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DOES TRANSACTION COST AFFECT FARMERS' PARTICIPATION IN CONTRACT FARMING? EMPIRICAL EVIDENCE FROM TANZANIA'S TEA SUBSECTOR

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Abstract. *This paper examines whether transaction costs affect farmers' participation in contract farming focusing in Tanzania's tea subsector. The study was descriptive by design and used primary data collected in a cross-sectional survey from 393 smallholder tea farmers from two regions (Mbeya and Njombe) in Tanzania. Binary Logistic Regression model was used to estimate the effect of transaction cost determinants on farmer's participation in contract farming, focusing on lower and upper tea value chain nodes. Findings show that downward transaction costs significantly negatively impact contract farming participation (P=0.002), while upward transaction costs significantly positively influence participation (P=0.000). Specific downward transaction costs that significantly negatively influence contract farming participation at P=0.05 are time used to understand contract terms, and services delivery waiting time. Moreover, cost to know contract opportunities and terms, visiting frequency to the investor to qualify for contract farming, contract terms rigidity, and contract terms clarity, negatively influence participation but they are not statistically significant at P=0.05. We recommend that, to enhance farmers' participation in contract farming, practitioners and policies should prioritize on reduction of specific downward transaction costs through training farmers and developing transaction cost-cutting policies. Future research can explore transaction costs in contract farming among processors and analysing the reasons for its variations across value chain nodes.*

Keywords: *Transaction cost, farmers' participation in contract farming, downward transaction cost, upward transaction cost, Tanzania.*

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Introduction

Contract farming is a renowned form of vertical integration that benefits farmers by providing them access market for their agricultural products, while buyers are assured a steady supply of the products they demand. Contract farming also helps farmers to overcome various production challenges, including access to extension services, inputs, and production technologies

like irrigation and mechanisation (Dogeje & Ngaruko, 2023; Arouna et al., 2021; Ncube, 2020). It is argued that contract farming accounts for about 15 percent of agricultural output in industrialised nations and is a common method of vertical integration. For instance, it is estimated to contribute to 39 percent of agricultural production in the US, while it contributes to 38 percent of dairy production in German and 75 percent in Japan to grill production (Prowse, 2016; Rehber, 2007; Young & Hobbs, 2002).

In transitional and emerging nations, contract farming is commonly used as a strategy to foster agricultural development, improve market access for smallholder farmers, and overall livelihood of farmers. This farming arrangement is employed at varying degrees in over 110 different nations across the world. For instance, high proportions of corporate farms employing contract farming are found in Europe's Czech Republic, Slovakia, and Hungary, while the proportion of food firms utilising contract farming has increased dramatically in Georgia, Moldova, Armenia, Russia, and Ukraine (Ruml & Qaim, 2020; UNCTAD, 2009; Swinnen & Maertens, 2007).

Moreover, this farming system has expanded quickly throughout Latin America, especially in Mexico, Brazil, Peru, and other nations. Similarly, in Malaysia, Indonesia, Vietnam, India, China, and Pakistan have adopted contract farming in diverse agricultural sectors (Bellemare, 2021). Since the 1980s, contract farming has increased in Sub-Saharan Africa, and many projects are now being started by private entities by using this arrangement. It is estimated that contract farming is practised by around 12% of Mozambique's rural population and accounts for 60% of Kenya's sugar and tea production (Oya, 2011; FAO, 2005; Rehber, 2007; UNCTAD, 2009). In Tanzania, farmers' involvement in contract farming varies across value chains or crops, with certain crops exhibiting stronger farmer involvement than others. For instance, according to a study by URT (2016), 75% of sisal farmers and 49% of sugarcane producers assigned their land to contract farming. Meemken and Bellemare (2019) on the other hand found that the proportion of Tanzanian farmers participating in contract farming is about 77%. These observations demonstrate major differences in contract farming participation levels in Tanzania and beyond.

In Tanzania, tea is a critical cash crop that supports about 2 million people indirectly and employs about 50,000 people directly. It is estimated that Tanzania has about 32,000 smallholder farmers involved in the cultivation of tea with average tea farms totalling less than 3.5 acres. Moreover, Tanzania's tea operations generate about 45 million USD in foreign exchange annually (IDH, 2021a, 2021b; URT, 2023). The government of Tanzania, through Section 40 (1) of the Tanzania Tea Regulations 2010, encourages smallholder tea farmers to market their green leaf tea through contract farming (URT, 2010). Besides, evidence from the literature review demonstrates that contract farming is practised by some smallholder tea growers in the districts involved in this study (Rungwe, Busokelo, and Njombe). For instance, according to IDH (2021a) and IDH (2021b), it is estimated that about 52% of the 6,147 farmers who supplied green leaf tea to the Ikanga Tea Factory in Njombe region, were done through annual sourcing contracts leaving roughly 48% uninvolved. This observation may imply that a sizeable number of smallholder tea farmers are not engaged in this arrangement in the study and potentially across other tea-growing areas in Tanzania. This, in turn, is likely to limit their performance because of limited forward and backward market linkage outcomes, thus limiting their livelihood improvement.

Transaction cost is regarded by several scholars as one of the determinants of farmers' participation in contract farming, besides, there is limited evidence that shows how it affects farmers' participation in contract farming focusing on various nodes of traditional cash crop value chains such as tea, coffee, cotton, cashew nuts, and sisal. Prior research mostly concentrated on the discovery of broad transaction cost factors for instance focusing on the broader transaction cost classification of search, negotiation, and contract enforcement while ignoring individual and specific transaction costs throughout the value chain nodes. For instance, results from various studies including those conducted in Bangladesh, Vietnam, Zimbabwe, Benin, Ethiopia, Kenya, and Tanzania show that farmers' participation in contract farming is significantly impacted by information search, bargaining, enforcement, payment delays, and side selling (Tuyen et al., 2022;

Chazovachii et al., 2021; Arouna et al., 2021; Yeshitila et al., 2020; Maina, 2015; Ngaruko & Lyanga, 2021; Mmbando et al., 2016; Ismail et al., 2015; Msami & Ngaruko, 2014; Coase, 1937). We argue that if transaction cost is not carefully considered and managed using a focused approach, it might be difficult to meaningful reduce the same thus, leaving farmers operating out of this arrangement and missing out its potential benefits. This entails that the advantages of contract farming may be overstated if transaction costs are not properly considered (Rehber, 2007).

This study intends to fill this research gap by adopting a nuanced approach by specifically examining the effect of upward and downward transaction costs on farmers' participation in tea contract farming in Tanzania. Specifically, this paper tests two hypotheses as follows: Ho: Downward transaction costs do not negatively influence farmers' participation in contract farming, and Ho: Upward transaction costs do not negatively influence farmers' participation in contract farming. Testing these two hypotheses will respond to the overarching research question that, Does Transaction Cost Affect Farmers' Participation in Contract Farming? The study findings are critical in transaction cost theory, especially in the classification and quantification of transaction costs focusing on the nodes of the tea value chain. Likewise, understanding various specific transaction costs across the tea value chain nodes is crucial for farmers and processors to engage in meaningful contractual arrangements that focus on addressing critical transaction costs in the context of contract farming participation in Tanzania and other settings across the globe. Furthermore, these research findings can also be applied to other subsectors in Tanzania and beyond, providing insights into the impact of transaction costs on contract farming and other forms of vertical integration participation.

Literature Review

Theoretical Literature Review

Theoretically, contract farming as a form of vertical integrated is considered to be critical in addressing various challenges faced by farmers and processors as a result of different failures in spot markets (Dogeje& Ngaruko, 2023; Arouna et al., 2021; Ngaruko, 2012). This study hinges on the transaction cost theory to explain farmers' decision to participate in contract farming in the tea subsector. Transaction Cost Theory is part of New Institutional Economics (NIE) founded by Ronald Coase in the 1930s and further expanded by Oliver Williamson in the 1970s. This theory assumes bounded rationality and considers institutions as tools for managing transaction costs (Coase, 1937; Williamson, 1975; Williamson, 2000). The theories' main constructs are information search, negotiation, contract enforcement, and bounded rationality. The theory posits that transacting parties use institutional arrangements to maximize exchange benefits (Coase, 1937; Williamson, 1975; Parada, 2002). In the context of this study, the choice of this governance structure may be influenced by transaction costs. Precisely, farmers may choose contract farming when they believe it minimizes the transaction costs associated with market transactions, like search, negotiation, enforcement, and monitoring costs.

To understand how specific transaction costs affect the likelihood of farmers' participation in contract farming or not, this study used three variables from the Transaction Cost Theory (search, negotiation, and search transaction costs) to generate variables of the nuanced upward and downward transaction costs which are based in the tea value chain nodes. Based on this theory, six sub-variables are developed, three for each of the two transaction cost classifications; downward and upward transaction costs, which are the main variables in this study. Specifically, these variables are downward search transaction costs, downward negotiation transaction costs, downward enforcement transaction costs, upward search transaction costs, upward negotiation transaction costs, and upward enforcement transaction costs.

Empirical Literature Review

Contract farming is regarded as an essential mechanism to foster rural development, farmer engagement, market access, household welfare, and household welfare. Moreover, it contributes to boosting output, productivity, and way of life while providing small farmers with worthwhile

chances to participate in commercial markets (Tekalign, 2019; Bellemare, 2021). For example, a study in India by Cariappa et al. (2023) found that contract farming contributes to the reduction of the cost of inputs, increases production, and contributes to the overall improved farm income profit. Another study conducted in Benin by Mounirou and Yebou (2023) revealed that contract farming positively influences farmers' income from parboiled rice. Similarly, a study by Meemken and Bellemare (2019) in six developing countries (Bangladesh, Nigeria, Mozambique, Côte d'Ivoire, Uganda, and Tanzania) found that farmers engaged in contracting farming had higher income, precisely 10 percent more than those not engaged in this arrangement. Likewise, a study in Tanzania by Dogeje and Ngaruko (2023) revealed that contract farming positively influences Greenleaf tea production. These studies underscore that contract farming is critical to improved farmers' performance.

Even though contract farming has several benefits, farmers' participation in contract farming varies in different parts of the world. For instance, in India which is estimated to have at least 90 million farmers, this arrangement is used by 550,000 farmers only. This proportion is approximately 0.6% only of the total Indian farmers (Cariappa et al., 2023; Damodaran & Agarwal, 2021). Likewise, a study by Meemken and Bellemare (2019) in six developing countries revealed a variable level of participation in contract farming across different subsectors, precisely Bangladesh (3%), Nigeria (13%), Mozambique (4%), Côte d'Ivoire (11%), Uganda (7%), and Tanzania (77%), respectively. In the tea subsector in particular, in Kenya for example, it is estimated that about 60 percent of the tea production is done through this system (UNCTAD, 2009; FAO, 2005). In Tanzania, specifically in the Southern Highlands Tanzania where this study was undertaken, it is estimated that over 50 percent of smallholder tea farmers are engaged in contract farming (IDH, 2021a; IDH, 2021b).

To sum up, results from these studies evident that participation in this arrangement may be value chain or geographical location specific. This entails that farmers' decision to participate in contract farming may be attributed to different factors. Additionally, evidence from the literature review indicate that transaction cost plays a pivotal role in influencing farmer's decision to participate in contract farming. The subsequent paragraphs shed light on the literature regarding the influence of transactions on farmers' participation in this farming system. According to Singh (2002), transaction costs are costs related to market exchange. On the other hand Williamson (1975) related transaction costs to asset specificity, frequency, and uncertainty.

This study considers transaction costs as unforeseen expenditures incurred by farmers while using contract farming to receive services at various nodes along the agricultural value chain. The reviewed studies highlight the significance of transaction cost factors influencing farmers' participation in contract farming across different countries and agricultural sectors. Different scholars conceptualise transaction costs in relation to contract farming and overall vertical integration in the agricultural value chain in many ways depending on the location, the tangible and intangible features, and the observable and unobservable components (Pingali et al., 2005; Holloway et al., 2000; Key et al., 2000).

For instance, a study by Chazovachii et al. (2021) discovered that information asymmetry and uncertainty negatively influence participation, emphasizing the significance of information search and contract negotiation costs in Zimbabwe. While this result underscores the significance of transaction cost variables in contract farming, it does not specify the specific nodes in the value chain where transaction costs are critical during contract implementation. On the other hand, a study by Kozhaya (2020) revealed that payment and delivery delays, as well as side selling due to market price changes, negatively affect contract farming effectiveness in Lebanon. Similarly, a study by Tuyen et al. (2022) found that factors like delayed payments and late delivery influence contract farming performance in Vietnam. Connectedly, Rokhani et al. (2020) identified access to extension services as a positive determinant of farmers' participation in contract farming in Indonesia. These studies also reflect various transaction cost determinants influencing farmers' participation in contract farming but do not show which specific nodes of the agricultural value chain have an

impact within those nodes. Specifically, whether they have effects in the downward or upward node of the value chain.

Furthermore, a study in Benin by Arouna et al. (2021) noted that transaction costs related to contract complexity have little bearing on participation, but emphasised the beneficial effects of services obtained through contract farming. Relatedly, Negasi and Mebrahatom (2019) discovered that while contract farming participation is favourably impacted by transaction costs related to projected services, contract schemes in Ethiopia are negatively impacted by transaction costs associated with mistrust and lack of openness. Similarly, in the study by Ewusi Koomson et al. (2022) in Ghana, transaction costs related to service delays have a big impact on farmers' side sales. Likewise, a study in Ethiopia by Yeshitila et al. (2020) revealed that side selling in contract farming is increased by high transaction costs in general, while, in contrast, the same is reduced by trust and satisfaction. Additionally, information asymmetry and transaction costs were found to have a negative impact on farmers' market participation (Rondhi, 2021). These studies too do not provide an aggregated relationship and effect of transaction cost on farmers' decision to engage in contract farming with a focus on backward and forward nodes of the specific agricultural value chain nodes.

Focusing on Tanzania, results from a study by Ngaruko and Lyanga (2021) demonstrated how enforcement costs have a favourable impact on sunflower seed output in Tanzania while transaction costs associated with information search and bargaining have a negative impact. Similarly, according to Msami and Ngaruko (2014), search and screening transaction costs have a substantial impact on institutional marketing arrangements for the poultry industry in Tanzania. Connectedly, according to Mmbando et al. (2016), the choice of farmers' market channel is influenced by transaction cost variables like pricing information search, market access road condition, and business trust. According to Ismail et al. (2015), in Tanzania, farmers' decisions to participate in markets are greatly influenced by transaction costs such as market levy, middlemen charges, transportation costs, and government tax.

These studies also sow inherent limitations when viewed in the value node-specific transaction costs. This entails that looking at transactions using the other scholar's approach used in previous studies cannot aid a nuanced understanding of transaction costs on farmers' participation in contract farming focusing on the downward and upward value chain nodes. This may subsequently limit the targeted development of policies and practices to address specific transaction cost factors effectively to influence farmers' participation in contract farming. This implication may extend to findings in prior studies discussed in the previous paragraphs.

To sum up, based on the reviewed literature it is evident that, although scholars in the reviewed literature emphasize the impact of transactions on farmers' participation in contract farming, a gap still exists in understanding how transaction costs specifically affect farmers' participation in contract farming by focusing on specific nodes of various Agri-value chains, including cash crops like tea, coffee, cotton, and cashew nuts. This study aims to fill this gap by investigating the effects of transaction cost on farmers' engagement in contract farming using a nuanced approach that focuses especially on the upward and downward value chain nodes of the tea subsector in Tanzania. By examining the specific effects of transaction costs at various value chain nodes, the proposed study adds significant knowledge to the field of contract farming and transaction costs, by ensuring that the influence of transaction costs is understood with a focus on the entire value chain and farming contracts lifecycle. This knowledge also will help various actors, including the government to formulate more informed policies and strategies to identify and reduce transaction costs, thus enhancing successful and sustainable contract farming practises.

Methods

Research Design

This research used descriptive approach to estimate the likelihood of farmers' participation in contract farming based on transaction cost variables. This approach formed the basis for testing the null hypothesis as it uncovered trends and patterns in contract farming participation in the research population. This study collected primary data in a cross-sectional study comprising 393

smallholder tea farmers from 37 villages in three districts selected located in Southern Highlands Tanzania based on their participation or non-participation in contract farming in the 2022 tea production season. The specific study districts in the Southern Highlands of Tanzania are Rungwe and Busokelo districts in Mbeya regions and Njombe District Council (DC). These districts were selected because over 70 percent of smallholder tea farmers are in the Southern Highlands of Tanzania (IDH, 2021a; IDH, 2021b). Random sampling was used to maximise the representation of the tea smallholder farmers in this study. Specifically, participants were purposively divided into contract and non-participants (70% and 30% respectively), with random samples drawn from selected clusters, specifically in the selected 37 villages which were selected based on the availability of farmers participating or not participating in contract farming.

Variables Measurement

The dependent variable is farmers' participation in contract farming which is measured as a dichotomous variable (1 if participated, 0 if otherwise). This method makes a clear distinction between participating and non-participating farmers and offers insights into the transaction cost elements affecting farmers' willingness to participate in tea contract farming.

This study used two main independent variables (downward transaction costs (DTC) and upward costs transaction costs (UTC) with, six sub-variables, three for each DTC and UTC in line with Transaction Cost Theory. Specifically, the six specific sub-variables are downward search transaction costs, downward negotiation transaction costs, downward enforcement transaction costs, upward search transaction costs, upward negotiation transaction costs, and upward enforcement transaction costs measured on a five-point Likert scale (1-5), whereby 1 denotes strongly disagree, while 5 mean strongly agree.

Table 1
Transaction Costs Measurement

Contract farming stage	Construct/ Variables	Number of Indicators	Specific transaction cost measurement (indicators)
Downward Transaction Costs (DTC)			
Production {Farm preparation, planting and management (growing)}	DSTC	4	DSTC1: Contract length; DSTC2: Time used to know the contract terms; DSTC3: Cost to know contract opportunities and terms; DSTC4: Visiting frequency to the investor
	DNTC	4	DNTC1: Contract terms rigidity; DNTC2: Contract negotiation frustration; DNTC3: Time to understand contract terms; DNTC4: Comprehension of the contract terms
	DETC	4	DETC1:Delays in receiving the agreed services; DECT2: Reputation of not complying to contract; DECT3: Time use in contract monitoring; DNCT4: Fear of legal reprisal production techniques non-compliance
Subtotal DTC	**3**	**12**	
Upward Transaction Costs (UTC)			
Selling {harvesting (plucking), aggregation sorting and selling}	USTC	4	UTSC1: Frustration to know harvesting and collection dates; UTSC2: Visits to the buyer (investor) to know net amount payable; UTSC3: Cost to know net amount payable; UTC4: Time spent to wait for payment status
	UNTC	4	UNTC1: Price-renegotiation in case of market changes; UNTC2: Frustration with re-negotiation price; UNTC3: Time used to understand revised price setting mechanism; UNTC4: Frustration in agreeing on the net amount to be paid on the acceptable quality supplied
	UETC	4	UETC1: Delays in payments; UETC2: Loss due to quality-based products rejection; UETC3: Product inspection time; UETC4: Side-selling penalty
Subtotal UTC	**3**	**12**	
Total TC	**6**	**24**	

Source: Researcher Constructs, 2023

Specifically, each variable had three constructs with three indicators, resulting in a total of 6 constructs (3 for DTC and 3 for UTC) and 24 indicators (12 for DTC and 12 for UTC). The Likert scale, which was used as a proxy indicator allowed for quantifying farmers' perceptions and opinions on transaction costs, providing nuanced analysis and interpretation of data. Participants rated 24 items (12 for DTC and 12 for UTC) based on their perspectives and experiences in contract farming engagement (see the details in Table 1).

Composite scores were calculated for each of the six constructs in order to evaluate how the various transaction costs in contract farming along the tea value chain nodes were perceived in general. The mean, median, mode, range, maximum, minimum values, and standard deviation were then computed using these scores as indices of central tendency. Each composite score was divided into two mean groups, with the low mean range group designated as low transaction cost and the high mean range group as high transaction cost. This approach which is shown in Table 2, also referred to as the mean range approach, was adapted and modified from a related study carried out by Ngaruko (2022).

Table 2
Data Interpretation Matrix

Variable	Number of Items	Measurement (Mean score)	Mean (M) interpretation
1: DTC			
DSTC	4	4-20	Low=4-11.9; High=12-20
DNTC	4	4-20	Low=4-11.9; High=12-20
DETC	4	4-20	Low=4-11.9; High=12-20
Total TDC	12	12-60	Low=12-35.9; High=36-60
2: UTC			
USTC	4	4-20	Low=4-11.9; High=12-20
UNTC	4	4-20	Low=4-11.9; High=12-20
UETC	4	4-20	Low=4-11.9; High=12-20
Total UTC	12	12-60	Low=12-35.9; High=36-60
Total TC	**24**	**24-120**	**Low=24-71.9; High=72-120**

Source: Researcher's Constructs, 2023 as adapted from Ngaruko (2022)

Structural Equation

This part provides the estimation equations on the likelihood of farmers who participated in contract farming in the tea subsector in the last production season (2022) or beyond. Participation was estimated by using the Binary Logistic Regression model through the following structural equations.

$$\ln(FPCF_j) = f(TC) \tag{1}$$

Whereby:

$\ln(FPCF_j)$ = Log-odds (likelihood) of participation in contract framing for the j^{th} farmer where 1 = log-odd farmer participation in contract farming; 0 = log-odds of non-participation in contract farming in a range of 0 to 1 to the range of -∞ to +∞.

TC=Total transaction.

In Equation 1, the logit transformation extends predicted values from -∞ to +∞. To estimate participation likelihood within the 0 to 1 range, Equation 1 can be reformulated as Equation 2, converting log-odds into probabilities.

$$Probability(FPCF_j) = \frac{\exp(\ln(FPCF_j))}{[1+\exp(\ln(FPCF_j))]} \tag{2}$$

Whereby:

$Probability(FPCF_j)$ = Probability of j^{th} farmer participating in contract farming.

$\exp(\ln(FPCF_j))$ = Exponent of the logit which specifically, undo the logit transformation, to the value of the original odds scale.

$1+\exp(\ln(FPCF_j))$ = Exponent of the logit added to 1.

$\frac{\exp(\ln(FPCF_j))}{[1+\exp(\ln(FPCF_j))]}$ = Estimation of probability $(FPCF_j)$, which is computed by dividing the exponent of the logit by the sum of the exponent and 1 to ensure that the probability falls from the range of 0 to 1. This entails probability $(FPCF_j)$ is estimated by applying the logistic function to the log-odds by ensuring it remains within the 0 to 1 range.

Therefore, as indicated in Table 2, transaction cost is a composite score of downward and upward transaction cost, thus, Equation 1 may be re-written into Equation 3.

$$\ln(FPCF_j)=f(DTC,UTC) \tag{3}$$

Whereby:
DTC=Downward Transaction costs
UTC=Downward Transaction costs
Structurally, Equation 3 can be presented as in Equation 4 when an error term is introduced.

$$\ln(FPCF_j)=\beta_0+\beta_1 DTC_j+\beta_2 UTC_j+\epsilon_j \tag{4}$$

Whereby:
j=Farmer identity where j=1-n
i=disaggregated variable where i=1-n
β_1 = the regression coefficient
ϵ = error term
As indicated in Table 1, DTC and UTC depend on the variables described in equations 5 and 6.

$$DTC=f(DSTC,DNTC,DETC) \tag{5}$$

$$UTC=f(USTC,UNTC,UETC) \tag{6}$$

Following disaggregation of UTC and DTC in equations 5 and 6, to establish the effect of disaggregated transaction cost of downward and upward indicators on log-odds of farmers' participation, Equation 4 may be re-written into Equation 7.

$$\ln(FPCF_j)=\beta_0+\beta_1 DSTC_{ij}+\beta_2 DNTC_{ij}+\beta_3 DETC_{ij}+\beta_4 USTC_{ij}+\beta_5 UNTC_{ij}+\beta_6 UETC_{ij}+\epsilon_j \tag{7}$$

Whereby:
DSTC=Downward Search Transaction Costs
DNTC=Downward Negotiation Transaction Costs
DETC=Downward Enforcement Transaction Costs
USTC=Upward Search Transaction Costs
UNTC=Upward Negotiation Transaction Costs
UETC=Upward Enforcement Transaction Costs

Data Processing and Analysis

The collected data were cleaned using Excel before being loaded into IBM SPSS Statistics Version 26 for both descriptive and inferential statistical analysis. Descriptive analysis of the predictor and outcome variables was performed and presented in the forms of tables and figures. Binary Logistic Regression Model was used for the inferential statistical analysis to estimate the probability of farmers' participation in contract farming. This model was also used to test the null

hypothesis for this study. The criteria for accepting or rejecting the null hypotheses were based on a 5% significance level, indicating a 95% confidence level. Before, running the Logistic Regression Analysis, relevant assumptions, including, validity, reliability, normality, significant outliers tests, multicollinearity test, Box-Tidwell test, and overall model fitness were tested and passed.

Results

Descriptive Results

The findings show that the majority of participants were male (57%), while females constituted 43 percent of the sample. Respondents' ages ranged from 20 to 80 years, with an average age of 47 years. Notably, this average age is slightly below the African average age of farmers in agriculture, which stands at 60 years (FAO, 2014). Connectedly, about 90 percent of the participants had completed primary school while 10 percent had not completed primary school. The average household size was 5.2 persons, which is slightly higher than the national average (4.9 persons) (URT, 2019). Likewise, the average farm size planted with tea, average production and income from tea were 1.5 acres, 3.3 tons, and Tanzania Shillings (TZS) 1.1 million, respectively.

In the context of contract farming participation, the research reveals that 70% of smallholder tea farmers engaged in contract farming, while the remaining 30% did not participate in this farming system. Moreover, the study findings indicate that smallholder tea farmers, in general, have a perception that transaction costs associated with farmers' participation in contract farming are relatively high (Table 3). This is evident from the overall composite score mean of Total Transaction Cost (TTC), which stands at approximately 74 and falls within the high-cost range of 72 to 120, as established in this study (Table 2). This finding emphasises how crucial it is to address transaction costs as potential obstacles to farmers' participation in contract farming.

Table 3
Transaction Cost Descriptive Results (n=393)

Variable	Measure of central tendency					Cost classification
	Mean	Median	Mode	Minimum	Maximum	
Downward Transaction Cost (DTC)						
DSTC	9.1	9	8	4	14	Low
DNTC	16	16	16	12	20	High
DETC	16.5	16	16	12	20	High
TDTC	**41.5**	**41**	**40**	**30**	**52**	**High**
Upward Transaction Cost (UTC)						
USTC	8.9	9	9	5	13	Low
UNTC	10.3	10	10	4	20	Low
UETC	13.0	13	14	5	20	High
TUTC	**32.2**	**32**	**34**	**16**	**44**	**Low**
TTC	**73.8**	**74**	**79**	**55**	**91**	**High**

Source: Research Data, 2023

In line with the classification threshold for the transaction costs composite scores in Table 1, when we examine upward and downward transaction costs, the mean value of the downward transaction costs (41.5) is higher than the mean value of downward transaction costs (32.2) (see the details in Table 3). This shows that farmers regard the downward nodes of the tea value chain as having more difficulties or complexities related to transaction costs associated with contract farming engagement than the upward nodes of the tea value chain. Moreover, in the downward value chain node, Downward Negotiation Transaction Costs (DNTC) and Downward Enforcement Transaction Costs (DETC) were thought to be higher than Downward Search Transaction Costs (DSTC) (see the details in Table 3). In contrast, in the upper-value chain node, only Upward Enforcement Transaction Costs (UETC) were thought to be higher than Upward Search Transaction Costs (USTC) and Upward Negotiation Transaction Costs (UNTC) (see the details in Table 3).

Inferential Statistics Results

Logistic Regression Results

Prior to conducting the Logistic Regression Analysis, we assessed and confirmed the fulfilment of key assumptions, such as validity, reliability, normality, tests for significant outliers, multicollinearity, the Box-Tidwell test, and the overall model fitness. For instance, exploratory Factor Analysis was used to test construct validity, whereby both discriminant and discriminant factor loading above 0.7 factor loading for all six constructs which is above the acceptable thresholds for all constructs (Fabrigar & Wegener, 2011). Reliability was checked by using Cronbach's alpha, whereby all six constructs scored 0.7 which is also above the minimum threshold (Pallant, 2016; Nunnally, 1978). For the Box-Tidwell Test, the two main variables, the logistic transformation between downward and upward composite scores yielded a p-value ($p > 0.05$) which is nonsignificant showing that this assumption is assumed. For significant outliers test was done resulting in the removal of 16 observations with Cook's values exceeding 0.01, equivalent to one-fourth of the sample size (393/4), from the model (Cook & Beckman, 2006). Consequently, the regression model was executed using 377 observations.

Aggregated Effects of Downward and Upward Transaction Costs on FPCF

Precisely, the Binary Logistic Regression model was used to examine the impact of upward and downward transaction costs on farmers' willingness to engage in contract farming. Two steps were taken in the analysis. First, regression was carried out using equation 2 on aggregated downward and upward transaction cost factors. Following equation 7, a second regression analysis was performed on disaggregated transaction cost indicators. The results for the first regression step are presented in Table 4.

Table 4
Aggregated TC Indicators Logistic Regressions

Model		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	TDTC	-0.089	0.029	9.721	1	0.002*	0.915	0.865	0.968
	TUTC	0.122	0.03	16.57	1	0.000*	1.129	1.065	1.197
	Constant	0.881	1.213	0.527	1	0.468**	2.412		

(a) Variable(s) entered on step 1: TDTC, TUTC.
(b) Dependent variable: Farmers' PCF; Sig=0.000; Nagelkerke R Square= 0.08; Correct Classification=74.3%;
*Significant at P = 0.05; **Significant at P = 0.1; n=377

Source: Research Data, 2023

As indicated in Table 4, the findings show that total downward transaction cost (TDTC) exhibits a significant negative effect on farmers' participation (P=0.002), as such the null hypothesis is not supported. In contrast, total upward transaction cost (TUTC) demonstrates a significant positive effect on farmers' participation in contract farming at a 5 percent precision level, thus, the null hypothesis is accepted. These results imply that while upward transaction costs may motivate farmers to join in contract farming, downward transaction costs may serve as a barrier to participation. Further results on the disaggregated transaction cost indicators are shown in Table 5.

Effects of Downward Transaction Costs on FPCF

On downward value chain node, the results show that DSTC1 and DSTC2 had a positive effect on farmers' desire to engage in contract farming (DSTC1 statistically significant and DSTC2 not statistically significant at P=0.05), but DSTC3 and DSTC4 had a negative effect but both not statistically significant at P=0.05. These findings entail that, shorter contracts and simpler conditions increased involvement, whereas higher learning costs for contract opportunities and frequent investor visits decreased it. These findings concur with those of the study by Arouna et al. (2021) showing that contract complexity has no bearing on farmers' participation.

Moreover, DNTC2 (contract negotiating irritation) and DNTC3 (time needed to understand contract conditions), negatively influence farmers' participation in contract farming (DNTC2 is not statistically significant, while DNTC3 is statistically significant at P=0.05). Conversely, DNTC1 (rigidity of contract conditions) and DNTC4 (complexity of legal papers) have a positive impact on

participation. These results support earlier studies that point to the possibility that contract farming may be discouraged or encouraged depending on specific negotiating costs (Chazovachii et al., 2021; Arouna et al., 2021). In line with the findings of Ngaruko (2022) and Kozhaya (2020) research, DETC2 (reputation for not upholding contract conditions) and DETC3 (time spent on contract monitoring) had a positive effect on farmers' participation but both are not statistically significant at P=0.05.

Table 5
Results for Disaggregated TC Logistic Regression Indicators

Model Variable (a)	Item	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Downward Search Transaction Cost (DSTC)	DSTC1	0.796	0.302	6.942	0.008*	2.217	1.226	4.008
	DSTC2	0.201	0.301	0.447	0.504	1.223	0.678	2.207
	DSTC3	-0.104	0.285	0.134	0.715	0.901	0.516	1.575
	DSTC4	-0.382	0.309	1.526	0.217	0.682	0.372	1.251
Downward Negotiation Transaction Cost (DNTC)	DNTC1	0.874	0.302	8.343	0.004*	2.396	1.324	4.334
	DNTC2	-0.572	0.34	2.827	0.093**	0.564	0.29	1.099
	DNTC3	-1.027	0.345	8.879	0.003*	0.358	0.182	0.704
	DNTC4	0.121	0.327	0.137	0.711	1.129	0.594	2.143
Downward Enforcement Transaction Cost (DETC)	DETC1	-0.618	0.301	4.208	0.040*	0.539	0.299	0.973
	DETC2	0.099	0.302	0.109	0.742	1.105	0.612	1.995
	DETC3	0.473	0.333	2.022	0.155	1.605	0.836	3.082
	DETC4	-0.46	0.27	2.908	0.088**	0.631	0.372	1.071
Upward Search Transaction Cost (USTC)	USTC1	0.452	0.244	3.423	0.064**	1.571	0.974	2.536
	USTC2	-0.316	0.27	1.372	0.241	0.729	0.43	1.237
	USTC3	0.084	0.225	0.139	0.709	1.088	0.699	1.691
	USTC4	-0.265	0.265	0.999	0.318	0.767	0.456	1.29
Upward Negotiation Transaction Cost (UNTC)	UNTC1	0.84	0.288	8.491	0.004*	2.316	1.316	4.074
	UNTC2	-0.031	0.352	0.008	0.931	0.97	0.487	1.932
	UNTC3	0.137	0.281	0.239	0.625	1.147	0.661	1.991
	UNTC4	-0.094	0.353	0.071	0.79	0.91	0.456	1.817
Upward Enforcement Transaction Cost (UETC)	UETC1	-0.082	0.252	0.105	0.746	0.922	0.562	1.511
	UETC2	0.566	0.274	4.274	0.039*	1.76	1.03	3.009
	UETC3	-0.356	0.301	1.4	0.237	0.701	0.389	1.263
	UETC4	0.167	0.255	0.43	0.512	1.182	0.718	1.946
Constant	3.087	1.561	3.913	0.048	21.912			

(a) Variable(s) entered on step 1: DSTC1, DSTC2, DSTC3, DSTC4, DNTC1, DNTC2, DNTC3, DNTC4, DETC1, DETC2, DETC3, DETC4, USTC1, USTC2, USTC3, USTC4, UNTC1, UNTC2, UNTC3, UNTC4, UETC1, UETC2, UETC3, UETC4

(b) Dependent variable: Farmers' PCF; Sig=0.000; Nagelkerke R Square= 0.287; Correct Classification=78.%; *Significant at P = 0.05; **Significant at P = 0.1 ; n=377

Source: Research Data, 2023

The positive influence of DETC2 shows a negligible impact of the reputation for non-compliance in participation. Farmers are more motivated, confident, and engaged with more monitoring (DETC3). In line with theoretical expectations, DETC1 (delays in receiving agreed services) and DETC4 (fear of legal retaliation) have a negative effect on participation and serve as impediments to farmers' involvement in contract farming (DETC1 is statistically significant, while DETC4 is not statistically significant at P=0.05).

Effects of Downward Transaction Costs on FPCF

Focusing on the upward value chain node, the research demonstrates a positive link between USTC1 (efforts to establish net harvesting dates) and USTC3 (costs for collecting net payment information) with farmers' engagement in contract farming, but both are not statistically significant at P=0.05. This contradicts earlier research (Chazovachii et al., 2021; Ruml & Qaim, 2020; Maina, 2015) that suggests that lower participation is negatively impacted by greater search transaction costs. The positive connections imply that investment in information collecting and proactive

management have a positive impact on farmers' participation in contract farming. Furthermore, contract farming participation is adversely affected by USTC2 (visits to the buyer to assess payment) and USTC4 (waiting for payment status), but both are not statistically significant at P=0.05. Similar results from other studies emphasise the deterrent effect of payment delays on farmers' participation. Long waiting times raise uncertainty, which may make farmers less likely to participate (Ewusi Koomson et al., 2022; Tuyen et al., 2022; Kozhaya, 2020).

Discussion

Moreover, the study's findings show that, farmers' willingness to engage in contract farming is negatively impacted by dissatisfaction with price renegotiations (UNTC2) and issues reaching an understanding on net payments (UNTC4), but both are not statistically significant at P=0.05. In addition, farmers' engagement is positively impacted by their ability to renegotiate prices as a result of market changes (UNTC1) and their comprehension of the updated price-setting process (UNTC3) (UNTC1 statistically significant, while UNTC3 is not statistically significant at P=0.05). This result is in contrast to earlier research by Ngaruko and Lyanga (2021) and Msami and Ngaruko (2014), but it emphasises the significance of pricing flexibility and transparent methods for promoting farmers' participation.

Furthermore, UETC1 (delays in payments) and UETC3 (green leaf tea inspection time) have a negative impact on farmers' participation in contract farming, but both are not statistically significant at P=0.05. This is consistent with earlier research, which demonstrates the importance of effective payment procedures and prompt inspections for fostering participation (Ewusi Koomson et al., 2022; Kozhaya, 2020). Relatedly, the fact that UETC2 (product rejection losses) and UETC4 (side-selling fines) have a favourable impact on participation (UETC2 is statistically significant, while UETC4 is not statistically significant at P=0.05). Furthermore, according to these findings, farmers place high importance on quality assurance and the necessity of contract enforcement (Ngaruko, 2022; Tuyen et al., 2022; Kozhaya, 2020). Penalties deter side-selling and encourage active involvement in contract farming.

Conclusion

This paper aimed to determine if transaction costs, both downward and upward, affect farmers' participation in Tanzania's tea subsector contract farming, testing two hypotheses against negative influences. The study findings reveal that total downward transaction cost (TDTC) has a significant negative impact on participation, thus, the null hypothesis is not supported. Nevertheless, total upward transaction cost (TUTC) has a significant positive impact on farmers' participation in contract farming, thus the null hypothesis is supported. This entails, that the increase in farmers' participation in contract farming due to an increase in upward transaction cost implies that farmers have no significant influence in mitigating upward transaction cost (cost of selling green leaf tea) as these are induced to them by the tea monopsonist. Instead, farmers can only cope with the increasing marketing by effectively participating in contract farming with the monopsonist. This study concludes that downward transaction costs negatively affect tea contract farming participation, while upward transaction costs exhibit a positive influence. Moreover, the disaggregated transaction cost metrics show how particular factors affect farmers' participation in more detail both in the downward and upward value chain nodes.

We recommend that stakeholders, including the government, investors, and farmers should adopt a nuanced approach in transaction cost identification, measurement, and reduction strategies and policies focusing on upward and downward value chain nodes. This approach will contribute to a targeted and effective reduction of transaction costs related to farmers' participation in contract farming with a lens of agri-value chain nodes. More precisely, the strategies and policies focus should be prioritised on reducing specific downward transaction costs like time used to understand the contract terms and time to wait to receive the agreed services. Improved farmers' participation in contract farming is likely to improve their performance in terms of production output, green leaf income, and livelihood. Further studies may consider exploring transaction cost factors on contract farming participation focusing on other value chain actors like processors as well as studying

factors affecting transaction cost variations across value chain nodes. Moreover, a similar study may be replicated in other crops in Tanzania and beyond.

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