Plural contracting and adoption drivers for avocado contract farming in Njombe District, Tanzania: Exploring credit inclusiveness and infrastructure accessibility

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ABSTRACT

Spreading risks among farmers from production to market access is vital, and the opportunity to console is plural contracting. This study assessed plural contracting adoption among avocado farmers in Tanzania. Specifically, multiple contracts incurred for avocado farmers were examined, and access to credit finance and infrastructure were adoption drivers examined to influence adoption of avocado contract farming in Njombe District, Tanzania. Guided by agency theory, cross-sectional data were collected from a sample size of 385 respondents using questionnaires. Descriptive statistics and inferential analysis were employed to analyse both qualitative and quantitative data, respectively. The study identified four categories of contract farming among avocado cultivators: input, production, marketing, and full-service contracts.Variables such as age, gender, education, and geographic region significantly influenced participation rates.The predominant demographic of farmers consisted of middle-aged individuals who operated on a small scale and lived in rural areas.The findings indicate that various contract forms incentivise farmers to adopt practices, with these four types being the most significant.Moreover, pivotal elements that significantly facilitate the adoption of avocado contract farming include access to credit (OR=0.579, p=0.002), infrastructure (OR=2.564, p<0.001), advisory help (OR=0.623, p=0.023), and contract enforcement methods (OR=0.470, p<0.001). Moreover, access to credit finance and infrastructure, in addition to advisory support and clear contracts that include efficient enforcement procedures, significantly influences farmers' willingness to adopt contract farming.The results demonstrate the significance of socio-demographic characteristics, institutional support, and well-structured contracts in facilitating the adoption of avocado contract farming. It is recommended that plural contracts, access to credit finance and infrastructure need policies and regulatory frameworks for guiding farmers to have appropriate contractual arrangements. Further, a replicate study should focus on the relationship of avocado quantities sold, price, and income of the farmers.

Keywords: Avocado Farming, Credit Finance, Contract Farming, Plural Contract, Transparent Contracts

I. INTRODUCTION

Contract farming is elevating on its importance globally due to changes in the global market competitiveness, varied consumer preferences, innovativeness in technology, policy institutions and agribusiness systems (Akumu et al., 2020a).This has enabled them to access better technology, inputs, and credit facilities, leading to increased productivity and income. Additionally, contract farming has provided farmers with a guaranteed market for their produce, reducing the risks associated with price fluctuations and market uncertainties. Overall, contract farming has played a significant role in improving the livelihoods of smallholder farmers in developing countries (Le Huong, 2018a). Several studies (Dogeje & Ngaruko, 2023; Nsindagi, 2023; Mujama & Uchiyama, 2022) focused on specific crops such as tea, oilseeds, sugarcane, cotton, oil palm, sunflower, and rice studying contract farming in explaining these benefits. Contract farming, mostly defined as an agreement made before the growing season between two parties, farmer and buyer, focusing a quantity, quality, and delivery of an agricultural produce (Dubbert et al., 2023).

In Contract farming not only market and production barriers are overcome purposely to support farmers in selling products to different market across countries but also higher crop quantities are produced, promoting famers' incomes and improved food security (Dubbert et al., 2023). Numerous reviews of contract farming programs suggest that farmers benefit from contract farming (Hung Anh et al., 2019). A recent review indicates that only about 1 to 5% of farmers in developing countries participate in contract farming. This low participation in contract farming is a central concern for the sustainability of the global agricultural sector (Jabbar et al., 2025). Globally, the adoption of contract farming presents diverse outcomes and challenges. While certain regions have witnessed significant benefits of contract farming, obstacles persist in fostering widespread participation, impacting agricultural productivity. In countries such

as India and China, where contract farming has become increasingly popular, the limited participation of farmers remains a notable challenge (Singh & Thakur, 2021).

The adoption of contract farming in Africa has been on the rise, particularly in developing countries, serving as a vital link for connecting farmers to export markets (Dubbert et al., 2023; Sambuo, 2021). Contracting companies play a pivotal role by providing crucial production inputs, ensuring stable income, and addressing environmental concerns related to agriculture (Vabi Vamuloh et al., 2019). Despite these benefits, farmers face persistent challenges in financing seasonal investments, obtaining timely agricultural inputs, and converting their produce into economic value (Hansen et al., 2011). This call for an in-depth understanding of credit finance and infrastructure as a driving tool in promoting production and transport of avocados during contracting.

Low avocado production is particularly evident in several African countries. In Kenya, for example, production remains relatively low as compared to global market demand. This narrows the country's production profile ability to meet global demand for the Hass variety, thus threated to maintain its market share (Mwambi et al., 2016). Johnny et al., (2019) observed Kenya farmers, approximately 94 percent sell their produce to brokers, facing relatively low prices. In addition to receiving low prices, farmers also face quality losses due to inadequate harvesting practices. Thus, contract farming remains a potential tool to highlights solutions when integrating avocado farmers into value chains across the globe. However, the incentive behind farmers' decisions to participate or not in contracts along the avocado value chain remain unclear.

While in Uganda, crops such as tea, tobacco and sugarcane, are contract farming oriented, for large scale processors. This opportunity for commercialize agricultural have reportedly left farmers with contractual problems in dealing with large agribusiness firms, led to farmers leaving contractual arrangements with an outcome of low production (Akumu et al., 2020b). Large agribusiness firm are claimed to cause contractual problems like biased contract terms, lack of transparency in pricing, arbitrary quality standards used to reduce payments, unequal bargaining power as a results farmers found difficulty enforcing contracts against powerful contractual parties(Da Silva & Rankin, 2014; Kirsten & Sartorius, 2002; Wolf et al., 2001). In avoiding unforeseen exploitation and unfair treatment, decision to adopt avocado contracts may requires on re-thinking of the types of contracts and its package. Unless otherwise the power imbalance leaves farmers vulnerable to being taken advantage of in the contractual agreements.

Agriculture sector economy is heavily relied by Tanzanians, which contributes over 25% to the national Gross Domestic Product [GDP], accounts for 85% of exports, and provides employment for about 65% of the workforce. The sector is predominantly driven by smallholder farmers who face persistent production and marketing challenges, hindering their ability to fully benefit from high-value crops. Since 1990, the contract farming in Tanzania gained political will to address smallholder farmers' challenges and considered to address market access and inadequate inputs. Initially contract farming in Tanzania was targeting crops like cotton and sugarcane, it later included high-value crops like horticultural produce (Eldridge et al., 2022).

Avocado contract farming adoption represents a significant opportunity to enhance avocado farmers' productivity and improve their livelihoods. Despite the demand increase in avocado globally, domestic production in Tanzania remains inadequate, resulting in a substantial production deficit. Current estimates indicate that Tanzania produces only about 190,000 tons of avocados annually, in stark contrast to Kenya's production of over 200,000 tons (Tumaini et al., 2024). The limited production capacity is exacerbated by factors such as inadequate farming practices, restricted access to quality seeds, and insufficient market knowledge (Juma, 2020; Malekela, 2022; Swai & Ubaldus, 2023).

Avocado contract farming in Njombe District began in the early 2010s, driven by rising global demand for commercial varieties (Mahenge, 2023). Companies such as Rungwe Avocado Company and Africado partnered with farmers in the region, leveraging its favourable climate to boost productivity and link farmers to export markets. Contract farming has emerged as a key intervention to address production and marketing challenges, offering structured market access, enhanced farmer incomes, and increased agricultural productivity. Several contract farming initiatives have been successfully implemented in Tanzania, including cotton in Bunda District (Nsimbila, 2021), French beans in Arusha (Marwa & Manda, 2022), sugarcane in Kilombero, Morogoro (Isager et al., 2018) and sunflower in Dodoma (Mpeta, 2015).

Avocado farming has significant potential to contribute to economic growth in Tanzania, driven by the global demand for commercial varieties such as 'Hass,' 'Fuerte,' and 'Waisal.' Unlike local avocado varieties with short shelf lives and limited marketability, these commercial varieties are exported by companies like Rungwe Avocado Company (RAC) in Mbeya and Africado in Kilimanjaro. These companies have supported over 6,000 smallholder farmers by providing farm inputs, farming technical assistant services, and accessing market for quality produced crops (Juma, 2020). Despite these interventions, avocado production in Njombe District remains low, largely due to farmers' reluctance to adopt contract farming, which is essential for addressing the region's productivity and market challenges.

The government has introduced several initiatives aimed at improving avocado production, including the Avocado Value Chain Development Program launched in 2020 and the Agricultural Sector Development Strategy (ASDS) initiated in 2010. These programs focus on providing training, financial support, and enhancing market access

for farmers (Mpogole et al., 2020). Despite these efforts, avocado production remains low, and there is a lack of comprehensive studies to address production challenges linked with contract farming.

The low avocado production is far-reaching, impacting the local economies and food security whilst contract farming is termed as a viable solution to enhance both production levels and farmer participation in lucrative markets. Studies have demonstrated that farmers engaged in contract farming often experience increased yields, improved financial stability, and enhanced market access (Murigi et al., 2024 Malekela, 2022; Juma, 2020; Sambuo, 2014). However, the specific benefits associated with each type of avocado contract farming, plural contracting and the drivers that influence farmers to adopt and to engage in such arrangements remain insufficiently explored.

Existing studies in Tanzania (Marwa & Manda, 2022; Nsimbila, 2021; Isager et al., 2018; Mpeta, 2015; Sambuo, 2014) has predominantly focused on other crops: cotton in Bunda District, fresh beans in Arusha, sugarcane in Kilombero, Morogoro and sunflower in Dodoma and Tobacco in Urambo District. While these studies have enriched the understanding of contract farming for these crops, research on avocado contract farming remains notably scarce. Addressing this gap is critical to understanding the types of avocado contract farming, their benefits, and the factors influencing farmers' participation, offering vital insights for policymakers and stakeholders to unlock the full potential of the avocado sector in Tanzania.

1.1 Research Objective

The main objective of the study was to assess the plural contracting adoption among avocado farmers in Tanzania. The Specific objectives were to examine:

(i) Type of contractual arrangements among avocado farmers
(ii) How access to credit finance and infrastructure influence adoption of avocado contract farming

II. LITERATURE REVIEW

2.1 Theoretical Review

In this study, agency theory Meckling and Jensen (1976) was employed to explain the relationship between the principal (owners) and agents of a business, in this case avocado buyers and producers. On presumption of goal conflict, with principals (owners) pursuing their interests, that is to maximize profits and assurance of markets, producers may prioritize quality of avocados produced. This assumption is useful in unveiling socio-demographic characteristics of the avocado producers in attributing for the adoption of avocado contract farming (Skachkova et al., 2022; Awasthi, 2016).

However, with assumed existence of information asymmetry in this theory, buyers may possess limited knowledge about avocado producers' actions, leading to moral hazard and adverse selection issues. Henceforth call on understanding types of contracts and its usefulness in principal agent relationship. Further, both principals and agents are assumed to act rationally and in their own self-interest, with principals designing contracts and incentives that align agent interests with their own objectives. This assumption guided the present study on contract farming adoption subject to access to credit, financial services, reliable infrastructure, supportive policies, technical support and training, and transparent contract enforcement mechanisms (Schillemans & Bjurstrøm, 2020).

Agency theory strength the interests of principals and agents through contracts arrangements, solving parties conflicts and provides incentives, which can mitigate agency problems and improve production performance. Contrarily, there are unrealistic assumptions included of perfect rationality and self-interest. The relational aspects and limited applicability is overlooked to non-profit organizations and the public sector. Despite the weaknesses of this theory, the usefulness of the theory was to explain how the design of contracts and incentives can align the interests of avocado farmers and contracting companies, aiming to mitigate agency problems and enhance the adoption of avocado contract farming. The study considered the role of monitoring mechanisms, transaction costs, and contextual factors in shaping the success or challenges associated with the adoption of this farming arrangement (Mio et al., 2020).

2.2 Empirical Review

There are several studies on determinants of avocado contract farming. Johnny et al. (2019) found avocado variety (Hass and Fuertes), farm labours, access to production information, and marketing significantly influenced participation in contract farming. Other determinant factors were size of farming, land tenure, crop rotation system, qualified seed, extension services, cooperative membership were found by Rokhani et al. (2020) to influence of farmers' involvement in contract farming. While Kanburi Bidzakin et al. (2019) found contract farming increases significantly the yields of avocado and gross margins, Dubbert et al. (2023) found out that older and male farmers participated more in contract farming than others but become less sustainable in their farming practices. Meanwhile, native and members of famers-based organization practicing sustainable farming are negatively impacted by adoption of CF.

Study by Key and Runsten, (1999) found that, a contract by type of contract farming such as resource-providing, production management and market-specification contracts have different incentives in adoption decision of contracts farming. Study by Wilson (1986) provided a similar type of contracts such as production contract and marketing contract

that supports farmers' decision in contract farming engagement. Wilson (1986) argued that these are contracting approaches and are subject to continue concentration of agribusiness with government supports. Other incentives were access to credit and finance, improved infrastructure and technical and advisory services (Murigi et al., 2024; Ruml & Parlasca, 2022; Sambuo, 2014). However, these studies rarely establish the benefits of multiple contracting among avocado farmers pertaining to contractual arrangements participation.

Empirically, studies also employed different methods of analysis. On showing the differences between contract and non-contract farmer**,** Johnny et al. (2019) employed probit analysis for determinants of avocado contract farming using a gap analysis approach. Rokhani et al. (2020) employed logistic regression analysis and analysed factors that influence farmers' involvement in sugarcane growing through contract farming. While Dubbert et al. (2023) use a marginal treatment effect approach to examine participation in contract farming. Kanburi Bidzakin et al. (2019) analyse data on the impact of contract farming using endogenous switching regression and propensity score matching method.

The existing body of research on avocado has extensively covered various aspects such as contract farming participation, its impacts on farmers, decision-making processes, market dynamics, challenges in production, and productivity determinants (Dubbert et al., 2023; Johnny et al., 2019; Kanburi Bidzakin et al., 2019; Marwa & Manda, 2022; Mio et al., 2020; Vabi Vamuloh et al., 2019). However, there is a rarely significant knowledge on plural contracts for Avocado contracted farmers, further an evenly inclusion of credit finance and infrastructure as package of contracts farming remains oblique addressed from unique local context, which are crucial for effective policymaking and interventions.

III. METHODOLOGY

3.1 Study Area and Data Tools

Njombe district, located in southern region of Tanzania is one of the largest suppliers of avocados to the local markets and export market underscored its significance in avocado plural contracting study. Variety of Hass Avocado species are produced from selected twelve wards in Njombe district, Tanzania with an estimated population of 109,311. The sampling frame of this study were both contracted and non-contracted farmers in avocado farming formed. Sample size of 385 was used computed from the formula n= $(Z^2 \times P \times (1-P) \,/\, D^2)$. Where: n is sample size; Z is the critical value or desired level of confidence at 95% CI, Z=1.96, P is the estimated proportion of the population, and D is desired the margin of error (level of precision). Thus n =$(1.96)^2 \times 0.5 \times (1-0.5)/(0.05)^2 = 385$.

A cross-sectional research design, which allowed data to be collected once in time using concurrent mixed-method approach was employed. The study utilised only primary sources of data to gather actual information about the research topic. Quantitative data on factors influencing adoption of contract farming (Spector, 2019) were collected through structured surveyed questionnaire to quantify various aspects of contract farming and adoption. Others were social demographic factors such as age, farming experience, years of operation, and number of employees. Qualitative data were collected through Interviews and Key Informant Persons were collected to triangulate quantitative data sources, the study ensured robust, reliable, and valid findings (Saunders et al., 2009).

The selection of respondents involved multi-stage sampling techniques. In the first stage, Njombe district noted for the avocado farming contract arrangements was purposely selected from the southern region of Tanzania. In the second stage, 12 wards were selected using stratified sampling method because they are leading in avocado production. In third stage, two groups were randomly selected, contracted constitute of 192 contracted farmers and 193 non-contracted farmers. Each member of the population had an equal chance of being selected hence minimizing biases (Lohr, 2021).

Survey questionnaire was the main tool of data collection. The questionnaires were administered to 385 avocado farmers contracted and non-contracted. Before full sample survey, pre-testing of the questionnaire was conducted to three wards with four selected respondents in each and improvement were made to ensure validity and reliability of the questions. The full sample survey with distribution of the questionnaire by the enumerator and guided respondents on how to fill them was conducted. Interviews generally collected qualitative information and twelve Key informants were interviewed, one from each ward in addition to the 385 respondents.

3.2 Data Analysis

Quantitative data gathered through questionnaires were analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics were presented in frequencies and percentages in tables after computation. Inferential statistics was employed using a choice regression model that where a farmers' decision to adopt contract farming or not was dependent variable and regressed against independent variables include access to credit and finance, presence of reliable and accessible infrastructure, the inexistence of advisory support, availability of technical support and training, and lack of transparent and efficient contract enforcement mechanisms on farmers' decision to adopt contract farming. The binary logistic regression model that was used is shown in equation 1.

$Pi = \exp^{Zi}/1 + \exp^{Zi}$……..…….…….……. (1)

Where Pi = a random variable that predicts the probability of the farmer's decision to adopt contract farming, Zi is an index that is linearly related to an array of access to credit and finance, presence of reliable and accessible infrastructure, the inexistence of advisory support, availability of technical support and training, and lack of transparent and efficient contract enforcement mechanisms and their influence on farmers' adoption to contract. More specifically, the relationship between these variables and Zi may be specified as follow:

$Z_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_3 + \ldots\ldots + \beta_n X_{ni}$ ..... (2)

The model is s specification for the study can therefore be summarized in equation:

$$\begin{Bmatrix} \text{ADOPT} = 1 \\ NOT\ ADOPT = 0 \end{Bmatrix} = \text{Zi} \quad \ldots\ldots (3)$$

$$\text{Zi} = \beta_0 + \text{AGE}(X_1) + \text{SEX}(X_1) + \text{MARITAL}(X_1) + \text{EDU}(X_1) + \text{EMPY}(X_1) + \text{EXP}(X_1) + \text{ATC}(X_1) + \text{INFA}(X_1) + \text{SPR}(X_1) + \text{ATST}(X_1) + \text{TECE}(X_1) + \mu \quad \ldots\ldots (4)$$

Before proceeding to data analysis, diagnostic tests were done to check whether the model is applicable to the collected data. Several model tests were conducted, include Multicollinearity to test correlation between predictor (independent) variables in the regression model using Variance Inflating Factor (VIF). The VIF tests was below 5 for all independent variables, thus no multicollinearity. Hosmer and Leme show test statistics for goodness of fit show χ^2=15.713, df=7 and p-value of 0.052, indicating no significant difference between predicted and observed values thus the model fits quite reasonably.

Table 1

Description of Model Variables

Variable	Definition and Unit of Measurement
Dependent Variable ADOPT	Adoption of contract farming (Adopting = 1, Not adopting = 0)
Independent Variables	
AGE (X_1)	Age categories of respondents (20-35=1, 36-50=2, 51+ =3)
SEX (X_2)	Sex of the respondents (1=Male; 2=Female)
MARITAL(X_3)	Marital status of the respondent (1=single, 2=married)
EDU (X_4)	Education level of respondents (1=primary, 2=secondary, 3=college)
EMPY (X_5)	Number of employees in a farm (1=1-10 employees, 2=11-20 employees 3=above 20 employees)
EXP (X_6)	Years of experience (1=1-5 years, 2= 6 years and above)
ATC(X_7)	Access to credit (1=SD, 2=D, 3=N, 4=A, 5=SA)
INFRA (X_8)	Reliable and accessible infrastructure (1=SD, 2=D, 3=N, 4=A, 5=SA)
ESPR(X_9)	Existence of other advisory supports (1=SD, 2=D, 3=N, 4=A, 5=SA)
ATST(X_{10})	Availability of technical support and training (1=SD, 2=D, 3=N, 4=A, 5=SA)
TECE(X_{11})	Transparent and efficient contract enforcement mechanisms (1=SD, 2=D, 3=N, 4=A, 5=SA)

Note: SD=Strongly Disagree, D=Disagree, N= Neutral, A=Agree, SA=Strongly Agree

IV. FINDINGS & DISCUSSION

4.1 Type of Contract Farming in Relation to Socio Demographic Features of Avocado Farmers

We analyse descriptively how choice of contract farming by type is well explained by socio demographic features of avocado farmers. The study has found four types of contract farming, input contract, production contract, marketing contract, full-service contract incurred between avocado famers and buying companies. The extent of dispersed socio-demographics with this type has shown in Table 2. By implication, clustering of contracts is a means of facilitating adoption of contract farming with respect to farmers' socio-demographic characteristics. Similar results on type of contract farming like include Market-Specification Contracts; Resource-Providing Contracts; Production Management Contracts were found by Key and Runsten (1999).

Table 2

Plural Contracts and Percent Adopted and Non-Adopters N=326

Variable	Plural contracts and percent adopted				Non-adopters
	Input contract	Production contract	Marketing contract	Full-service contract	
	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)
Age					
18-35	(3) 14.6	(8) 32.8	(10) 40.7	(18) 26.8	(93) 49.1
36-50	(8) 46.3	(12) 49.2	(8) 32.2	(27) 40.9	(61) 32.3
51+	(7) 39.1	(6) 18.0	(7) 27.1	(22) 32.3	(36) 18.6
Sex					
Male	(14) 78.0	(12) 49.2	(17) 73.3	(41) 62.2	(132) 69.5
Female	(4) 22.0	(14) 50.8	(8) 26.7	(26) 37.8	(58) 30.5
Marital status					
Single	(3) 17.1	(9) 34.4	(11) 46.7	(27) 40.9	(117) 61.8
Married	(15) 82.9	(17) 65.6	(14) 53.3	(40) 59.1	(73) 38.2
Education level					
Primary	(10) 59.7	(12) 49.2	(11) 46.7	(30) 43.3	(111) 58.4
Secondary	(5) 29.3	(6) 23.0	(6) 23.3	(19) 28.7	(51) 26.6
College	(3) 12.1	(8) 27.8	(8) 30.0	(18) 28.0	(28) 15.0
Number of employees					
1-10	(17) 97.6	(25) 96.7	(22) 93.3	(63) 93.3	(136) 71.5
11-20	(1) 2.4	(0) 0.0	(3) 6.7	(4) 6.7	(35) 18.2
21+	(0) 0.0	(1) 3.3	(0) 0.0	(0) 0.0	(18) 10.3
Years of experience					
1-5	(7) 41.5	(18) 70.5	(18) 76.7	(45) 68.3	(140) 73.8
6+	(11) 58.5	(8) 29.5	(7) 23.3	(22) 31.7	(50) 26.2
Location					
Peri-urban	(8) 46.3	(14) 50.8	(10) 43.6	(29) 42.7	(79) 41.9
Rural	(10) 53.7	(12) 49.2	(15) 56.7	(38) 57.3	(111) 58.1

Input Supply Contract Farming: In comparing the input supply contract farming with farmers' social characteristics, the study revealed a significant gender disparity, with 78% of respondents being male, likely due to traditional decision-making roles within households. Most respondents (46.3%) were aged 36-50, indicating that middle-aged individuals, who often have family responsibilities, are more likely to engage in farming compared to the younger demographic (14.6%) affected by urban migration. Marital status also influenced participation, as 82.9% of participants were married, suggesting that family responsibilities drive their involvement. Educationally, 59.7% had only primary education, reflecting economic disadvantage and reliance on agriculture for livelihood. Most farmers employed 1-10 workers, indicating a prevalence of small-scale operations, with only 41.5% having 1-5 years of experience in contract farming. Finally, rural farmers constituted 53.7% of the sample, showing greater engagement in contract farming compared to their peri-urban counterparts, primarily due to income disparities. In similar view our findings are supported by Nagaraj et al., 2008) who found farmers' characters, nature of family, and other social characteristics contributes on adoption during the contract formation process.

Production Contract among Avocado Producers: About production contract farming type, the results showed a nearly equal participation between genders, with 50.8% female and 49.2% male respondents, highlighting a balanced involvement that promotes equality. Age analysis indicated that the 36-50 age group represented the largest share at 49.2%, reflecting a dynamic workforce driven by financial stability and experience, while older farmers (51+) faced challenges, accounting for only 18%. Marital status played a significant role, with 65.6% of participants being married, suggesting that shared resources and responsibilities facilitate greater involvement in farming. Education levels revealed that 49.2% of respondents had primary education, indicating a strong agricultural background among those participating in contract farming, while higher education correlated with reduced engagement in farming. Most respondents (96.7%) employed 1-10 workers, emphasizing the prevalence of small-scale operations in the region. Additionally, 70.5% of farms had 1-5 years of operational experience, indicating a recent increase in contract farming adoption. Finally, slightly more farmers (50.8%) were from peri-urban areas, benefiting from better market access and resources, which enhanced their participation in production contract farming. Contrary with location effects, a study by Legesse et al. (2024) had of the opinion that participation in contract framing had a substantial impact on avocado producer households' income.

*Marketing Contract Farming***:** Another type is marketing contract farming, it was revealed a pronounced gender disparity in choice of avocado marketing contracts, with 73.3% of participants being male compared to 26.7% female. This difference arises from the physically demanding nature of avocado farming, where tasks like harvesting favour men, as well as traditional gender roles that limit women's participation due to family responsibilities. Age also plays a role, as younger individuals (18-35 years) are more inclined to engage in marketing contracts (40.7%) compared to older age groups (27.1% for those aged 51 and above). Financial pressures and the physical demands of the work make younger adults more likely to pursue these opportunities, while older individuals often have increased family obligations that restrict their availability. Similar to Thomas and Feldman (2009), there are reasons why contract procedures become more important with age and work experience. However, the type of contract may cause negative reactions and lead to breaches, which is beyond the scope of our discussion.

Full-Service Contract Farming: On the other hand, avocado contract farmers opt for full-service contract farming, with 62.2% of participants being male, highlighting ongoing gender disparities in agricultural contract participation. When investigating partnerships in contract farming, Eaton and Shepherd (2001) noted in Gambia that, through contract farming, historical land rights and land access are gender-sensitive. The age distribution shows that 40.9% of participants are aged 36-50, suggesting this group's accumulated experience and stable life circumstances make them more likely to engage in such contracts. Married individuals (59.1%) also demonstrate a stronger inclination towards full-service contracts, driven by financial responsibilities to support their families. Education levels influence participation as well, with those holding primary education (43.3%) showing the highest engagement, while college-educated individuals (28%) are less involved, possibly due to alternative career paths. The majority of respondents operate small-scale farms, with 92.3% employing 1-10 workers, and 68.3% have been in business for 1-5 years, reflecting a recent trend towards full-service contract adoption, particularly in rural areas where such farming practices thrive.

4.2 Factors Influencing Farmers' Decision to Adopt Contract Farming

In order to assess whether variations in adoption of contract farming can be attributed to specific factors, the study conducted a binary logistic regression analysis. The analysis utilized adoption of contract farming as the dependent variable and five independent variables: access to credit and finance, the presence of reliable and accessible infrastructure, the existence of supportive policies and regulations, availability of technical support and training, the presence of transparent and efficient contract enforcement mechanisms. Table 3 show the results of the binary logistic regression analysis.

Table 3

Regression Results on the Factors Influencing Farmers' Decision to Adopt Contract Farming

Dependent Variable =Adoption (Ref Variable: Not Adoption)	**B**	**S. E**	**Wald**	**Sig**	**Exp(B)**	**95% Lower**	**C.I for Upper**
Independent variables							
Access to credit and finance	-.547	.178	9.401	.002	.579	.408	.821
The presence of reliable and accessible infrastructure	.941	.226	17.353	.000	2.564	1.646	3.993
Existence of other advisory supports	-.474	.208	5.169	.023	.623	.414	.937
Availability of technical support and training	.159	.201	.623	.430	1.172	.790	1.739
Lack of transparent and efficient contract enforcement mechanisms	-.754	.183	17.066	.000	.470	.329	.673
Age	.436	.297	5.211	.075	.391	.032	.065
Sex	.893	.783	1.451	.671	0.316	.001	.909
Education	0.511	.308	4.131	.456	0.162	.221	.713
Years of Experience	.159	.201	.623	.430	1.172	.790	1.739
Marital Status	.310	.231	1.132	.0701	.820	.092	.293
Number of employees	-.547	.178	9.401	.002	.579	.408	.821
R^2	0.809		n=326				

The results of the binary logistic regression analysis indicate the relationship between various aspects of contract farming determinants and their influence on farmers' adoption decision. Independent variables were evaluated along with their relationships to contract farming adoption. While the other variables in the model are kept constant, an increase in the predictor (an independent variable) is predicted to cause the response variable (a dependent variable) to change by its respective regression coefficient in the binary odd ratios.

When all other model variables are maintained constant, access to credit and finance was found to have a significant negative effect on adoption (OR = 0.579, p = 0.002), indicating that farmers with less access to credit and finance were less likely to adopt contract farming. Agency theory, which focuses on the relationship between principals (farmers) and agents (contract farming companies), provides a framework for understanding this finding. A core assumption of the theory is that principals and agents may have differing risk appetites and access to resources. Limited access to credit creates financial constraints for farmers (principals), increasing their dependency on agents for resources like inputs and capital. This finding was supported by KII5 during the interview who responded to a question concerning the determinants of farmers' decision to participate in contract farming. The KII stated that:

> *"Contract farming is seen as a way of getting loans from banks and the companies that engage in contract with farmers though it is not for all avocado farmers. Most adopt contract farming not because of this reason but other benefits, for example those people who are poor and have small pieces of land experiences more challenges when it comes to the question of securing a loan which makes them lose hope because of so many procedures and other things they follow-up before giving out the loan and even though you are given the loan repayment interest is very high. Contrast also helps in marketing of the avocado of which their price is much better than selling to those brokers" (*KII5, 29th July 2023)

The findings from Key Informant highlight the pivotal role of access to credit in shaping the dynamics of contract farming for farmers. The study indicates that credit is a cornerstone for financial stability and security, providing a safety net for farmers engaged in contract farming also emphasized by Key and Runsten (1999). Farmers emphasized the significance of credit in securing timely access to quality inputs such as seeds, fertilizers, and pesticides, crucial for successful contract cultivation. Furthermore, credit was found to be instrumental in mitigating production risks through investments in modern agricultural practices, technology, and essential equipment, instilling a sense of security among contracted farmers. These results are consistent with the study findings by Muriithi and Kabubo-Mariara (2022) on the dynamics and role of gender in high - value avocado farming in Kenya who uncovered that access to credit finance had a negative and statistically significant effect on farmer's decision to adopt contract farming. This implies that when farmers find it increasingly challenging to access credit and financial resources, their willingness to engage in contract farming diminishes (Hoang & Nguyen, 2023) because of limited collateral and high interest rates that makes it challenging for smallholder farmers to secure loans and hinder their ability to access affordable credit.

The presence of reliable and accessible infrastructure had a significant positive effect (OR = 2.564, $p < 0.001$), suggesting that farmers in areas with better infrastructure were more likely to adopt contract farming (Ton et al., 2018). The highly statistically significant p-value underscores the importance of infrastructure in facilitating contract farming adoption. The results above were supported by KII 1 who stated that:

> *"Accessible and well-maintained roads play an important part in transporting avocados to market places. It also avoids avocado damage of avocado, it also reduces the cost of transport and ensures timely delivery of avocado to the required destination. Additionally, the availability of post-harvest facilities, including storage and processing units, is essential. [Farmers are more likely to engage in contract farming when the infrastructure supports proper handling and preservation of avocados, providing assurance that their produce will reach the market in optimal condition. arrangements*]." (KII1, IST Aug, 2023)

The findings revealed that well-developed infrastructure, including efficient road networks, is integral to reducing transportation costs and ensuring timely delivery, making contract farming appealing by directly impacting operational efficiency and financial outcomes. Adequate post-harvest facilities assure farmers of optimal produce quality during transit, aligning with the practical need for reliable infrastructure in meeting supply chain demands. Factors related to market access, including proximity and established market access through contracts, directly impact the commercial viability of participation by ensuring a ready market and minimizing uncertainties. The emphasis on market information highlights its empowering role, enabling informed decision-making for farmers entering contractual agreements.

The findings align with the study findings by Ncube (2020) on the importance of contract farming to small-scale farmers in Africa and the implications for policy who found out that presence of accessible and reliable infrastructure positively influences farmers to engage in contract farming. When farmers experience improvements in infrastructure, such as better roads and accessible storage facilities, they are more inclined to engage in contract farming. These findings imply that investing in rural infrastructure is not only critical for agricultural development but also a driving force behind the adoption of contract farming.

Existence of other advisory support showed a positively and statistically significant effect on farmers' adoption decision (OR = 0.623, p = 0.023). Agency theory suggests the importance of reducing information asymmetry to align the interests of principals and agents. This finding implies that those farmers who receive advisory support on the better agricultural practices and the importance of contract farming are more likely to adopt than those who do not. This was supported by KII8 on the response of the question, the role advisory support in promoting contract farming adoption who stated that:

> *"The contract officers' advice on the importance of joining contract farming and its benefits such as access to loans, good cultivating methods, application of organic fertilizer, and good harvesting methods enables most of us to join contract farming. By adopting contract farming one is sure of access to information about the international and national price of avocado which motivates one to continue engaging in agriculture for commercial purpose."* (KII8, 5th August 2023)

The findings above indicate that the existence of advisory support promoting sustainability serves as positive incentives, aligning with the environmental aspects of certain contract farming agreements. These findings are consistent with the study findings by (Pham et al., 2021) on adoption of contract farming for managing agricultural risks in Mekong delta, Vietnam who found out that lack of contractual advisory support, particularly in Vietnam, was found to hamper private investment and economic growth. This finding implies that when contract farming is perceived as less supportive, farmers are less likely to participate.

The presence of transparent and efficient contract enforcement mechanisms had a significant negative effect (OR = 0.470, $p < 0.001$), indicating that farmers in areas with poor contract enforcement were less likely to adopt contract farming. Without effective enforcement, farmers may perceive a higher risk of not receiving the benefits promised in the contracts, such as fair prices or access to inputs and services. Consequently, they might be reluctant to enter into such agreements, preferring to rely on traditional farming methods or other arrangements they perceive as less risky. The agency theory's principle states that weak enforcement undermines trust and increases transaction costs, making contract farming less attractive. The absence of transparent enforcement mechanisms exacerbates the principal-agent conflict, as farmers are reluctant to rely on agents without safeguards. The study findings are in line with the findings of the study by Ruml and Qaim (2021) on the smallholder farmers' dissatisfaction with contract schemes in spite of economic benefits due to distrust and lack of transparency who found that contract farming is typically seen as a useful mechanism to help smallholders in overcoming market access constraints and has a statistically significant influence on farmer's decision to participate in contract farming. When farmers perceive that there is no transparency and clear information of the contract, their willingness to participate decreases.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study concluded that plural contracts: input contract, production contract, marketing contract and full-service contract were useful contributing adoption of contract farming decision among avocado farmers. The access to credit finance and infrastructure were important factors also found significantly influence decision for the successful adoption of avocado contract farming, others were farming advisory support, transparency and efficient contract enforcement mechanisms.

5.2 Recommendations

It is recommended to include these factors on fostering farmers' confidence and encouraging their involvement in contract farming to other related non-contracted crops. Since cross sectional design was used which has the limitation of making causal inferences, future studies are recommended to collect longitudinal data on quantity sold, price and income earned via contract farming. Finally, the usefulness of the theory in similar crop remains explicitly to explain and design contract that attract interests of producers and traders, hence recommended.

Declaration

This manuscript has not developed with any AI tools.

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