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Influence of Farmer Quality Attributes on Farmers' Participation in Contract Farming in Tanzania's Tea Subsector

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This paper assesses how selected farmer quality indicators influence farmers' participation in contract farming in Tanzania's tea subsector. A total of 393 smallholder tea farmers from three purposefully selected districts in the Mbeya and Njombe regions in the southern highlands of Tanzania participated in a cross-section survey that yielded the study's primary data. Data were collected using a structured questionnaire with five-point Likert scale questions. Binary logistic regression analysis was conducted to assess the impact of the four farmer quality determinants on farmers' participation in contract farming. The results show that farmers' engagement in contract farming is significantly negatively affected by land access (B=-0.529, Wald value=4.931 and P<0.05). Access to farming equipment was found to have negatively influenced farmers' engagement in contract farming (B=-0.21, Wald value=0.931 and P<0.30). Further results show that prior contract farming experience significantly positively affects tea farmers' participation (B=0.551, Wald value=9.656 and P<0.05). Also, regression results indicate that farmers' knowledge of the tea value chain seems to have a positive influence on farmers' engagement in contract farming (B=0.27, Wald=1.757 p<0.20). These findings suggest that access to land and equipment negatively affects farmers' contract farming participation. Thus, strategies and policies should focus on improving land access to overcome the challenges faced by farmers to engage in contract farming. Moreover, the enhancement of farmers' access to farming equipment through subsidised programs, equipment rental schemes or cooperative initiatives is crucial. These measures contribute to enhanced and sustainable contract farming practices, thus benefiting both farmers and the tea subsector at large.

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INTRODUCTION

Contract farming, a popular type of vertical integration, enables farmers to gain access to markets for their agricultural products and get around production obstacles including limited access to extension services, inputs, and production technologies (Ncube, 2020; Meemken & Bellemare, 2019). This form of vertical integration has a significant impact on the agricultural sector, accounting for 15% of agricultural output in developed countries, 39% of agricultural production in the US in 2001, and a significant portion of the production of dairy and grilled meats in Germany and Japan (Young & Hobbs, 2002; Prowse, 2016; Rehber, 2007). Contract farming is commonly practised in transitional and developing countries, with over 110 countries using it to varied degrees (UNCTAD, 2009). It is widely used by corporate farms in nations including the Czech Republic, Slovakia, and Hungary, as well as food companies in Ukraine, Georgia, Russia, Moldova, and Armenia (Swinnen & Maertens, 2007).

In many Latin American nations, including Brazil, Mexico, Peru, and others, contract farming has grown quickly. Asia has seen the adoption of contract farming across a variety of agricultural industries by Malaysia, Indonesia, Vietnam, India, China, and Pakistan. Since the 1980s, the practice has grown across Sub-Saharan Africa, thanks in large part to projects started by commercial organisations. Notably, contract farming employs about 12% of the rural population in Mozambique and accounts for 60% of Kenya's production of sugar and tea (Rehber, 2007; FAO, 2005; UNCTAD, 2009). Across

various value chains and commodities, Tanzanian farmers' involvement in contract farming varies. For instance, according to the United Republic of Tanzania (URT) (2016), 75% of sisal farmers and 49% of sugarcane growers engage in contract farming by entrusting such agreements with the use of their land. On the other hand, Meemken and Bellemare (2019) discovered that the involvement rate of Tanzanian farmers exceeds 70%, demonstrating notable variances in participation levels.

In developing countries, the tea business has a substantial impact on rural development, poverty alleviation, and food security. A significant source of export earnings, annual tea production surpasses USD 17 billion, with a USD 9.5 billion market value. East Asia, Africa, Latin America, the Caribbean, and the Near East are among the developing countries that have made noteworthy strides in their tea production over the past ten years, helping to drive up global per capita consumption of tea by 2.5%. About 60% of the tea drunk worldwide is grown by smallholder farmers, which boosts rural employment, enhances nutrition, and increases food security. About 45 million USD in foreign exchange are generated by Tanzania's tea industry annually, which also directly employs about 50,000 people and indirectly supports 2 million more (FAO, 2022; URT, 2023; IDH, 2021a, 2021b).

The Tanzania Tea Regulations 2010 (URT, 2010), Section 40 (1), encourages smallholder producers to market their green leaf tea through contract farming. Besides, some growers of tea in various tea-growing locations do not use contract farming to produce or sell tea. The literature review shows

that some smallholder tea growers in the study's districts are not engaged in contracts. The Ikanga Tea Factory in Njombe, for example, received green-leaf tea from 6,147 farmers in 2021. According to IDH (2021a) and IDH (2021b), about 52% of these farmers participated in annual sourcing contracts, implying that about 48% of smallholder tea farmers were not involved in contract farming.

There is no consensus on determinants of farmers' participation in contract farming for various subsectors. Various scholars attributed contract farming participation to different factors, including farmers' characteristics, which are referred to by other scholars as farmer quality (Huang-ping and Chuan-fang (2012). Examples of the most studied farmer quality variables include farm size, age, sex, farming experience, contract farming experience, and education (Hoang & Nguyen, 2023; Loquias et al., 2021; Nazifi & Ibrahim, 2021).

Despite numerous research that have investigated various factors of farmer involvement in contract farming, the literature particularly investigating the effect of farmer quality on smallholder tea growers' engagement in contract farming is limited. Our argument is that if some farmer quality traits are not managed properly, the involvement of some smallholder tea farmers may be hindered. To fill this gap, this paper examines how select farmer quality indicators influence their participation in tea contract farming in Tanzania.

LITERATURE REVIEW

Contract farming is essential for promoting rural development, involving farmers, increasing market access, and enhancing household welfare in developing nations. It offers smallholder farmers beneficial chances to participate in commercial marketplaces while also enhancing the output, productivity, and general quality of life for farmers (Ton et al., 2018). In this regard, farmers' involvement in contract farming cannot be overemphasised. It is impossible to exaggerate the value of farmers' engagement in contract

farming. Various scholars relate contract farming participation with various factors, some of which are explored in this section.

In a study undertaken by Koshuma et al. (2023) on contract farming participation by sugarcane producers in Tanzania by using binary logistics regression analysis found that variables including smallholder sugarcane farmers' age, marital status, farming experience, land size, and land ownership have a substantial positive impact on their participation in contract farming through Agricultural Marketing Cooperative Societies (AMCOS). Likewise, a study by Rokhani et al. (2020), which used a logistic regression analysis to study the contract farming determinants in the sugarcane subsector in Indonesia, concluded that farmers' involvement in sugarcane contract farming is negatively influenced by factors like cultivated land type, education, and age, while cultivation area, land tenure, cooperative membership, cropping system, and certified seeds positively affect participation.

A study on contract farming participation by Rondhi et al. (2021) found that factors like land size, education, farmer group, population, and agricultural extension had a significant positive impact on farmers' participation in contract farming. Connectedly, a study undertaken by Behera (2019) on contract farming participation determinants in India revealed that farmers' participation in contract farming is affected by the size of land held by a farmer, household workforce availability and area under the irrigation scheme. On the other hand, a study by Tongchure (2013) on contract farming participation by cassava farmers in Thailand revealed machinery cost (access to farming equipment) to significantly positively affect contract farming participation. Other factors that significantly influenced contract farming participation are household members' education, household head gender, cost of inputs, agricultural group numbers, access to credit and smallholders' income.

Furthermore, Vabi Vamuloh et al. (2019) discovered that critical farmer characteristics

influencing participation in contract farming include farm size, which may imply access to relatively large plots of land, farm location, and access to a productive assets in a study that conducted a systematic literature review to examine smallholder engagement in contract farming for achieving sustainable development goals. In another study, Swain (2012) employed binary logistic regression analysis to determine the influence of farmers' engagement in paddy seed contract farming in India. The study discovered that access to equipment was a major driver of farmers' engagement in contract farming. This entails that access to equipment may increase farmers' production and ability to meet contract obligations, making contract farming more appealing and feasible for them.

A cross-sectional study by Nazifi and Ibrahim (2021) using the Craggs Double Hurdle model on factors influencing smallholder maize farmers' participation in contract farming in North-Western Nigeria revealed that training in good agricultural practices, experience in contract farming, credit access, and access to extension services had a positive and significant relationship on maize farmers' participation in contract farming, at a precision level of 5 percent. Moreover, in a study by Mazwi et al. (2020), the experience with contract farming related to poor product prices and high input expenses that lead to indebtedness has a detrimental impact on certain farmers' decision to participate in such an arrangement.

Likewise, a cross-sectional study by Loquias et al. (2021) on smallholder Cavendish banana growers in the Philippines found that farmers' participation in contract farming is highly impacted by finance access and production experience. Production experience may be likened to the experience of various nodes of the tea value chain in the current study. Likewise, a study by Rantlo and Bohloa (2022) in Lesotho on determinants of broilers farmers' engagement in contract farming, by using binary logistic regression analysis, found that contract farming participation is influenced by various factors,

including farmer group/association membership, farming experience, access to marketing infrastructure, and access to extension services. Furthermore, according to Huang-ping and Chuan-fang (2012), farmer characteristics, including income, degree of education, and experience, are thought to be aspects of farmer quality, potentially differentiating farmers' capacity to engage in agriculture. Access to land, experience, and education level are specific characteristics linked to farmer engagement in tea production and agriculture in general (Pingali et al., 2005).

To sum up, based on the reviewed literature, the critical farmer quality variables mentioned by various scholars to be affecting farmers' participation in contract farming include contract farming experience, knowledge of the tea value chain, access to land, and farming equipment access. These factors are regarded as significant for a variety of reasons. For example, in terms of farm size, it is suggested that dealing with farmers who have relatively large plots is easier and less expensive for investors than dealing with multiple farmers who have smaller plots. Farmers can meet the needs of investors on larger farms, and they are more willing to commit to providing the requisite volumes over a longer period (Vabi Vamuloh et al., 2019). Similarly, farmers with easy access to various farming equipment are likely to meet the contractual requirements; as such, the same positively significantly affects their participation in contract farming (Bellemare, 2012)

Despite extensive studies on the broad aspects affecting farmers' involvement in contract farming, including social and cultural factors, there is still a knowledge gap about the precise influence of particular selected farmer quality indicators, precisely contract farming experience, knowledge of the tea value chain, access to land, and farming equipment access *ceteris paribus* on smallholder tea farmers' participation in such arrangement. By studying how the selected farmer quality determinants affect farmers' participation in contract farming, this study aims to close this

knowledge gap. Therefore, this paper concentrates on contract farming experience, knowledge of the tea value chain, access to land, and farming equipment access, as critical farmer quality factors that influence tea farmers' engagement in contract farming *ceteris paribus*. Focusing on specific farmer quality variables provides a focused approach to deriving a meaningful relationship between farmer quality and contract farming participation. The new knowledge is likely to assist different actors in developing more informed strategies for promoting sustainable contract farming practices. Further research may consider additional farmer quality indicators to better understand how various farmer quality factors affect farmers' engagement in contract farming in the tea subsector and other crops in Tanzania and beyond.

MATERIALS AND METHODS

Data Collection and Processing

The study used primary data from a cross-sectional survey that included 393 smallholder tea farmers from 37 villages in three districts who were chosen based on whether or not they engaged in contract farming during the 2022 tea production season. In order to increase representation, stratified cluster sampling was used. Random samples were taken from chosen

clusters, specifically from the 37 villages that were chosen based on the availability of farmers participating in or not participating in contract farming, and participants were purposefully separated into contract and non-participants (70% and 30%, respectively).

Farmers' engagement in contract farming is the dependent variable, which is expressed as a dichotomous variable (1 if participated, 0 if otherwise). This approach clearly distinguishes between participating and non-participating farmers and provides insights into farmer quality indicators and the factors influencing farmers' engagement in contract farming in the tea subsector. The study used four indicators of farmer quality, namely contract farming experience (CFE), tea value chain knowledge (TVCK), land access (LNA), and farming equipment access (FEA). The farmer quality variables were measured on a five-point Likert scale (1-5), which was used as a proxy indicators that allowed for quantifying farmers' perceptions and opinions on farmer quality, providing nuanced analysis and interpretation of data. Demographic variables which were used in the descriptive analysis were measured as scale or nominal variables, while farmer quality variables were assessed using the Likert scale applied to each of the four indicators, as shown in *Table 1*.

Table 1: Variables measurement

Group	Variable	Measurement	Expected Sign
Respondents Demographics	Sex	Nominal (1=Male; 0=Female/Otherwise)	
	Age	Continuous	
	Education	Nominal (1=Completed primary school; 0=Otherwise)	
	Production/Acre	Continuous	
Dependent variable	Farmer's participation in contract farming	Ordinal (1=Participate; 0=Otherwise)	
Farmer quality (independent variable)	CFE=Contract Farming Experience	Experience to engage in contract farming (Likert scale 1-5)	+ve/-ve
	TVCK=Tea Value Chain Knowledge	Knowledge of various tea value chain aspects (Likert scale 1-5)	+ve/-ve
	LNA=Land Access	Land access for tea production (Likert scale 1-5)	+ve/-ve
	FEA=Farming Equipment Access	Farming equipment access to engaged in tea production (Likert scale 1-5)	+ve/-ve

Structural Equation

The following structural equations were used to estimate participation using binary logistic regression.

$$FPCF_j = f(FQ) \tag{1}$$

Whereby: $FPCF_j$ = Farmer Participation in Contract Framing for the j^{th} farmer where 1 = if a farmer participated in contract farming; 0 = non-participation in contract farming.

FQ=Total farmer quality

When an error term is inserted, equation 1 can be structurally stated as in Equation 2.

$$FPCF_j = \beta_0 + \beta_1 FQ_j + \epsilon_j \tag{2}$$

Whereby: j =Farmer identity where $j=1-n$, i =disaggregated variable where $i=1-n$, β_i = the regression coefficient, ϵ = error term

As indicated in *Table 1*, farmer quality is a combination of four indicators; as such, equation 1 may be rewritten into equation 3.

$$FQ = f(CFE, TVCK, LNA, FEA) \tag{3}$$

Whereby: CFE=Contract Farming Experience, TVCK=Tea Value Chain Knowledge, LNA=Land Access, FEA=Farming Equipment Access

Therefore, equation (2) may be rewritten as equation 4 to determine the impact of farmer quality indicators on farmers’ involvement following the disaggregation of FQ in equation 3.

$$FPCF_j = \beta_0 + \beta_1 CFE_j + \beta_2 TVCK_j + \beta_3 LNA_j + \beta_4 FEA_j + \epsilon_j \tag{4}$$

Variables Interpretation

Smallholder tea farmers’ perception of farmer quality indicators in relation to their participation in contract farming was measured using a Likert scale ranging from 1 (strongly disagree) to 5

(strongly agree). To derive meaningful insights from the farmer quality data, the weighted average approach was adapted weighted by León-Mantero et al. (2020) and Okolie (2023). By using this approach to calculate the overall average using a weighted average, values are multiplied by corresponding weights in order to account for their varying relevance (León-Mantero et al., 2020; Cheng et al., 2021; Stevens, 2012).

Based on the mean of each indicator, the weighted average for the total farmer quality indicators was determined in this study. The level of agreement among farmers regarding whether a particular farmer quality indicator was viewed as being high or low, i.e., possessing or lacking a particular attribute, was then ascertained using these weighted averages. The decision rule used was: if the mean of a single farmer quality indicator was lower than the farmer quality weighted average, it was classified as a “low/not possessing.” Conversely, indicators labelled as “high/possession of that attribute” had a higher mean value than the weighted farmer quality score.

Additionally, the farmer quality composite score was also calculated in order to evaluate the overall perception of farmer quality. Measures of central tendency, such as mean, median, mode, range, maximum and minimum values, and standard deviation, were computed using this score. The study used the mean range approach to establish interpretation ranges for the overall farmer quality mean values. Two groups were created based on low and high mean ranges: “low perceived low farmer quality” and “high farmer quality.” This approach was adapted from a similar study by Ngaruko (2022) in Tanzania, analysing transaction costs in microfinancing models for family-owned businesses. *Table 2* displays the interpretation matrix for the farmer quality composite scores.

Table 2: Farmer quality agreement level interpretation matrix

Description	Number of indicators	Measurement (Mean score)	Mean (M) interpretation
Number of indicators	4	4-20	Low=4-11.9; High=12-20
Total	4		

RESULTS AND DISCUSSION

Demographics

The results show that there were more male respondents (57.3%) than female respondents (42.7%). The study revealed a significant age difference among smallholder tea farmers, with the majority (85.8% of the sample) being adults aged 35 years and above, while the youth comprised only 14.2% of the participants. Moreover, the study found a considerable age gap among smallholder tea farmers, with the majority (85.8% of the sample) being adults 35 years of age and older and the minority (14.2%) being youth. Additionally, the findings show that, in the last production season, smallholder tea farmers produced 3,308 kilogrammes (Kg) of green leaves on average per acre. This is consistent with recent research demonstrating that smallholder tea

productivity typically ranges from 1,300 to 3,300 kilogrammes per acre, less than the 4,272 to 5,200 kilogrammes per acre produced annually by tea processing estates (URT, 2021; IDH, 2021b).

Farmer Quality Descriptive Results

The attitudes of small-scale tea producers regarding their involvement in contract farming were investigated in this study. The perceptions were rated as high or low based on a comparison of the individual mean scores to the weighted average score of 3.9 for the farmer quality. The study’s results show that most respondents had a strong perception of having access to land (LNA), knowledge of the tea value chain (TVCK), and access to farming equipment (FEA). Additionally, the majority of respondents believed they had little experience with contract farming (CFE) (see *Table 3*).

Table 3: Respondent’s agreement level (%) on farmer quality indicators (n=393)

Variable	SD	D	SwD	A	SA	Mean	Std Dev	Classification
CFE	6.9%	12.5%	13.0%	43.3%	24.4%	3.7	1.2	Low
TVCK	2.0%	12.5%	11.7%	41.2%	32.6%	3.9	1.2	High
LNA	0.0%	10.9%	21.1%	33.1%	34.9%	3.9	1.0	High
FEA	0.8%	10.2%	18.1%	38.7%	32.3%	3.9	1.0	High
TFQ weighted average						3.9		

SD = Strongly Disagree, D= Disagree, SwA = Somewhat, A = Agree, SA = Strongly Agree

Table 4 illustrates the overall perception of farmer quality concerning farmers’ engagement in contract farming.

Table 4: Farmer quality composite score measure of central tendency (n=393)

Mean	Median	Mode	Minimum	Maximum	Classification
15	16	18	6	20	High

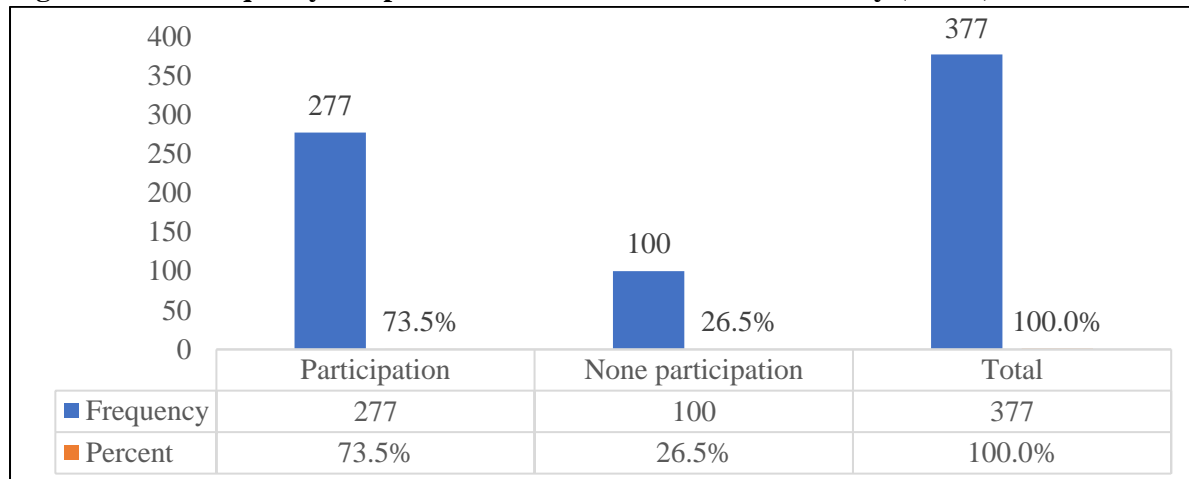
The results indicate that the average composite score of 15 in *Table 2* falls within the range of 12 to 20, which is categorised as a high perception of farmer quality. According to the findings, most respondents had a positive view of farmer quality, showing their good traits and preparedness for contract farming. This could result in increased

participation and successful contractual relationships.

Contract Farming Participation Descriptive Results

The proportion of smallholder farmers’ participation in this study is displayed in *Figure 1*.

Figure 1: Farmer quality composite score measure of central tendency (n=393)



The study shows that 70.5% of smallholder tea farmers participated in contract farming (PCF), while 29.5% did not in the last tea production season across the three districts involved in this study. This aligns with existing literature, indicating that while contract farming opportunities exist for tea smallholder farmers in

Tanzania, not all choose to participate in such arrangements (URT, 2010; IDH, 2021a; 2021b).

Binary logistic regression was used to examine the effect of farmer quality indicators on farmers' participation in contract farming in line with equation 4. The binary logistic regression results are shown in *Table 5*.

Table 5: Farmer quality indicators logistic regressions results

Farmer quality (a)	B	S.E.	Wald	df	Sig.	Exp(B)
Contract Farming Experience (CFE)	0.551	0.177	9.656	1	0.002*	1.735
Tea Value Chain Knowledge (TVCK)	0.27	0.204	1.757	1	0.185	1.31
Land Access (LNA)	-0.529	0.241	4.805	1	0.028*	0.589
Farming Equipment Access (FEA)	-0.21	0.218	0.931	1	0.335	0.811
Constant	0.914	0.507	3.252	1	0.071	2.494

(a) Variable(s) entered on step 1: CFE, TVCK, LNA, FEA;

(b) Dependent variable: Farmers' PCF; Sig=0.000; Nagelkerke R Square= 0.089; Correct Classification=74.5%; *Significant at P = 0.05; n=377

The study findings show that land access significantly negatively influences farmers' participation in contract farming at a precision level of 5%. This finding contradicts other literature, for example, in studies by Rondhi et al. (2021) and Behera (2019), who found that land size positively influenced contract farming participation. This suggests that farmers are less likely to choose contract farming arrangements if they have limited access to adequate land. Their capacity to satisfy contractual obligations or produce a sufficient amount of green-leaf tea may also be limited. Similarly, access to equipment, such as plucking machines, negatively affects farmers' participation in contract farming. However, the effect is not statistically significant

at a 5% precision level. This is unlike other studies like that by Tongchure (2013), which show that equipment access significantly affects participation. This finding shows that farmers with limited access to necessary farming equipment may be discouraged from signing contract farming agreements because of the unlikelihood of fulfilling contractual obligations or reaching desired production levels. Moreover, reduced productivity due to inadequate or old equipment may affect farmers' confidence in meeting contractual obligations and producing the desired output.

Further findings reveal that prior contract farming experience significantly affects contract farming

participation at the 5% precision level. This is similar to other scholars' findings like Koshuma et al. (2023), Nazifi and Ibrahim (2021) and Mazwi et al. (2020). This result highlights the importance of farmers' previous exposure to contract farming schemes, as it likely instils a sense of familiarity and confidence, making them more receptive to contract farming engagement. Additionally, knowledge of the tea value chain exerts a favourable influence on farmers' participation in contract farming. Besides, the statistical significance is not attained at the conventional 5% accuracy level. This finding is in line with other studies, for instance, by Loquias et al. (2021), Koshuma et al. (2023) and Rantlo & Bohloa (2022) who argue that contract farming participation is positively influenced by farming experience. This finding underscores the significance of understanding the intricacies of the tea value chain, including the production, processing, and marketing aspects, as farmers who possess such knowledge are more likely to perceive the potential benefits and risks associated with contract farming. Equipped with a comprehensive understanding of the value chain dynamics, farmers can make informed decisions that align with their production goals and market demands, thus improving their likelihood of engaging in contract farming systems.

CONCLUSION AND RECOMMENDATIONS

We conclude that land and farming equipment access are critical farmer quality indicators that affect farmers' participation in contract farming, as they negatively influence contract farming participation. This highlights the significance of addressing land-related issues and providing enough assistance for farming equipment to encourage farmers' participation in contract farming. We recommend that policymakers and stakeholders should come up with plans to improve smallholder farmers' access to land through improved and secure land tenure, which provides options for leasing or ownership. Additionally, cooperative initiatives, equipment rental programmes, or subsidised programmes

should be used to increase access to modern, acceptable farming equipment. Moreover, in order to promote the adoption of this production model, increase agricultural productivity, and improve economic outcomes for both farmers and the tea industry, it is essential that farmers address these key factors. By doing so, they can remove obstacles that prevent them from participating in contract farming.

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