suggest that improving information dissemination, strategically locating warehouses, providing transport support, and ensuring transparent pricing mechanisms can increase WRS participation among smallholder farmers.*

Social Implications: *Enhanced WRS participation can improve farmers' income, food security, and community economic resilience by promoting structured marketing and reducing post-harvest losses.*

Keywords: *Warehouse Receipt System, Green Gram, Smallholder Farmers, Market Information, Distance to Warehouse, Selling Price Expectation, Tanzania*

1.1 INTRODUCTION

The Warehouse Receipt System (WRS) is widely recognized as an effective tool for improving agricultural marketing, stabilizing prices, and enhancing smallholder farmer incomes. The system allows farmers to store produce in certified warehouses and receive receipts that serve as proof of ownership and collateral for credit, enabling them to delay sales until prices improve (Coulter & Onumah, 2002; Fauzi, 2023). This helps farmers avoid distress sales common immediately after harvest and increases their access to financial services. Beyond credit access, WRS reduces post-harvest losses, improves commodity quality, and promotes efficient and transparent trade (Hidayani, 2019; Yasar & Secer, 2023). Since many crop prices rise after harvest, the

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system enables farmers to benefit from favorable seasonal price trends (Hidayani et al., 2023; Mwangala et al., 2023).

Globally, countries such as India, Brazil, Indonesia, Kenya, Uganda, and Ethiopia use WRS to stabilize markets, support farmer financing, reduce reliance on middlemen, and strengthen supply chains (Gunawan et al., 2019; Asare et al., 2024; UNCTAD, 2019). However, challenges including poor infrastructure and limited farmer awareness hinder full participation. In Africa, public–private partnerships have been particularly important in improving market efficiency and reducing post-harvest losses (Ferroni & Castle, 2011; Neven, 2014).

In Tanzania, WRS was introduced in 2005 to address income instability caused by price fluctuations following trade liberalization. The system initially covered coffee and cotton and later expanded to cashews, cereals, and legumes. It aims to reduce marketing constraints, stabilize prices, and give farmers incentives for collective marketing and improved quality (Operational Manual, 2008; UNIDO, 2016). While the Ministry of Agriculture reports improvements in market transparency and price stability, participation remains below 30% of eligible farmers (Ministry of Agriculture, 2022).

In Mwanza Region specifically Misungwi District the WRS for green grams began in 2020. Despite its benefits, only about 25% of farmers participate, while many continue selling produce immediately after harvest at lower market prices (Ministry of Agriculture, 2024). Previous studies identify demographic, socio-economic, and behavioral factors influencing WRS participation, including age, gender, education, distance to warehouses, transport cost, farm size, farmers' perceptions, and the amount harvested (Mapunda et al., 2019; Mwangakala, 2022; Yazar & Secer, 2023). Understanding these factors is essential to improving uptake. Thus, this study examines the socio-economic determinants of farmers' participation in the Warehouse Receipt System in green gram production in Misungwi District, Tanzania.

1.2 Statement of problem

The Warehouse Receipt System (WRS) in Tanzania is designed to stabilize prices, improve access to credit, and reduce post-harvest losses for smallholder farmers, yet participation among green gram farmers in Misungwi District remains low at about 25% despite extensive promotion efforts (Ministry of Agriculture, 2023/24). Several socio-economic factors—such as distance from farms to warehouses, access to market information, selling price expectations, production volume, and cultivated acreage—have been suggested as possible contributors to this low uptake, but no empirical study has examined their influence in Tanzania's legume sector. International and regional evidence shows that determinants of WRS participation vary across contexts; for example, Asare et al. (2024) found that farm size, household income, perception of collateral, and selling price expectations affected cashew farmers' participation in Ghana, while Mahyuddin et al. (2021) reported that distance to the warehouse had a stronger influence than price expectations or market information in Indonesia's rice sector. These variations highlight a contextual research gap in understanding why green gram farmers in Misungwi underutilize the system. Therefore, this study examines how access to market information, distance to storage warehouses, and selling price expectations influence smallholder farmers' participation in the WRS in Misungwi District.

1.3 Definition of key terms

1.3.1 Warehouse Receipt System (WRS)

A Warehouse Receipt System allows farmers to store commodities in certified warehouses and receive receipts as proof of ownership (Safo et al., 2023). It also enables farmers to use stored commodities as collateral for accessing financial services (Kwadjo, 2018).

1.3.2 Access to Market Information

Access to market information involves farmers obtaining timely and accurate data on prices, demand, and supply trends (Magesa et al., 2014). Limited access restricts participation in systems like WRS because farmers cannot make informed selling decisions. It is assumed that WRS participation improves information access, negotiation power, and income.

1.3.3 Distance from Farms to Storage Warehouse

Distance to storage warehouses is the physical length in kilometers between farms and the nearest storage facility (FAO, 2013). Long distances increase transport costs and discourage storage. In this study, it is measured as kilometers between farmers' fields and a warehouse, cooperative store, or collection center. Short distances and good transport networks encourage WRS participation.

1.3.4 Selling Price Expectation

Selling price expectation is the anticipated price at which farmers believe they can sell their produce (Monroe, 2003). It shapes decisions on whether to sell immediately or store crops. In this study, it refers to farmers' belief that storing commodities will lead to higher future prices.

1.3.5 Smallholder Farmers

The NBS defines smallholder farmers as those operating small plots or keeping limited livestock (NBS, 2019/20; 2022/23). Most manage small-scale production with minimal land and resources. Heifer International describes them as farming up to 10 hectares, usually less than 2.

2. 1 THEORETICAL FRAMEWORK

2.1.1 Key Idea of the Theory

The Theory of Planned Behavior (TPB), developed by Ajzen (1985, 1991, 2015), proposes that human behavior is primarily determined by behavioral intention, which is influenced by attitudes, subjective norms, and perceived behavioral control. The theory suggests that people behave in certain ways after rationally evaluating the consequences of their actions, considering social pressures, and assessing their ability to perform the behavior (Ajzen, 1991). In the TPB framework, perceived behavioral control recognizes that not all behaviors are fully voluntary, making the theory applicable to contexts where individuals face constraints (Green, 2000).

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2.1.2 Assumptions of the Theory

The TPB assumes that individuals rely on knowledge, beliefs, and reasoned judgment when making decisions (Ishak & Zabil, 2012). It further assumes that behavior is shaped not only by actual control but also by perceived control, meaning individuals act based on how easy or difficult they believe a behavior will be (Ajzen, 1991). The theory also assumes that attitudes, normative expectations, and perceptions of control jointly shape behavioral intention, which in turn predicts actual behavior.

2.1.3 Strengths of the Theory

One of the key strengths of TPB is its strong predictive power, with numerous studies demonstrating its ability to explain a substantial portion of variance in behavioral intentions and actions across different fields such as health, agriculture, environmental management, and social behavior (Armitage & Conner, 2001). Another major strength is the incorporation of perceived behavioral control, which broadens the theory beyond the Theory of Reasoned Action by capturing constraints and self-efficacy (Ajzen, 1991). TPB is also widely supported empirically, having been applied successfully in various cultural and behavioral contexts (Godin & Kok, 1996). Additionally, it provides clear targets for designing interventions, such as modifying attitudes, subjective norms, or perceived control to influence behavior (Hardeman et al., 2002).

2.1.4 Weaknesses of the Theory

Despite its strengths, the TPB has been criticized for overemphasizing rational decision-making and underestimating the role of emotions, habits, and spontaneous behavior (Sniehotta et al., 2014; Hagger, 2016; Sheeran et al., 2013). Another limitation is the intention–behavior gap, whereby strong intentions do not always result in actual behavior (Sheeran & Webb, 2016). The theory also does not adequately incorporate past behavior or habit, although these factors often predict future actions more strongly than intentions (Ouellette & Wood, 1998). TPB is further criticized for insufficiently accounting for environmental, cultural, and social influences beyond subjective norms (Conner & Armitage, 1998). Finally, scholars argue that TPB is static because it does not capture how behavior may later shape attitudes or norms (McEachan et al., 2011; Sutton, 1998; Sussman & Gifford, 2019).

2.1.5 Application of TPB to This Study

The TPB provides a useful conceptual foundation for examining the factors influencing participation of smallholder green gram farmers in the Warehouse Receipt System (WRS) in Misungwi District. Farmers' attitudes toward WRS shaped by perceptions of pricing, storage benefits, and risk—directly influence their intention to participate. Subjective norms, including expectations from farmer groups, cooperative societies, and community leaders, also shape participation decisions. Perceived behavioral control is particularly important in this context, as farmers' ability to participate is constrained by access to market information, distance to storage warehouses, and expectations of selling price. These three constructs jointly determine farmers' intention and actual participation in the WRS, making TPB a relevant model for this study.

2.2 Empirical Evidence

2.2.1 Influence of Access to Market Information on Farmers' Participation in WRS (Summary)

Access to market information has been widely recognized as a key factor influencing farmers' participation in the Warehouse Receipt System (WRS). Matei et al. (2019), in their study on smallholder coffee farmers in Tanzania, found that farmers' access to market information significantly influenced their likelihood of participating in the WRS. Their results showed that younger, male farmers with access to reliable information on coffee prices and market trends were more likely to use the system. They also observed that dissemination of market information and the proximity of AMCOS or farmer group centers played a critical role in enhancing participation. However, this study focused mainly on demographic characteristics, whereas the current study emphasizes socio-economic factors within the legume sector.

2.2.2 Influence of Distance from Farms to Storage Warehouse on Farmers' Participation in WRS

Distance from farms to storage warehouses is a critical factor influencing farmers' participation in the Warehouse Receipt System (WRS). Studies in Tanzania (Mapunda et al., 2019; Lyimo & Kasilwa, 2021) show that longer distances reduce participation due to higher transportation costs, logistical challenges, and limited access to market information. Similar findings have been reported in Indonesia, where Gunawan et al. (2019), Mahyuddin et al. (2021), and Hidayani et al. (2019) observed that greater distances to warehouses negatively affected farmers' use of WRS facilities, although institutional type and infrastructure could modify this effect. Comparative evidence from Kenya (Njehia et al., 2013) also confirmed that increased travel distance and time discourage farmers from adopting warehouse-based marketing. While these studies provide important insights, most focused on single crops, specific regions, or isolated variables. The current study addresses these gaps by examining multiple socio-economic factors including distance to warehouses, access to market information, selling price expectations, and institutional participation affecting green gram farmers' WRS participation in Misungwi District, Tanzania, using a mixed-methods approach. This broader perspective aims to generate context-specific evidence on how proximity and other market-related factors jointly shape participation and inform strategies to improve inclusivity and efficiency of the WRS for smallholders.

2.2.3 Influence of Selling Price Expectation on Farmers' Participation in WRS

Selling price expectation significantly affects farmers' participation in the Warehouse Receipt System (WRS). Studies in Tanzania show that farmers anticipating higher prices are more likely to use WRS to store crops and sell when market conditions are favorable, while low or uncertain price expectations discourage participation (Lyimo &

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Kasilwa, 2021; Towo & Kimaro, 2014). Research in Indonesia also confirms that price expectations, alongside distance and institutional factors, shape farmers' decisions to use WRS facilities (Gunawan et al., 2019). Nangameta (2022) similarly found that price incentives, access to market information, and proximity to warehouses strongly influence participation, with institutional trust further enhancing engagement.

The current study in Misungwi District builds on these findings by focusing on green gram farmers and integrating multiple socio-economic factors, including selling price expectation, access to market information, distance to warehouses, and institutional participation. Using a mixed-methods approach, the study provides a context-specific understanding of how price expectations influence smallholder engagement with WRS, offering insights for improving participation in Tanzania's legume sector.

2.4 Research gap

Studies on farmers' participation in the Warehouse Receipt System (WRS) show mixed results on the influence of demographic and non-demographic factors. Age, education, selling price, and distance to warehouses positively affect participation, while production and processing facilities may have negative effects (Hidayani et al., 2019; Gunawan et al., 2019; Lyimo & Kasilwa, 2021; Nangameta, 2022). Access to market information and proximity to cooperative centers also influence participation (Mapunda, 2018; Lyimo & Kasilwa, 2021). However, many studies relied on desktop reviews or small qualitative samples (UNCTAD, 2019; Mwangakala et al., 2023), limiting their applicability. This study addresses these gaps by examining access to market information, distance to warehouses/cooperatives, and selling price expectation among green gram farmers in Misungwi District, providing context-specific insights for improving WRS participation.

3.0 RESEARCH METHODOLOGY

3.1 Research Philosophy

The study adopts a positivist philosophy, emphasizing empirical, quantifiable observations to identify patterns and trends (Stephen, 2022). Positivism aligns with the study's objective of analyzing participation in WRS using statistical methods and a sufficiently large sample (Neuman, 2014).

3.2 Research Approach

A quantitative research approach was employed to systematically collect and analyze numerical data, facilitating unbiased statistical analysis (Creswell, 2018).

3.3 Research Design

A cross-sectional design was used to collect data at a single point in time, allowing identification of associations between variables efficiently and cost-effectively (Creswell, 2018; Kothari, 2014). This design enabled analysis of relationships between factors such as market access, distance, and selling price with farmers' WRS participation.

3.4 Area of Study

The study focused on Misungwi District in Mwanza Region, which contributes about 23% of the region's green gram production. Misungwi was selected because it has an active WRS and green gram cultivation is a key source of income for smallholder farmers (Mwanza Region Annual Crop Production Report, 2024).

3.5 Target Population

The population consisted of 312 registered smallholder green gram farmers participating in the WRS in Misungwi District (DALFO, 2024).

3.6 Sample Size

Using Krejcie and Morgan's (1970) table, a sample of 172 farmers was selected to represent the population with 95% confidence and 5% margin of error.

3.7 Sampling Procedure

Simple random sampling was employed. Farmers were selected systematically from the registration list, ensuring each individual had an equal chance of selection and minimizing bias.

3.8 Data Sources and Collection Tools

Primary data were collected using structured questionnaires to capture information on access to market information, distance to warehouses, and price expectations. Both English and Kiswahili versions were used, with Kiswahili responses translated into English for analysis.

3.9 Questionnaire

Questionnaires included close-ended questions and 5-point Likert scales to assess respondents' views on factors influencing WRS participation (Likert, 1932). The instrument was pretested for validity and reliability before full administration (Creswell, 2014).

3.10 Data Analysis

Data were analyzed using SPSS v26. Descriptive statistics summarized demographic and WRS participation data, while inferential statistics (correlation and multiple regression) assessed relationships and predictive effects of independent variables. Collinearity diagnostics were conducted to check multicollinearity among predictors (Pallant, 2013).

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4.0 FINDINGS AND DISCUSSION

4.1 Correlation Analysis

		MARKET	DISTANCE	PRICE	RECEIPT
MARKET	Pearson Correlation	1	.335**	.458**	.519**
	Sig. (2-tailed)		.000	.000	.000
	N	169	169	169	169
DISTANCE	Pearson Correlation	.335**	1	.441**	.502**
	Sig. (2-tailed)	.000		.000	.000
	N	169	169	169	169
PRICE	Pearson Correlation	.458**	.441**	1	.728**
	Sig. (2-tailed)	.000	.000		.000
	N	169	169	169	169
RECEIPT	Pearson Correlation	.519**	.502**	.728**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	169	169	169	169

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis examined the relationships between access to market information, distance from farm to warehouse, selling price expectation, and participation in the Warehouse Receipt System (WRS) among smallholder green gram farmers in Misungwi District. Access to market information exhibits a moderate positive correlation with participation ($r = 0.519$, $p < 0.01$), suggesting that farmers with better knowledge of market prices and trends are more likely to use the WRS. Distance from the farm to the warehouse also shows a positive correlation ($r = 0.502$, $p < 0.01$), indicating that logistical support or cooperative arrangements can mitigate distance-related barriers. Selling price expectation demonstrates the strongest positive correlation with participation ($r = 0.728$, $p < 0.01$), highlighting that farmers' anticipation of higher returns is the most influential factor motivating WRS use.

4.2 Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.120	.275		.438	.662
	MARKET	.257	.071	.203	3.629	.000
	DISTANCE	.217	.063	.191	3.439	.001
	PRICE	.631	.067	.550	9.349	.000

a. Dependent Variable: RECEIPT

The multiple regression analysis examined the individual influence of selling price expectation, access to market information, and distance from farm to warehouse on smallholder green gram farmers' participation in the Warehouse Receipt System (WRS) in Misungwi District. Results indicate that selling price expectation has the strongest positive effect on participation ($B = 0.631$, $p < 0.001$), highlighting that farmers are primarily motivated by the prospect of higher returns. Access to market information also significantly influences participation ($B = 0.257$, $p < 0.001$), suggesting that better knowledge of market trends and prices increases farmers' willingness to use WRS. Distance from farm to warehouse shows a positive effect as well ($B = 0.217$, $p = 0.001$), indicating that logistical barriers can be mitigated through cooperative support or transport options. Overall, these findings underscore that price incentives, information access, and manageable logistical factors are key determinants of WRS participation among smallholder farmers.

4.3 Discussion of findings

4.3.1Influence of Access to Market Information on Farmers' Participation in Warehouse Receipt System

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Correlation analysis showed a significant positive relationship between access to market information and participation in the Warehouse Receipt System ($r = 0.519$, $p < 0.01$), indicating that better-informed farmers are more likely to engage with the system. Regression results further confirmed this influence, with a Beta coefficient of 0.203 ($p < 0.001$), demonstrating that access to market information significantly increases participation even when controlling for selling price expectations and distance to the warehouse. These findings align with previous studies; Matei et al. (2019) found that farmers with access to market information were more likely to use structured storage systems, while FAO (2018) and UNCTAD (2019) emphasized that reliable information reduces uncertainty in agricultural marketing and strengthens decision-making. The study also revealed that farmers primarily obtain market information from extension officers, cooperatives, and informal networks, whereas mobile phones and radios are less commonly used. Limitations such as network coverage, digital literacy, and affordability may constrain technological solutions, consistent with findings by Kassie et al. (2018).

4.3.2 Influence of Distance from Farms to Storage Warehouse on Farmers' participation in Warehouse Receipt System

Correlation results showed a positive and significant relationship between distance from the warehouse and participation in the Warehouse Receipt System ($r = 0.502$, $p < 0.01$). Regression analysis further confirmed a significant positive effect (Beta = 0.191, $p = 0.001$), indicating that while distance may pose a challenge, farmers are still able to participate when supported by transport options, market information, and favorable price expectations. This suggests that distance is a manageable factor rather than an absolute barrier. These findings align with prior studies. UNCTAD (2019) emphasized that proximity to storage facilities and transport infrastructure is a key determinant of smallholder participation. Similarly, Matei et al. (2019) found that high transport costs and logistical limitations reduce WRS use, while Kumar et al. (2018) reported that farmers located farther from warehouses rely on cooperatives or government support to participate. Overall, the study highlights that distance significantly influences participation, but its impact can be mitigated through improved accessibility, such as strategically located warehouses, subsidized transport, or cooperative-led collection points. Enhancing these support mechanisms can strengthen farmers' ability and willingness to engage with the WRS.

4.3.3 Influence of Selling Price Expectation on Farmers' participation in Warehouse Receipt System.

Correlation analysis revealed that selling price expectation has the strongest positive relationship with participation in the Warehouse Receipt System ($r = 0.728$, $p < 0.01$). Regression results confirmed it as the most influential factor, with a Beta coefficient of 0.550 ($p < 0.001$), indicating that higher price expectations significantly increase farmers' participation, even when controlling for market information and distance. These results align with previous studies. Towo and Kimaro (2014) observed that Tanzanian smallholder farmers are motivated to participate in structured storage systems by anticipated price benefits. Similarly, Gunawan et al. (2019), Hidayani et al. (2019), Lyimo and Kasilwa (2021), and Nangameta (2022) reported that price expectations strongly drive participation, encouraging farmers to strategically time sales for higher returns and adopt organized storage mechanisms for financial gain. Overall, selling price expectation is a critical determinant of WRS participation. Transparent pricing, market forecasts, and promotion of WRS as a tool for maximizing income can significantly enhance adoption among smallholder green gram farmers.

4.4 Relevance of the Study Findings to the Theory of Planned Behavior (TPB)

The study findings align with the Theory of Planned Behavior (TPB), showing that farmers' attitudes, perceived behavioral control, and social influences significantly shape participation in the Warehouse Receipt System (WRS). Access to timely and reliable market information enhances perceived control and fosters a positive attitude by reducing uncertainty and highlighting benefits such as price stability. Distance to warehouses affects perceived control, with longer distances limiting participation unless mitigated by cooperative transport or logistical support, which also reinforces social influence. Selling price expectations emerged as the most influential factor, as anticipating higher and stable prices strengthens positive attitudes and behavioral intentions, motivating farmers to store and sell through the system.

5.1 Conclusion

The study concluded that farmers' participation in the Warehouse Receipt System (WRS) is significantly influenced by access to market information, distance to warehouses, and selling price expectations. Farmers with timely and reliable market information are more confident in making storage and sales decisions, enhancing their engagement with the system. Proximity to warehouses further facilitates participation by reducing transport costs and logistical challenges, while long distances can discourage use unless mitigated by supportive infrastructure or cooperative arrangements. Among all factors, selling price expectation was the most influential, as farmers are motivated to store produce when they anticipate higher returns compared to immediate local sales. These findings underscore that improving information flow, strategically locating warehouses, enhancing transport accessibility, and ensuring transparent and competitive pricing are critical for increasing smallholder farmers' adoption and effective utilization of the WRS.

5.2 Area of Further Studies

Future studies could focus on examining the role of cooperatives in promoting smallholder participation in the Warehouse Receipt System, particularly in facilitating access to credit and collective marketing. Also, more studies using a large sample size need to be carried prior generalization of the results to the entire population. Furthermore, the study can be done to examine the influence of other variables that were not captured in the current study which are production volume,

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acreage farm cultivation size, access to credit and government support.

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