

Factors Influencing Smallholder Cocoa Farmers' Participation in the Warehouse Receipt Marketing Channel in Kyela District, Tanzania

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KEYWORDS

Extent of Participation, Market channel, Participation, Warehouse Receipt System (WRS).

ABSTRACT

This study aimed to identify the factors influencing smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) marketing channel in Kyela District, Mbeya. A quantitative cross-sectional approach was employed, collecting primary data from 177 WRS participants and 87 non-participants across Ikolo, Sinyanga, Makwale, and Mbwasyo villages. Data analysis with multivariate logistic regression revealing key findings. Two factors positively influenced participation: education and extension services. Conversely, cocoa being the primary source of income and reliance on informal market information negatively affected participation decisions. Cragg's double hurdle regression analysis highlighted four factors that increased the extent of participation: education, compliance with quality standards, market accessibility, and price predictability. In contrast, two factors negatively influenced participation extent: WRS payment lead time and access to credit. The study concludes that socio-economic, market, and institutional factors significantly influence smallholder cocoa farmers' decisions and extent of participation in the WRS. Whenever smallholder farmers are constrained within a mix of formal and informal marketing channels, or WRS with parallel brokers who have no choice but to sell through WRS need to ensure that limiting factors are properly addressed. Transaction costs associated with high standards need to be mitigated, credit schemes need to be separated from WRS payment process.

1. INTRODUCTION

The cocoa industry, characterized by its labor-intensive production methods, remains largely mechanization-resistant, which affects the livelihoods of millions of farming households (BPLANer, n.d.). Approximately 5 million families depend on cocoa as a vital cash crop, with smallholder farmers producing about 70% of the global supply (Coulibaly, 2024; World Cocoa Foundation, n.d.). These farmers often live on less than USD 2 per day, relying on cocoa for 60 to 90% of their income (Vivek et al., 2020). Despite projections for a 7.3% compound annual growth rate (CAGR) in the cocoa sector from 2019 to 2025, the market faces significant risks. Price volatility has historically challenged smallholder farmers, a situation recently complicated by uncertainties related to Brexit and the UK's role in international cocoa trade (Vivek et al., 2020).

In light of these challenges, there has been insufficient empirical research on Warehouse Receipt Systems (WRS) within the cocoa sector, particularly compared to other crops like paddy and white pepper. Notable studies, such as those by Pranoto and Purwasih (2019) and Hidayani and Hadi (2019), focused on WRS in grain crops, emphasizing the need for similar investigations in cocoa.

In a global perspective, the WRS emerged in 17th C first in the Netherlands followed by the United States of America in 19th C, Latin America in early 20th C and Asian countries mainly India, China and the Philippines in mid-20th C (Onumah, 2010; UNCTAD, 2022; FAO, 2015). This system has gained prominence across 30 countries worldwide at least for of the crops (FAO, 2015; UNCTAD, 2022).

In Africa, WRS has gained traction post-1980s liberalization to support smallholder farmers facing market challenges. Countries like Zambia, Uganda, Kenya, and Tanzania have adopted WRS, yet most studies have concentrated on grain crops, such as maize (Onumah, 2010). For instance, Safo et al. (2023) explored WRS's impact on maize farmers in Ghana, while Mutai et al. (2013) examined socio-economic factors influencing participation in Kenya's Grain WRS.

In Tanzania, the government introduced WRS in 2005 to address the specific challenges faced by smallholder farmers, including inconsistent pricing and limited access to financing. The establishment of the Warehouse Receipt Regulatory Board was pivotal in this process (URT, 2005;

URT, 2016; NFYDP, 2021). However, the effectiveness of WRS in cocoa remains underexplored, with existing studies primarily focusing on coffee (e.g., Mapunda et al., 2018). This study deployed the utility maximization theory. This is because the decision on whether or not to participate in WRS is considered under the general framework of utility or profit maximization (Norris & Batie, 1987 and Pryanishnikov & Katarina, 2003). Within this framework, economic agents were small-scale cocoa farmers whose participation decisions and extent of participation were determined by factors surrounding them based on perceived utility or net benefit from any option. Although utility was not be directly observed, the actions of economic agents would be observed through the choices made.

In the Kyela District of Tanzania, WRS was implemented in 2018 to tackle issues such as unreliable markets, low prices, and poor bargaining power for cocoa farmers. This system aimed to enhance market visibility and establish Kyela as a reliable source of high-quality cocoa, enabling farmers to sell directly through auction mechanisms. WRS serves as a centralized marketing channel, contrasting with decentralized channels where farmers sell directly to buyers (Otekunrin et al., 2019). Centralized systems aggregate produce in larger markets, allowing for more structured selling processes.

Understanding market participation is crucial for boosting agricultural growth and increasing rural incomes, particularly for impoverished farming households (Otekunrin et al., 2019). Research by Gunawan et al. (2019a) identified socio-economic, marketing, and institutional factors influencing smallholder farmers' involvement in WRS. However, the specific determinants affecting cocoa farmers in Kyela District have yet to be comprehensively studied.

This research aimed to explore the socio-economic, marketing, and institutional factors affecting smallholder cocoa farmers' participation in the WRS marketing channel in Kyela, Mbeya. Understanding these factors is critical for improving the livelihoods of cocoa farmers in this region and enhancing their income opportunities through better market access.

In Tanzania's Kyela District, approximately 80% of cocoa is produced by smallholder farmers, who often face unfair pricing (Nyomora et al., 2012). To combat this issue, the government

introduced the Warehouse Receipt System (WRS), a centralized marketing channel designed to provide fair prices and a secure storage environment for high-quality cocoa (IFAD, 2014; The Citizen, 2023). Despite its intentions, smallholder farmers frequently sell their cocoa to brokers at prices lower than the WRS rate, who then profit by reselling through the WRS (Mbilinyi, 2011; The Citizen, 2023).

This highlights the limited direct engagement of farmers in the WRS. Research on factors influencing this participation has been extensive but often focuses on crops other than cocoa or on participation decisions without exploring the extent of involvement (Pranoto & Purwasih, 2019; Mutai et al., 2013). Critical factors, including compliance with quality standards, access to marketing channels, and service quality of WRS operators, remain underexplored. This study aims to analyze the socio-economic, market, and institutional factors affecting smallholder farmers' direct participation in the WRS in Kyela District. Thus the study was designed to test two Hypotheses presented as: -

H₁ *H₀* There is no factor with significant influence on smallholder cocoa farmer's decision for participation in WRS in Kyela district

H_a There is at least one factor with significant influence on smallholder cocoa farmer's decision for participation in WRS in Kyela district

H₂ *H₀* There is no factor with significant influence on smallholder cocoa farmer's extent of participation in WRS in Kyela district

H_a There is at least one factor with significant influence on smallholder cocoa farmer's extent of participation in WRS in Kyela district

2. METHODOLOGY

The study was guided by the positivistic paradigm with a quantitative approach and a cross-sectional design. The study was conducted in Kyela District, Mbeya region, Tanzania, from March to April 2024, aimed to gather primary data from smallholder cocoa farmers during both low and peak harvest seasons. This timing minimized response bias related to memory lapses. Despite Kyela producing about 80% of Tanzania's cocoa, smallholder participation in Warehouse Receipt Systems (WRS) remains limited, with alternative market channels dominating since at least 2011 (Mbilinyi, 2011; The Citizen, 21st December 2023; Mwananchi, 26th May 2023). The

research is crucial for identifying factors limiting farmer participation and addressing these issues effectively, contributing valuable insights for improving the cocoa industry's dynamics in the region.

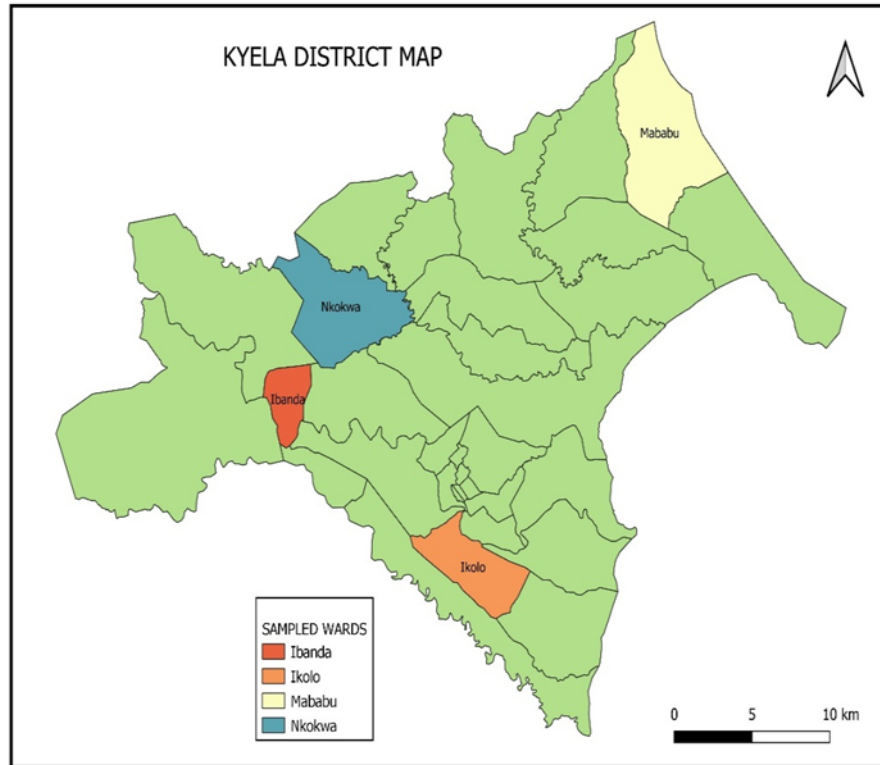


Figure 3.1: Map of Kyela District showing sampled wards for data collection

Source: Author (2024) based on GIS software

Sample size was estimated using formula for continuous outcome (in this case the extent of participation) that was modeled by Sullivan (2020). The formula was given as: -

$n_1 = [(Z_{1-\alpha/2} + Z_{1-\beta}) / ES]^2$, where effect size is given as: $ES = |U_1 - U_2| / \text{sdv}$; and the parameters were defined as: -

- $Z_{1-\alpha/2}$ is Z alpha score for 99% confidence interval which is 2.58. This implies that estimation of sample size tolerated margin of error of only 1% (0.01). This confidence level would maximize precision in sample estimation compared to 5% or 10% margins of error.

- $Z_{1-\beta}$ is Z beta score for 90% statistical power which is given as 1.28. This helped to ensure statistical power of the estimation from the sample. Statistical power of 80% is acceptable, but to increase chance of detecting a true effect a power of 90% is preferred to lesser (Bhandari, 2021). Unlike the lower power, higher power would make it possible to detect both larger and medium effects as chosen in this study (Cross, 2023).
- ES was the desired minimum detectable effect size given as 0.4. This was the median of the medium effect size (Cross, 2023). Medium effect size ranges from 0.3 – 0.5, using ES > 0.4 would yield sample size too small (≤ 30) for each of four clusters represented by four villages (Bhandari, 2021).
- DE was design effect given as 1.64 as suggested for sales of specific crops in previous study (Geyer et al., 2016). This was also considered mainly because intra-cluster correlation coefficient (ICC, ρ) was not available to estimate design effect.
- n_1 is sample size, in this case was sample size for participants in WRS

$n_1 = DE * [(Z_{1-\alpha/2} + Z_{1-\beta}) / ES]^2$, substituting the parameters in the formula;

$$n_1 = 1.64 * [(2.58 + 1.28) / 0.4]^2$$

$$n_1 = 1.64 * 94 = 154.2 \approx 155$$

Furthermore, adjustment ratios were 10% (0.1) for none response and 5% (0.05) for missing cases.

This made a total of $[0.1 + 0.05] = 0.15$

$$n_1 = [155 + (155 * 0.15)] = 178.3 \approx 179$$

Thus, sample for participants was estimated at 179 smallholder cocoa farmers

On the other hand, sample size for none participants was estimated using a ratio of 1:2 which is considered being reasonable as it doesn't exceed 1:4 which is traditionally regarded as maximum threshold for case control studies (Singh and Indian, 2016). Thus, sample size for non-participants was estimated as: -

$n_2 = n_1 / 2$, then substituting the parameters in the formula gives: -

Sample size for non-participants, $n_2 = 179 / 2 = 89.5 \approx 90$

Therefore, total sample size ($n_1 + n_2$) = $179 + 90 = 269$

After data collection 5 observations were omitted for missing cases and farm size being larger than 2.5 acres. Therefore, the study included 264 observations which is about 98.1% of the expected sample. Primary data were collected from randomly selected participants and non participants who were administered with questionnaires.

Data analysis involved exploratory analysis in terms of descriptive statistics and inferential statistical analysis that included binary logistic regression and Cragg's double hurdle regression model. The researcher used STATA version 17 for descriptive and inferential statistical analysis.

Exploratory analysis helped identify and address data irregularities, including outliers, missing cases, and duplicates. Categorical variables were assessed through frequency and percentage, while scale variables were analyzed using means, standard deviations, or medians based on their distribution. To prevent model overloading, a correlation matrix was generated for independent variables; if two were highly correlated ($r \geq 0.7$, $p < 0.05$), one was deemed redundant. The correlation analysis findings also informed the inclusion of potential interaction variables to mitigate inflationary estimates.

On the other hand, Binary Logistic Regression was used as the second step to analyse determinants of WRS participation of smallholder cocoa farmers. The outcome variable is WRS participation whereas explanatory variables are socio-economic characteristics, market factors and institutional factors altogether. During logistic regression a bivariate analysis was performed as a reduction

approach. In this case independent variables with coefficient less than 0.2 were not included in multivariate analysis. Based on bivariate analysis results, the researcher was able to decide on whether to use odds ratio of prevalence ratio. Prevalence ratio would be preferred in a scenario where outcome is rare (<10%) in all strata used in analysis, otherwise odds ratios were used (Tamhane *et al.*, 2016 and Cummings, 2009).

The logit model was specified as:

$$P_i = F(z_i) = F(\alpha + \beta x_i) = \frac{1}{1 + e^{-z_i}} = \frac{1}{1 + e^{-(\alpha + \beta x_i)}} \quad \text{----- (2.1)}$$

Where

e represents the base of natural logarithms, P_i is the probability that an individual would participate in WRS (0= no, 1= yes) given X_i , where X_i is the set explanatory variables that influence participation in WRS, and β is the coefficients of the explanatory variables.

Equation (3.1) can be restated as

$$\log_e \frac{p_i}{1-p_i} = z_i = \alpha + \beta X_i \quad \text{----- (2.2)}$$

The dependent variable in this regression equation is the logarithm of the odds that a particular choice would be made.

Finally, at the third step the Cragg’s double hurdle model regression was performed particularly for analysing factors for extent of participation in WRS. This method as initially proposed by Cragg (1971) undertakes the autonomous estimation between the participation decision and the intensity of participation in WRS. The model involved two stage decision process, where in stage one the decision of whether to participate or not to participate in WRS was evaluated using either probit or logit models. At this juncture, all observations were included in the analysis including participants in WRS and non-participants. Finally, the extent of participation was modelled by truncated regression targeting only participants in WRS (incessant positive values), and non-participants were dropped in the analysis (Lukurugu *et al.*, 2022). The two steps of the double hurdle model and their respective equation were shown in equation 3 and 4 hereunder;

Step one: The participation equation.

As shown above this step is normally estimated using either probit and logit regression. In this study probit model was used to identify factors guiding cocoa farmers' decision to participate in WRS in Kyela district. The probit model is chosen due to its outstanding properties, of assuming a normal distribution than other models, namely Logit and Tobit. The probit model was specified as follows:

$$C_i^* = \delta w_i + \mu_i \dots\dots\dots (2.3)$$

$$C_i = \begin{cases} 1, & \text{if } C^* > 0 \\ 0, & \text{if } C^* \leq 0 \end{cases}$$

Where,

C_i^* Represent a latent variable, which equal to 1 when a household i participates in WRS and equal to 0 if a household didn't participate in WRS.

w_i Indicates a vector of explanatory variables influencing the participation in WRS.

δ is the unknown parameter to be estimated and μ_i is the error term which is normally distributed ($\mu \sim N(0, 1)$)

Second step: Examine the extent of Participation in WRS

The second step of the double hurdle model was to examine the extent of participation in WRS after using it and disregard non-participant household. This step was estimated using a truncated regression as indicated hereunder:

$$Y_i^* = \beta' X_i + \varepsilon_i \dots\dots\dots (2.4)$$

$$Y_i = \begin{cases} Y_i^* & \text{if } Y_i > 0 \text{ and } C^* > 0 \\ 0 & \text{if } Y_i > 0 \text{ and } C^* \leq 0 \end{cases}$$

Where,

Y_i is the latent variable indicating the observed extent of WRS participation for household i

X_i is a vector of independent variables influencing the extent of participation ($X = W$ as indicated in Table 3.1),

β is the unknown parameters to be estimated and $\varepsilon \sim N(0, \sigma^2)$ is the error term.

For the empirical analysis the probit and truncated regression as shown in equation 3 and 4 can be expanded into equation 5 and 6 respectively as: -

$$C_i(0, 1) = \delta_0 + \delta_1 w_1 + \delta_2 w_2 + \delta_3 w_3 + \delta_4 w_4 + \dots + \delta_n w_{5n} + u_i \dots\dots\dots (2.5)$$

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_n X_n + \varepsilon_i \dots\dots\dots (2.6)$$

3. RESULTS

This section presents the study's findings. The results aim to provide a comprehensive understanding of the dynamics surrounding smallholder cocoa farming and their engagement with the WRS in the region. The results are presented in subsections of descriptive statistics, Factors Influencing Smallholder Cocoa Farmers' Decision for Participation in WRS Marketing Channel, and Factors Influencing the Extent of Participation in WRS Marketing Channel.

3.1 Descriptive Statistics

Descriptive Statistics of Factors Surrounding Smallholder Cocoa Farmers in Kyela District Mbeya. Categorical variables were analysed using frequency and percentage distribution. The results are presented in Table 3.1.

Table 3.1: Descriptive Statistics of Categorical Variables

Variable	Categorization	Frequency	Percent
Sex	Female	43	16.3
	Male	221	83.7
	Total	264	100.0
Education	No formal education	28	10.6
	Primary education	131	49.6
	Secondary education or college	73	27.7
	Higher education	32	12.1
	Total	264	100.0
Primary source of income	Cocoa	193	73.1
	Other	71	26.9
	Total	264	100.0
Price predictability	Strongly disagree	64	24.2
	Disagree	48	18.2
	Neutral	36	13.6
	Agree	63	23.9
	Strongly agree	53	20.1

	Total	264	100.0
Access to alternative market channels	Strongly disagree	103	39.0
	Disagree	52	19.7
	Neutral	32	12.1
	Agree	36	13.6
	Strongly agree	41	15.5
	Total	264	100.0
Source of market information	AMCOS	221	83.7
	Peer cocoa farmer	16	6.1
	Brokers	27	10.2
	Total	264	100.0
Perceived WRS payment lead time	Very long payment term	28	10.6
	long payment term	78	29.5
	Not sure	13	4.9
	Short payment term	115	43.6
	Very short payment term	30	11.4
	Total	264	100.0
Access to extension services	No	186	70.5
	Yes	78	29.5
	Total	264	100.0
WRS Service quality	Low or medium	72	27.3
	High quality	192	72.7
	Total	264	100.0
Access to credit	No	208	78.8
	Yes	56	21.2
	Total	264	100.0

Source: Filed Data, 2024

The scale variables were analysed using means, median and standard deviation. The results were presented in Table 4.1b

Table 3.2: The scale variables

Variable	Observations	Minimum	Median	Mean	Maximum	Std. Deviation
Extent of participation	177	0.23	0.55	0.55	0.94	0.15
Age	264	28.00	50.00	50.36	98.00	10.50
Household size	264	1.00	5.00	4.99	11.00	2.03
Annual household income ('000 Tshs)	264	1,690	17,970	19,807	64,728	12,424
Annual off farm income ('000 Tshs)	264	400	5,314	6,952	32,896	5,441
Annual output (Kg)	264	69	1,349.5	1,406.66	3,921	824.75
Cocoa farm size in acres	264	0.1	1.25	1.27	2.5	0.67
WRS payment lead time (weeks)	177	1	1	1.17	3	0.40
WRS Price (Tshs/Kg)	177	5,455	11,583.12	11,605.28 ^a	17,101	3,331.85
Brokers Price (Tshs/Kg)	87	4,150	8,384.08	8,340.39 ^a	13,000	2,824.11

^aIndependent sample test of equality of means of WRS price and Broker Price: t-statistic = 7.750, Df = 262, p-value <0.001

Socio-Economic Characteristics of Smallholder Cocoa Farmers in Kyela District Mbeya

The study's findings revealed that smallholder cocoa farmers' ages ranged from 28 to 98 years, with a median age of 50. The majority (83.7%) were male, and educational levels varied: 10.6% had no formal education, 49.6% had primary education, and 12.1% achieved higher education. Household sizes ranged from 1 to 11 members, averaging 5 members. Farm sizes were between 0.1 and 2.5 acres, with a mean of 1.27 acres. Annual cocoa output varied from 69 kg to 3,921 kg, averaging 1,406.7 kg. About 73.1% of farmers relied on cocoa as their primary income source, with annual household incomes averaging Tshs. 19,806,612.50.

Market Factors Surrounding Smallholder Cocoa Farmers in Kyela District Mbeya

The results in Table 4.1b show that extent of participation as the proportion of output sold to WRS market channel for 177 participants ranged from 0.23 to 0.94 the median being 0.55 and mean estimated at 0.55 with standard deviation of 0.15. In a period of one year from March, 2023 to February, 2024, the price of cocoa offered through WRS was ranging from a minimum of Tshs. 5,455 to the maximum of Tshs. 17,101 with the mean estimated at Tshs. 11,605.28 with a standard deviation of Tshs. 3,331.85.

On the other hand, during the same period the price offered by other buyers mainly brokers ranged from a minimum of Tshs. 4,150 to the maximum of Tshs. 13,000 with the mean estimated at Tshs. 8,340.39. The independent sample test for equality of means suggest price offered by WRS was significantly higher than that offered by informal alternative market channels by Tshs. 3,264.89 [95%CI= 2,402.80 – 4,039.51, (Df = 262, p-value<0.001)].

However, in either case there was huge standard deviations indicating price instability. Smallholder cocoa farmers had different views on price predictability such that 24.2% strongly disagree that price was very unpredictable whereas 18.2% disagree, 13.6% were neutral, 23.9% agree and the remaining 20.1% strongly agree.

Also, majority of respondents' access market information from AMCOS, 6.1% from peer cocoa farmers, and 10.2% from brokers. Also, majority of smallholder cocoa farmers strongly disagree that access to alternative market channels was very easy, 19.7% disagree, 12.1% were neutral, 13.6% agree and the remaining 15.5% strongly agree.

The payment term also referred to as the payment lead time was ranging from 1 week to 3 weeks with median of 1 week and mean 1.17 weeks with a standard deviation of 0.4. However, 10.6% of respondents perceive WRS payment lead time as very long payment term, 29.5% said is long

payment term, 4.9% say payment term is neither long nor short, 43.6% said payment term is short and the remaining 11.4% said payment term was very short. The results indicate that although payment term was within a limit of 1 to 3 weeks interval still smallholder cocoa farmers had different perception on longevity of this payment lead time.

Institutional Factors Surrounding Smallholder Cocoa Farmers in Kyela District Mbeya

The results in Table 4.1a show that 70.5% of respondent had not accessed extension services in the period of past six months and only 29.5% had accessed extension services in the same period. Majority of respondents perceive service quality of WRS as high whereas 27.3% perceive service quality as either low or medium. For the case of access to credit 78.8% had no access to credit whereas 21.2% had access to credit.

3.2 Factors Influencing Smallholder Cocoa Farmers' Decision for Participation in WRS Channel

A binary logistic regression was performed to ascertain the factors influencing smallholder cocoa farmers' decision for participation in Warehouse receipt system marketing channel. Initially bivariate analysis was performed for each variable separately and a cut point of $p\text{-value} < 0.20$ as suggested in previous studies (Simon, 2023) was used to select variables for further analysis using multivariate model. After bivariate analysis 11 variables passed the test and were included in multivariate analysis.

The multivariate model summary results (-2 Log likelihood = 263.184 that was terminated at iteration number 6 because parameter estimates changed by less than .001, Cox & Snell R Square = 0.237, Nagelkerke R Square = .330). The model correctly classified 75.8% of cases at the cut point of 0.500 indicating that the model was effective in predictive accuracy for the smallholder cocoa farmers' participation decision (Harris, 2021). Hosmer and Lemeshow Test results (Chi-square = 4.310, Df = 8, $p\text{-value} = 0.828$) the effect that the model was the best fit given the small Chi-square of 4.310 and $p\text{-value}$ of 0.828 which is much larger than the threshold of 0.05 as recommended (Harris, 2021 and Surjanovic & Loughin, 2023). The final results of both bivariate and multivariate logistic regression are presented in Table 3.3

Table 3.3: Bivariate and Multivariate Analysis Results

Variable	Response	Bivariate		Multivariate	
		cOR (95% C.I)	P-value	aOR (95% C.I)	P-value
Age (X1)	Complete years	0.967(0.943-0.992)	0.009	0.263 (0.055 - 1.255)	- 0.94
	No formal or primary education	Ref.			
	Secondary or college education	1.096 (0.616-1.950)	0.756	0.977 (0.479 - 1.990)	- 0.948
Education (X2)	Higher education	18.788(2.5-141.202)	0.004	19.0 (2.387 - 151.23)	- 0.005***
Household size (X3)	Number of households	1.113(0.977-1.269)	0.108	1.535 (0.756 - 3.117)	- 0.235
Household income (X4)	Annual income in Tshs.	1.576(1.097-2.264)	0.140	1.913 (0.85 - 4.305)	- 0.117
Off-farm income (X5)	Annual off farm income in Tshs.	1.604(1.170-2.199)	0.003	0.628 (0.302 - 1.305)	- 0.212
Primary source of income (X6)	Other	Ref.			
	Cocoa	0.282 (0.139-0.571)	<0.001	0.284 (0.122 - 0.659)	- 0.003***
	Very unpredictable	Ref.			
Price predictability (X7)	Unpredictable	1.556(0.715 - 3.384)	0.265	0.836 (0.310 - 2.255)	- 0.724
	Medium	1.376 (0.594 - 3.189)	0.457	0.573 (0.198 - 1.654)	- 0.303
Price predictability (X7)	Predictable	2.285 (1.077 - 4.847)	0.031	0.873 (0.336 - 2.269)	- 0.780

	Very predictable	2.167 (0.988 - 4.752)	0.54	0.861 (0.313 - 2.364)	- 0.771
	Limited accessible	Ref.			
	Highly accessible	0.663 (0.313 - 1.408)	0.285	0.853 (0.321 - 2.270)	- 0.750
Alternative market (X8)	Very highly accessible	0.293 (0.146 - 0.588)	0.001	0.774 (0.300 - 1.993)	- 0.595
	AMCOS	Ref.			
	Peer farmer	0.457 (0.163 - 1.284)	0.138	0.744 (0.203 - 2.724)	- 0.655
Source of market information (X9)	Broker	0.081 (0.029 - 0.223)	<0.001	0.102 (0.026 - 0.402)	- 0.001***
	Short time	Ref.			
	Medium	1.226 (0.321 - 4.690)	0.766	1.577 (0.331 - 7.519)	- .567
	Long time	0.429 (0.241 - 0.764)	0.004	0.932 (0.451 - 1.927)	- .849
Perceived pay lead time (X10)	Very long time	0.777 (0.324 - 1.861)	0.571	1.177 (0.394 - 3.516)	- .771
	No	Ref.			
Access to extension services (X11)	Yes	1.060 (0.603 - 1.865)	0.038	1.160 (0.701 - 1.966)	- 0.046**

** Significant at 5% level of significance

*** Significant at 1% level of significance

Based on the results in Table 4.2 above, the smallholder cocoa farmers' decision for participation (CSHFDP) in WRS model was specified as: -

$$RS = B_0 + B_1 X1 + B_2 X2 + B_3 X3 + B_4 X4 + B_5 X5 + B_6 X6 + B_7 X7 + B_8 X8 + B_9 X9 + B_{10} X10 + B_{11} X11 \dots\dots\dots$$

Furthermore, from multivariate logistic regression results in Table 4.2 that was performed to ascertain the factors influencing smallholder cocoa farmers participation in warehouse receipt system market channel in Kyela district, the researcher was able to conclude the hypothesis H1 as presented in Table 3.4

Table 3.4: Conclusion on Hypotheses H1

Hypothesis	Hypothesis statement	p-value < 0.05	Conclusion
H₁	H ₀ There is no factor with significant influence on smallholder cocoa farmer's decision for participation in WRS in Kyela district	4 factors > 0	Rejected
	H _a There is at least one factor with a significant influence on smallholder cocoa farmer's decision for participation in WRS in Kyela district	4 factors ≥ 1	Accepted

Cocoa as the Primary Source of Income and Market Participation

The odds of decision for participation in WRS were 0.716 times less for smallholder cocoa farmers who depended on cocoa as their primary source of income compared to those who depended on other sources [aOR=0.284 (95% CI=0.122 - 0.659; p-value = 0.003)]. The finding can be linked to liquidity constraints among smallholder cocoa farmers inclining them towards informal alternative market channels who use to pay in instant cash or in advance payment which is not the case with WRS market channel. The finding diverges from Bezu and Villanger (2019) who found that depending on crops as primary source of income motivated smallholder farmers to participate in cooperative market channel which guarantees higher prices in anticipation of increments in expected income from crop sales. This is mainly because members of cooperative union access higher prices compared to none members (Bezu and Villanger, 2019).

Market Information and Market Participation

The results on source of market information revealed that smallholder cocoa farmers who were often getting market information from cocoa brokers were 0.898 times less likely to have decided

to participate in WRS compared to those who were often getting market information from AMCOS [aOR=0.102 (95% CI=0.026 - 0.402; p-value = 0.001)]. The finding indicates that there was information asymmetry attributed to level of access to market information and primary source of information. As a result of information asymmetry smallholder cocoa farmers with low level of access to information especially who depended on informal channels of market information had limited possibilities of participation in WRS marketing channel. The finding converges with Atinkugn et al. (2023) who found that lack of access to market information reduced probability of market participation among smallholder farmers in Central Ethiopia.

Extension Services and Market Participation

The odds of decision for participation in WRS were 1.16 times higher for smallholder cocoa farmers who had access to extension services compared to those who did not have access to extension services [aOR=1.160 (95% CI=0.701 - 1.966; p-value = 0.046)]. The finding indicates that agricultural extension services play a vital role in enhancing market participation due to increased production and productivity. The finding is in line with Girma and Kuma (2022) who found that there was a positive influence of extension services on farmers' market participation for different crops in Ethiopia. The study emphasizes that extension services provide farmers with technical know-how related to production process in turn increasing output and quality of output which attract higher process hence market participation (Girma and Kuma, 2022).

3.3 Factors Influencing the Extent of Participation in WRS Marketing Channel

The study aimed to test the hypothesis regarding factors influencing smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) in Kyela district. Using Cragg's double hurdle model regression, the researcher examined eleven independent variables, including age, education, household size, income sources, price predictability, and access to extension services. The model's selection equation incorporated variables affecting participation, while the quantity equation analyzed factors like sex and compliance with quality standards. The estimated model was statistically significant (LR chi2 (27) = 144.6; p-value = 0.0000; Pseudo R2 = 0.9383), indicating robust findings. (Alberto et al., 2022), Results were summarized in Table 3.5

Table 3.5: Marginal Effects

Variable	Marginal effects	Std.Error	z-statistic	P-value	[95% C. Interval	
LNAge	0.01665	0.021316	0.78	0.435	-0.02513	0.058429
i.Male	0.008712	0.014052	0.62	0.535	-0.01883	0.036254
LNHousehold size	0.005842	0.012283	0.48	0.634	-0.01823	0.029917
LNOutput	-0.00872	0.007305	-1.19	0.233	-0.02304	0.0056
LNHousehold income	-0.01422	0.01265	-1.12	0.261	-0.03902	0.010569
LNOff-farm income	0.035861	0.019871	1.80	0.071	-0.00309	0.074808
LNMarket accessibility***	0.050801	0.016693	3.04	0.002	0.018083	0.083518
LNCompliance with quality standards***	0.047035	0.016523	2.85	0.004	0.014651	0.07942
1.Higher_education***	0.085734	0.017289	4.96	0.000	0.051849	0.119619
1.Secondary or college education	0.010924	0.019757	0.55	0.580	-0.0278	0.049647
1.Cocoa as the primary source of income	-0.00332	0.011474	-0.29	0.772	-0.02581	0.01917
1.WRS quality of service1	0.004147	0.01301	0.32	0.750	-0.02135	0.029646
1. WRS quality of service2	-0.00401	0.03366	-0.12	0.905	-0.06998	0.061962
1.Market information	-0.00994	0.019643	-0.51	0.613	-0.04844	0.028559
1.price predictability1**	0.113686	0.049892	2.28	0.023	0.0159	0.211473

i.Price						
predictability2	0.048601	0.028828	1.69	0.092	-0.0079	0.105102
1.WRS Payment						
lead time***	-0.0977	0.018929	-5.16	0.000	-0.1348	-0.0606
1.Access to						
credit***	-0.08624	0.013241	-6.51	0.000	-0.11219	-0.06029
I.Access to						
extension services	0.046035	0.028516	1.61	0.106	-0.00985	0.101924

** Significant at 5% level of significance

*** Significant at 1% level of significance

The results can be visualized in Figure 3.1

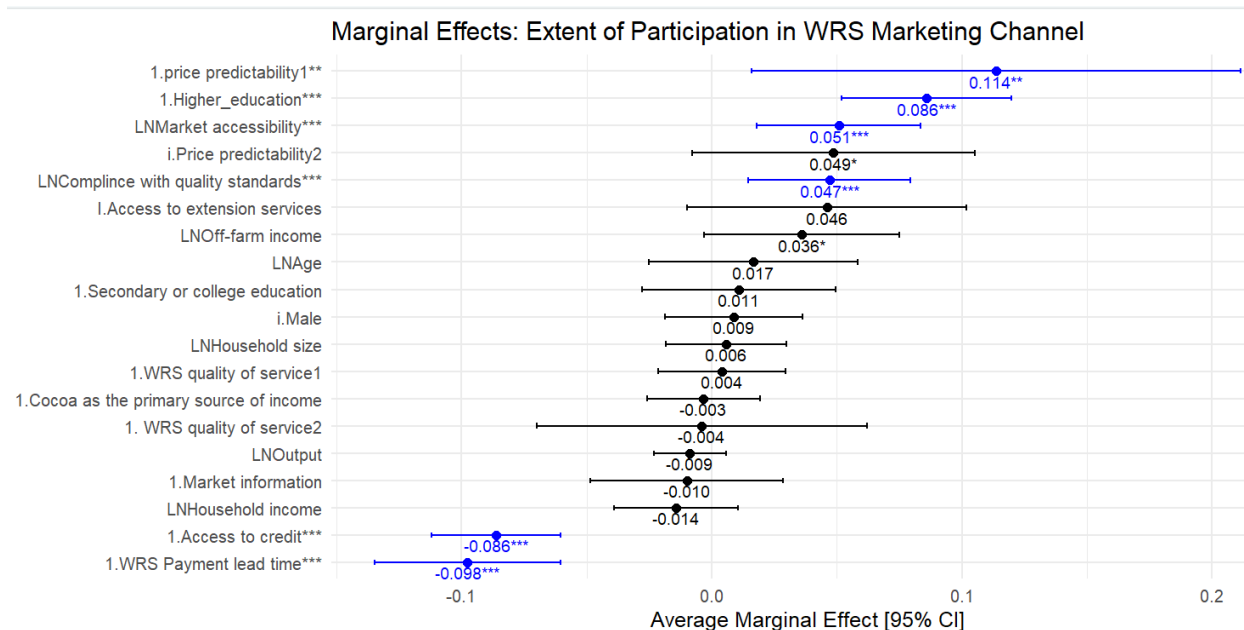


Figure 3.1: Marginal Effects Plot

Based on results of the estimated model in Table 3.5 and Figure 3.1 the researcher arrived at concluding on hypothesis H2 as presented in Table 3.6

Table 3.6: Conclusion on Hypotheses H2

Hypothesis	Hypothesis statement	p-value	Conclusion
H_0	There is no factor with significant influence on smallholder cocoa farmer's extent of participation in WRS in Kyela district	6 factors > 0	Rejected
H_a	There is at least one factor with significant influence on smallholder cocoa farmer's extent of participation in WRS in Kyela district	6 factors ≥ 1	Accepted

3. DISCUSSION

The study found that each additional level of education increases smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) by 8.57% (Marginal effects = 0.085734; p-value < 0.001). The result emphasizes how important education is for improving participation in formal market systems. This is consistent with earlier studies that demonstrate how education enhances farmers' comprehension of risk management strategies and market mechanisms (Asante et al., 2020). Furthermore, education enhances production and productivity, as educated farmers possess better skills and access to information (Mmbando, 2014).

The study revealed that compliance with quality standards positively influences smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS), with a unit increase in compliance resulting in a 4.7% increase in participation (Marginal effects = 0.047035; p-value = 0.004). Higher compliance encourages farmers to access better-priced markets (Alexis et al., 2024). The finding is in agreement with previous studies, where following postharvest quality guidelines greatly boosted the use of structured trading systems in Uganda (Okello *et al.*, 2020). Similarly, it has been demonstrated that farmers' access to premium markets and storage services is improved when they adhere to Ghanaian cocoa quality management methods (Amoah et al., 2021). In the context of Tanzania where all informal alternative market channels are eventually leading to WRS, the study acknowledges the role of transaction cost theory. In line with this theory, the finding implies that adhering to quality standards is associated with additional costs pushing farmers to high-price marketing channels in this case the WRS (Quartey et al., 2023).

The study found that each unit increase in market accessibility leads to a 5.08% rise in smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) (Marginal effects = 0.050801; p-value = 0.002). This is in agreement with a study by Mutero et al. (2016) who found that smallholder participation in formal marketing institutions in Malawi was significantly influenced by physical access to marketplaces. Similar findings were reported by Mapunda et al. (2019) who found that access to market influenced smallholder coffee farmers participation in WRS in Mbinga District, Tanzania. Regardless of the crop, still proximity, road conditions, and transport availability are crucial factors influencing participation (Haile et al., 2022; Mutero et al., 2016).

The study revealed that each level increase in price predictability boosts smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) by 11.37% (Marginal effects = 0.113686; p-value = 0.023). Similarly, as a result of predictable prices enhancing strategic planning and investing in crop production farmers in Uganda were highly participating in WRS (Katunze, 2017). However, the key difference is that reasons underlying the influence of price predictability differ by contexts. Some other findings show that price stability encourages farmers to wait for higher WRS prices, while unpredictability drives them to alternative markets (Melkani et al., 2019).

The study found that access to credit decreases smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) by 8.62% (Marginal effects = -0.08624; p-value < 0.001). Farmers prefer immediate cash from alternative markets to settle loans, diverging from Musah (2014), who suggested that credit repayment fosters greater participation.

4. CONCLUSION

In a context where informal alternative marketing channels are evident, the majority smallholder farmers prefer them to WRS especially when associated with delayed payments, limited accessibility, unpredictable prices. The situation becomes even worse when these alternative channels directly or indirectly sell to WRS. In this scenario the imposed quality standards mainly not afforded by smallholder farmers catalyse their deviation towards informal alternative channels to avoid transaction costs associated with adherence to quality standards. Brokers who afford quality standards take this advantage to buy from smallholder farmers at much lower prices, and later sell to WRS after improving on quality through high standards of postharvest handling procedures. Also, the findings suggest that the use of credit to finance emerging transaction costs associated with high quality postharvest standard procedures may not necessarily work out especially when repayment process is integrated together with WRS. This is based on the evidence that credit access had a negative influence on smallholder farmers participation in WRS due to credit repayment avoidance.

5. RECOMMENDATIONS

Policy Recommendations. The study findings suggest policy review regarding the administration of WRS in the contexts of smallholder farmers whose main source of income is the crop under consideration. A more holistic approach is needed to compensate the income and substitution effects associated with WRS as a constrained choice. Failure to compensate these effects encourages deviation from WRS and convergence towards informal alternative marketing channels. Thus a study on utility maximization functions regarding market channels and associated income effects of WRS based constraints need to be established and incorporated in policy development.

Recommendations for practice. To enhance smallholder cocoa farmers' participation in the Warehouse Receipt System (WRS) in Kyela district, several improvements are needed. First, Agricultural Marketing Cooperative Societies (AMCOS) should improve market information dissemination to reduce misinformation, helping farmers make informed decisions. Additionally, implementing price stabilization policies can support farmers during price fluctuations. Reducing payment terms from one week to 1-3 days is crucial, requiring increased resources. AMCOS should avoid credit deductions from sales, which push farmers to alternative markets. Local authorities must ensure adequate extension services to improve production skills and prioritize transportation infrastructure to enhance market accessibility, encouraging greater participation in WRS.

The government may need to emphasise on WRS mandates through legal enforcement. This approach would certainly minimize availability of informal alternative channels which encourage deviation from WRS by smallholder farmers.

Anywhere where smallholder farmers are constrained within a mix of formal and informal marketing channels, or WRS with parallel brokers who have no choice but to sell through WRS need to ensure that limiting factors are properly addressed. Transaction costs associated with high standards need to be mitigated, credit schemes need to be separated from WRS payment process.

CONFLICTS OF INTEREST

The author declares that, there are no potential conflicts of interest in the publication, public's reaction or pattern of the article.

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REFERENCES

Alberto Abadie, Susan Athey, Guido W Imbens, and Jeffrey M Wooldridge. 2022. "When Should You Adjust Standard Errors for Clustering?" *Quarterly Journal of Economics*.

Alexis H. Villacis, Thomas Kopp, Ashok K. Mishra, (2024). Agricultural marketing channels and market prices: Evidence from high-value crop producers in India. *Economic Analysis and Policy*, Volume 81(2024), 1308-1321. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0313592624000213>

Amoah, D., Donkoh, S. A., & Alhassan, H. (2021). Determinants of compliance with cocoa quality management practices in Ghana. *Cogent Food & Agriculture*, 7(1), 1911004. <https://doi.org/10.1080/23311932.2021.1911004>

Asante, B. O., Osei-Akoto, I., & Kuwornu, J. K. M. (2020). Smallholder adoption of climate-smart cocoa practices in Ghana. *Heliyon*, 6(12), e05682. <https://doi.org/10.1016/j.heliyon.2020.e05682>

Atinkugn A. Belete, Abibual G. Nigatu (2023). Determinants of market participation among smallholder teff farmers, empirical evidence from central Ethiopia. *Environmental Development*, Volume 48, December 2023, 100929. Accessed from <https://www.sciencedirect.com/science/article/pii/S221146452300129X> on 24th April, 2024.

Bezu S. and Villanger E. (2019). Crop market participation among smallholder farmers in Tanzania. CMI working paper number 1 of June, 2019. Accessed from <https://www.cmi.no/publications/file/7106-crop-market-participation-among-smallholder-farmers-in-tanzania.pdf> on 23rd April, 2024.

BPLANer. (n.d.). *Why cocoa farming businesses fail: Avoid these common pitfalls!* Retrieved from <https://bplaner.com/blogs/business-fails/cocoa-farming-business-fails>

- Coulibaly, I. (2024, May 29). Letter: Cocoa price surges rarely help West Africa's poor farmers. *Financial Times*. Retrieved from <https://www.ft.com/content/64af6dbb-5bd3-4836-943f-26516a6ae01d>
- Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica: journal of the Econometric Society*, 829-844.
- Cummings, P. (2009). Methods for Estimating Adjusted Risk Ratios. *The Stata Journal*, 9(2), 175-196. <https://doi.org/10.1177/1536867X0900900201>
- FAO. (2015). *Designing warehouse receipt systems for developing and transition countries*. Food and Agriculture Organization of the United Nations. <https://www.fao.org/3/i5442e/i5442e.pdf>
- Girma, Y. and Kuma, B. (2022). A meta-analysis on the effect of agricultural extension on farmers' market participation in Ethiopia. *Journal of Agriculture and Food Research*, Volume 7, March 2022, 100253. Accessed from <https://www.sciencedirect.com/science/article/pii/S2666154321001551> on 25th April, 2024.
- Gunawan, E., Kuwornu, J. K. M., Datta, A., & Nguyen, L. T. (2019a). Farmers' perceptions of the warehouse receipt system in Indonesia. *Sustainability (Switzerland)*, 11(6). <https://doi.org/10.3390/su11061690>
- Haile, K., Gebre, E. & Workye, A. Determinants of market participation among smallholder farmers in Southwest Ethiopia: double-hurdle model approach. *Agric & Food Secur* 11, 18 (2022). <https://doi.org/10.1186/s40066-022-00358-5>. Accessed from <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00358-5#citeas>
- Harris J. K. (2021). Primer on binary logistic regression. *Family medicine and community health*, 9(Suppl 1), e001290. <https://doi.org/10.1136/fmch-2021-001290>
- Hidayani, S., & Hadi, D. (2019). Factors influencing farmers to join warehouse receipt system in Barito Kuala Regency, South Kalimantan, Indonesia. *EurAsian Journal of BioSciences*,

13(2), 2177-2183. https://d1wqtxts1xzle7.cloudfront.net/77463296/Jurnal_S._Hidayani-libre.pdf?1640682452=&response-content.

IFAD (2014). A framework for Linking Small Farmers to Markets IFAD and the United Republic of Tanzania Prime Minister's Office (2014). Agricultural Marketing Systems Development Scheme. Completion Report. 5pp.

Katunze, M. (2017). Uganda warehousing receipt system: Improving market performance and productivity. *African Development Review*, 29(4), 532–544. <https://doi.org/10.1111/1467-8268.12268>

Lukurugu, G. A., Mwalongo, S., Kuboja, N. M., Kidunda, B. R., Mzena, G., Feleke, S., Madeni, J. P., Masawe, P. A., & Kapinga, F. A. (2022). Determinants of adoption of enhanced cashew production technologies among smallholder farmers in Mtwara region, Tanzania. *Cogent Food and Agriculture*, 8(1). <https://doi.org/10.1080/23311932.2022.2137058>

Mapunda, M. E., Mhando, D. G., & Waized, B. M. (2018). Credit access through warehouse receipt system and farm productivity of smallholder coffee farmers in Mbinga District, Tanzania. *Journal of Agriculture and Life Sciences*, 5(2), 24–34. <https://doi.org/10.30845/jals.v5n2p4>

Mapunda, M. E., Mhando, D. G., & Waized, B. M. (2019). Determinants of participation of smallholder coffee farmers in warehouse receipt system in Mbinga District, Tanzania. *Tanzania Journal for Population Studies and Development*, 26(1), 97–111. <https://doi.org/10.56279/tjpsd.v26i1.96>

Mbilinyi J. O. (2011). Tanzania Parliament Hansard. Retrieved from <https://www.parliament.go.tz/polis/uploads/documents/1458802751-HS-4-33-2011.pdf>

Melkani A., Mason N. M., Mather D. L., and Chisanga B., (2019). Smallholder Maize Market Participation and Choice of Marketing Channel in The Presence of Liquidity Constraints: Evidence from Zambia. Accessed from https://www.canr.msu.edu/fsp/publications/research-papers/RP_161ac.pdf on 24th April, 2024.

- Mmbando, F. E. (2014). *Market Participation, Channel Choice and Impacts on Household Welfare: The Case of Smallholder Farmers in Tanzania*. PhD Thesis Submitted to University of KwaZulu-Natal. Accessed from <https://core.ac.uk/download/344749584.pdf> on 20th April, 2024.
- Musah. A. B. (2014). Market participation of smallholder maize farmers in the upper west region of Ghana. *African Journal of Agricultural Research*, Vol 9(31), 2427-2435. Retrieved from [https://www.academia.edu/47913851/Market participation of smallholder maize farmers in the upper west region of Ghana](https://www.academia.edu/47913851/Market_participation_of_smallholder_maize_farmers_in_the_upper_west_region_of_Ghana)
- Mutai, J. K., Mshenga, P., Njehia, B. K., & Kosgei, G. K. (2013). Socio-Economic Factors Influencing Farmers' Participation in Grain Warehouse Receipt System and the Extent of Participation in Nakuru District, Kenya. In *Journal of Economics and Sustainable Development* www.iiste.org ISSN (Vol. 4, Issue 19). Online. www.iiste.org
- Mutero, Joel & Munapo, Elias & Seaketso, Phemelo. (2016). Operational challenges faced by smallholder farmers: a case of Ethekezi Metropolitan in South Africa. *Environmental Economics*. 7. 40-52. 10.21511/ee.07 (2).2016.4.
- NFYDP. (2021). National Five-Year Development Plan 2021/22-2025/26: Realising Competitiveness and Industrialisation for Human Development. *United Republic of Tanzania, Ministry of Finance and Planning, June*, 321.
- Nyomora, A., Kanyeka, Z., & Ndunguru, A. (2012). *Supporting Tanzania's Cocoa Farmers*. [Repoa Website]. Retrived from www.repoa.or.tz
- Okello, J. J., Narrod, C., & Roy, D. (2020). Compliance with food quality standards and participation in high-value markets: Evidence from smallholder bean farmers in Uganda. *Food Policy*, 95, 101932. <https://doi.org/10.1016/j.foodpol.2020.101932>
- Onumah, G. (2010). Implementing Warehouse Receipt Systems in Africa Potential and Challenges. *Fourth African Agricultural Markets Program Policy Symposium*, 1–16.
- Onumah, G. (2010). *Implementing warehouse receipt systems in Africa: Potential and challenges*. United Nations Conference on Trade and Development (UNCTAD). https://unctad.org/system/files/official-document/suc2010d9_en.pdf

- Otekunrin, O. A., Momoh, S., & Ayinde, I. A. (2019). Smallholder Farmers' Market Participation: Concepts and Methodological Approach from Sub-Saharan Africa. *Current Agriculture Research Journal*, 7(2), 139–157. DOI: <https://doi.org/10.12944/carj.7.2.02>
- Pranoto, Y. S., & Purwasih, R. (2019). Factors affecting the decision of farmers in selecting white pepper marketing channels. *Russian Journal of Agricultural and Socio-Economic Sciences*, 94(10), 180–186. DOI: <https://doi.org/10.18551/rjoas.2019-10.24>
- Quartey, P., et al. (2023). *GlobalGAP compliance costs in Ghana's small-scale pineapple farming sector*. Taylor & Francis Online. Retrieved from <https://www.tandfonline.com/doi/full/10.1080/03031853.2024.2374730>
- Safo, N. K., Al-Hassan, R. M., Somuah, H. A., Boakye, A. A., & Egyir, I. S. (2023). Warehouse receipt system: A shift to improve maize marketing in Ghana. *Ghana Journal of Agricultural Science*, 58(1), 60–76. DOI: <https://doi.org/10.4314/gjas.v58i1.6>
- Simon C. J. (2023). *Determinants Of Antiretroviral Treatment Retention Among Adolescent Girls and Young Women in Care and Treatment Clinics in Mwanza City, Tanzania*. Master Dissertation Submitted the Catholic University of Health and Allied Sciences.
- Surjanovic, N., & Loughin, T. M. (2023). Improving the Hosmer-Lemeshow goodness-of-fit test in large models with replicated Bernoulli trials. *Journal of Applied Statistics*, 1–13. <https://doi.org/10.1080/02664763.2023.2272223>
- Tamhane, A. R., Westfall, A. O., Burkholder, G. A., & Cutter, G. R. (2016). Prevalence odds ratio versus prevalence ratio: choice comes with consequences. *Statistics in medicine*, 35(30), 5730–5735. Retrieved from <https://doi.org/10.1002/sim.7059>
- The Citizen (21st December, 2023). Kyela cocoa boom: Farmers urged to go commercial as prices rise. Published online on, December 21, 2023. Retrieved from <https://www.thecitizen.co.tz/tanzania/news/business/kyela-cocoa-boom-farmers-urged-to-go-commercial-as-prices-rise-4471128>
- UNCTAD. (2022). *Commodities and Development Report 2022: Warehouse receipt financing and food systems transformation*. United Nations Conference on Trade and Development. <https://unctad.org/webflyer/commodities-and-development-report-2022>

United Republic of Tanzania (URT) (2016). National Five Year Development Plan 2016/17 to 2020/21. Ministry of Finance and Planning. Dar es Salaam. 293pp.

URT (2005). The Warehouse Receipt Act of 2005. Government Printers. Dar es Salaam, Tanzania. 24pp.

Vivek, V., Bermúdez, S., & Larrea, C. (2020). Global Market Report: Cocoa. *Exchange Organizational Behavior Teaching Journal*, 1–12.

World Cocoa Foundation. (n.d.). *Why sustainable cocoa farming matters for rural development*. Retrieved from <https://www.csis.org/analysis/why-sustainable-cocoa-farming-matters-rural-development>