

Loss–Gain Framing Effects on Maize Farmers’ Contract Farming Decisions for Enhancing Farm Economic Sustainability

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ABSTRACT

Maize is a strategic food commodity in Indonesia, yet smallholder farmers remain vulnerable to high price volatility and market uncertainty that threaten the economic sustainability of farm enterprises. Contract farming has been promoted as a mechanism to stabilize income and strengthen farmers’ market access, but participation remains uneven and may depend not only on structural factors but also on how contract benefits and risks are communicated. This study aims to examine how loss–gain framing affects maize farmers’ intentions to participate in contract farming and to identify the key determinants of actual participation. A quantitative survey was conducted with 120 maize farmers in Jelbuk Subdistrict, Jember Regency, East Java, selected through purposive sampling to represent both contract and independent farmers. Farmers evaluated contract messages framed as potential gains or potential losses using a five-point Likert scale, and differences in responses were assessed using paired non-parametric tests. Binary logistic regression was then applied to explain farmers’ contract participation decisions. The results show that gain-framed messages generated higher intention scores than loss-framed messages across both farmer groups, indicating that benefit-oriented communication is more persuasive. However, participation decisions were more closely associated with farm size, profitability, age, and education than with framing responses alone. These findings suggest that effective contract farming expansion requires both supportive economic conditions and communication strategies emphasizing tangible benefits to enhance farm economic sustainability.

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1. Introduction

Maize plays a central role in Indonesia’s food system, not only as a staple supporting national food security but also as a key input for the livestock feed industry. This dual role places maize at the intersection of food availability and agri-industrial demand, making its production performance economically and strategically significant. Previous studies have consistently highlighted maize as a strategic commodity within Indonesia’s agricultural sector (Kafasaskya *et al.*, 2020; Nikmatullah, 2021). Despite its strategic importance, maize farming at the smallholder level remains economically fragile. High price volatility and market uncertainty expose farmers to substantial income risks, particularly in contexts where access

to markets, price information, and institutional support is limited (Riyanto & Yuliana, 2024; Ma *et al.*, 2024). These vulnerabilities are evident in maize-producing areas such as Jelbuk Subdistrict, Jember Regency, East Java, where farmers continue to face unstable prices and weak market linkages.

Contract farming has increasingly been viewed as an important mechanism for linking smallholders to modern agrifood value chains and as an instrument for mitigating market risks. Numerous studies suggest that well-designed contracts can improve farmers' access to inputs, technology, credit, and markets, thereby enhancing productivity, income, and long-term welfare (Rondhi *et al.*, 2021; Yanuarti *et al.*, 2019; Chen & Chen, 2021; Hoang, 2021; W. Zhang *et al.*, 2023). Accordingly, contract farming holds considerable potential as a strategy for strengthening the economic sustainability of agricultural production. However, the benefits of contract farming are not always evenly distributed. Recent literature emphasizes that its impacts are heterogeneous and strongly shaped by power relations, organizational arrangements, and contract rules. Some farmers may experience reduced autonomy, unequal value distribution, or weaker incentives to adopt sustainable farming practices (Chen & Chen, 2021; Dubbert *et al.*, 2021; J. Zhang *et al.*, 2025; W. Zhang *et al.*, 2023). This mixed evidence has intensified policy debates regarding how contract farming arrangements can genuinely support farmer livelihoods while promoting sustainable farm economics (Ren *et al.*, 2021; Weituschat *et al.*, 2023).

Empirically, maize contract farming has also not been implemented optimally. Many farmers perceive contract farming schemes as requiring more complex standard operating procedures (SOPs), longer cultivation periods, and yields that are considered lower than those of local varieties, even though contract prices tend to be higher (Bellemare & Lim, 2018). These perceptions indicate that farmers' decisions to participate in contract farming are not determined solely by objective economic factors, but also by how farmers interpret the risks and benefits embedded in contractual arrangements. In this regard, behavioural economics offers an important perspective through the concept of loss–gain framing. Framing research demonstrates that the way incentives and outcomes are communicated, either as potential gains (gain frame) or potential losses (loss frame) systematically influences risk preferences, effort, and individual decision-making (Ferraro & Tracy, 2021; Homar & Cvelbar, 2021; Li *et al.*, 2017; Ngo *et al.*, 2022; von Bieberstein *et al.*, 2020). Meta-analytic evidence suggests that loss-framed incentive contracts may modestly increase effort relative to equivalent gain-framed contracts, although field effects tend to be small and preferences for loss framing are limited (Ferraro & Tracy, 2021; von Bieberstein *et al.*, 2020).

Previous studies on contract farming have primarily focused on structural and economic determinants of participation, such as contract design, access to inputs, credit provision, and market linkages (Dubbert *et al.*, 2021; Singh *et al.*, 2025). Although behavioural economics research has examined loss–gain framing in environmental communication and risk-related decisions among farmers (Homar & Cvelbar, 2021; Ngo *et al.*, 2022), these studies rarely investigate how framing influences farmers' decisions to participate in contractual market arrangements. As a result, it remains unclear whether the way risks and benefits are communicated within contract schemes can influence farmers' participation decisions. This gap is particularly relevant in maize-producing areas such as Jelbuk Subdistrict, where price volatility and market uncertainty make contract farming a potentially important risk management strategy.

A Clear research gap emerges, where it remains insufficiently understood whether the

way risks and benefits are communicated within contract arrangements (loss vs. gain framing) affects maize farmers' decisions to engage in contract farming, especially in the context of price volatility and the economic sustainability of farm enterprises. From a behavioural perspective, loss–gain framing can shape farmers' risk perceptions by altering how potential outcomes of contract participation are cognitively evaluated. When contract terms are framed in terms of potential losses avoided, such as reduced exposure to price declines or guaranteed minimum returns, risk-averse farmers may perceive contract farming as a protective mechanism rather than a constraint. Conversely, gain framing emphasizes expected benefits, such as income stability or assured market access, which can increase the perceived attractiveness of contract schemes under price volatility.

Prospect Theory provides the theoretical mechanism underlying the expected framing effect in contract farming decisions. According to the theory, individuals evaluate outcomes relative to a reference point and exhibit loss aversion, meaning that potential losses are perceived more strongly than equivalent gains. In the context of maize contract farming, framing contract information in terms of avoided losses (e.g., protection from price declines or reduced market uncertainty) may increase farmers' willingness to participate because such framing emphasizes risk mitigation relative to the status quo. Conversely, gain framing emphasizes potential benefits such as higher prices or stable market access. Following Prospect Theory, the behavioural pathway assumed in this study is that framing influences farmers' perception of market risk and economic security, which subsequently affects their decision to participate in contract farming.

This study aims to analyse how loss–gain framing, grounded in Prospect Theory, influences maize farmers' contract farming participation decisions in Jelbuk Subdistrict, Jember Regency, and to identify the demographic, economic, and institutional factors that shape farmers' participation in contract schemes. The study is expected to provide practical contributions for developing more adaptive contract farming designs that enhance income stability and support the economic sustainability of maize farming. As an academic contribution, this research differs from previous studies that primarily emphasize the structural dimensions of contract farming by highlighting the behavioural dimension of loss–gain framing as a psychological mechanism influencing maize farmers' contract decisions under price volatility. In doing so, it offers a novel perspective for designing contract farming arrangements that better support sustainable farm economics.

2. Methodology

2.1 Research Design

Research employed a quantitative approach supported by descriptive analysis to examine the effect of loss–gain framing on maize farmers' decisions to participate in contract farming (CF). The research focused on testing whether differences in the presentation of price-risk information (loss frame versus gain frame) influence farmers' responses, as well as identifying the economic, demographic, and institutional factors that determine farmers' contract decisions.

2.2 Research Area

Research was conducted in Jelbuk Subdistrict, Jember Regency, East Java, which is one of the main maize-producing areas characterized by smallholder farmers who are

potentially vulnerable to price fluctuations. The study location was purposively selected because maize contract farming schemes exist in this area, yet farmers' participation remains varied.

2.3 Sample Selection

The ample consisted of 120 maize farmers selected using purposive sampling, ensuring representation of both contract farming participants and non-participants. This approach was applied to obtain a comprehensive understanding of framing responses and the determinants of farmers' contract farming decisions in Jelbuk Subdistrict.

The sample consisted of 120 maize farmers selected using purposive sampling, ensuring the inclusion of both contract farming participants and non-participants. In the absence of a complete sampling frame of maize farmers in Jelbuk Subdistrict, the sample size was determined based on analytical adequacy for econometric analysis rather than population representativeness. Following commonly accepted guidelines recommending a minimum of 10 observations per estimated parameter (the rule of thumb) (Hair Jr *et al.*, 2021), and given seven independent variables included in the model, a minimum sample size of 70 observations was required. Therefore, a sample of 120 farmers was considered sufficient to ensure stable and reliable estimation of the model parameters.

2.4 Data Analysis

Data analysis was conducted in three main stages. First, descriptive analysis was used to describe the socio-economic profile of the respondent farmers (Mahesh *et al.*, 2020), including age, education level, farm size, income, and participation in farmer groups. This stage provides contextual background on maize farmers in the study area.

Second, to examine whether farmers respond differently to information framed as potential losses (loss frame) versus potential gains (gain frame) (Ngo *et al.*, 2022). Farmers were presented with both gain-framed and loss-framed informational statements related to contract farming and were asked to indicate their level of interest in participating using a five-point Likert scale (Table 1). To capture farmers' relative responsiveness to framing, a binary framing variable was constructed by comparing the interest scores for the two statements. The variable takes the value of 1 when the interest score under the gain-framed statement exceeds that of the loss-framed statement, indicating stronger responsiveness to gain framing, and 0 otherwise. This approach reflects farmers' dominant framing orientation when evaluating contract farming participation decisions.

Table 1. Loss-Gain Framed Statement

Loss Framing	Gain Framing
<i>"Without participating in a contract farming arrangement, maize farmers risk experiencing price declines that may reduce their income by more than 30%."</i>	<i>"By participating in a contract farming arrangement, maize farmers may obtain more stable prices, which can increase their income by more than 30%."</i>
<i>How interested would you be in participating in a contract farming?</i>	<i>How interested would you be in participating in a contract farming?</i>

The mean scores of gain framing and loss framing were then compared using a paired difference test. However, before conducting the Wilcoxon signed-rank test, the normality of paired responses was assessed using the Shapiro–Wilk test. The results indicated that the

data were not normally distributed ($p < 0.05$), the non-parametric Wilcoxon test was applied (Ngo *et al.*, 2022)

Third, the main analysis employed binary logistic regression to identify the factors influencing farmers' decisions to participate in contract farming. The logistic regression model is specified as follows:

$$Y_i = \ln\left(\frac{p_i}{1 - p_i}\right) = \frac{e^{b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7}}{1 + e^{b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7}}$$

where:

- Y_i = probability that farmer participates in contract farming
- 0 = Independent farmer
- 1 = Contract farmer
- b_0 = Constant term
- $b_1 - b_7$ = Coefficients of independent variables
- X_1 = Framing (If gain score > loss score=1; otherwise=0)
- X_2 = Education (years)
- X_3 = Farming experience (years)
- X_4 = Age (years)
- X_5 = Farm size (hectares)
- X_6 = Profit (million Indonesian Rupiah (IDR))
- X_7 = Household size (number of family members)

The framing variable in the regression was operationalized based on farmers' dominant response tendency toward gain framing compared to loss framing. This approach captures whether farmers are more influenced by benefit-based messages when considering contract farming participation decisions. Economic sustainability in this study is understood as farmers' ability to maintain income stability and reduce vulnerability (Verma *et al.*, 2019) to price fluctuations through stronger market access and institutional support, one of which is facilitated through contract farming arrangements. Hypothesis testing was conducted using the Wald test, formulated as follows:

H_0 : The independent variables partially do not affect farmers' decisions to participate in contract farming.

H_1 : The independent variables partially affect farmers' decisions to participate in contract farming.

The decision criteria for the Wald test are:

- If the significance value $\leq \alpha$ (0.05), H_0 is rejected.
- If the significance value $\geq \alpha$ (0.05), H_0 is accepted.

3. Results and Discussion

3.1. Result

Table 2 presents the descriptive statistics of the main variables used in this study by comparing maize farmers who participate in contract farming (contract farmers) and those who farm independently (non-contract farmers). Based on the data, the number of respondents participating in contract farming was 30 farmers, while 90 farmers operated independently. The framing distribution indicates that most non-contract farmers were more

responsive to gain framing than to loss framing. A total of 70 independent farmers were categorized as Gain > Loss, whereas 20 farmers fell into the category of Gain ≤ Loss. Among contract farmers, 24 respondents were classified as Gain > Loss, while only 6 farmers showed a dominant or neutral response toward loss framing.

Table 2. Descriptive Statistics of the Used Variables in the Study

Variables	Frequency		Mean		Standard Deviation	
	Contract	Independent	Contract	Independent	Contract	Independent
Participation in contract farming	30	90				
Framing						
Gain > Loss	24	70				
Gain ≤ Loss	6	20				
Education (years)			8.93	9.29	4.35	4.39
Farming experience (years)			21.40	26.19	10.44	9.65
Age (years)			46.47	51.55	8.79	10.81
Farm size (ha)			0.71	0.633	0.27	0.339
Profit (IDR)			14,166,796.23	6,511,406.3	5,452,651.32	4,854,768.28
Household size (persons)			3.367	3.92	1.066	0.889

Source: Primary data analysis, (2026)

In terms of socio-demographic characteristics, the average education level of contract farmers was 8.93 years, which was relatively similar to that of independent farmers at 9.29 years. Meanwhile, the average farming experience of contract farmers was 21.40 years, which was lower than that of independent farmers, who had an average experience of 26.19 years. The average age of contract farmers was 46.47 years, whereas independent farmers were older, with an average age of 51.55 years. This suggests that farmers participating in contract farming tend to belong to a more productive age group. From the farming enterprise perspective, the average farm size of contract farmers was 0.71 hectares, slightly larger than that of independent farmers at 0.63 hectares. In addition, contract farmers earned substantially higher farming profits, with an average of IDR14,166,796 per planting season, compared to independent farmers who obtained only IDR6,511,406 on average. The average household size of contract farmers was 3.37 persons, slightly lower than that of independent farmers at 3.92 persons. Overall, these descriptive findings indicate differences in the economic characteristics of contract and independent maize farmers, particularly in terms of farming profitability and responsiveness to gain framing.

Table 3 presents the mean responses of farmers to contract messages framed in terms of loss framing and gain framing, for both contract farmers and independent farmers. Overall, gain framing scores are higher than loss framing scores across both groups. Among contract farmers, the mean score for loss framing is 2.73, while the mean score for gain framing is 3.87. Similarly, among independent farmers, the mean loss framing score is 2.69, and the mean gain framing score is 3.93. These findings indicate that farmers, whether participating

in contract farming or operating independently, tend to respond more positively to messages emphasizing potential benefits rather than potential losses.

Table 3. Mean Comparison of Gain and Loss Framing Responses Between Contract And Independent Farmers.

Framing	Mean		Standar Deviation	
	Contract	Independent	Contract	Independent
Loss	2.73	2.69	1.28	1.17
Gain	3.87	3.93	1.04	1.05

Source: Primary data analysis, (2026)

In order to examine whether the observed differences are statistically significant, the Wilcoxon Signed Rank Test was applied because the framing data were not normally distributed. The results indicate a significant difference between farmers’ responses to gain framing and loss framing ($Z = -7.477$; $p = 0.000$). Based on the ranking outcomes, 94 respondents had higher gain framing scores than loss framing scores, while only 10 respondents showed higher loss framing scores than gain framing scores, and 16 respondents reported equal scores for both framings. Therefore, it can be concluded that gain framing is more effective in encouraging farmers’ intentions to participate in contract farming compared to loss framing. Figure 1 illustrates the same pattern visually as shown in Table 2, where gain framing produces higher contract intention scores than loss framing for both groups of farmers.

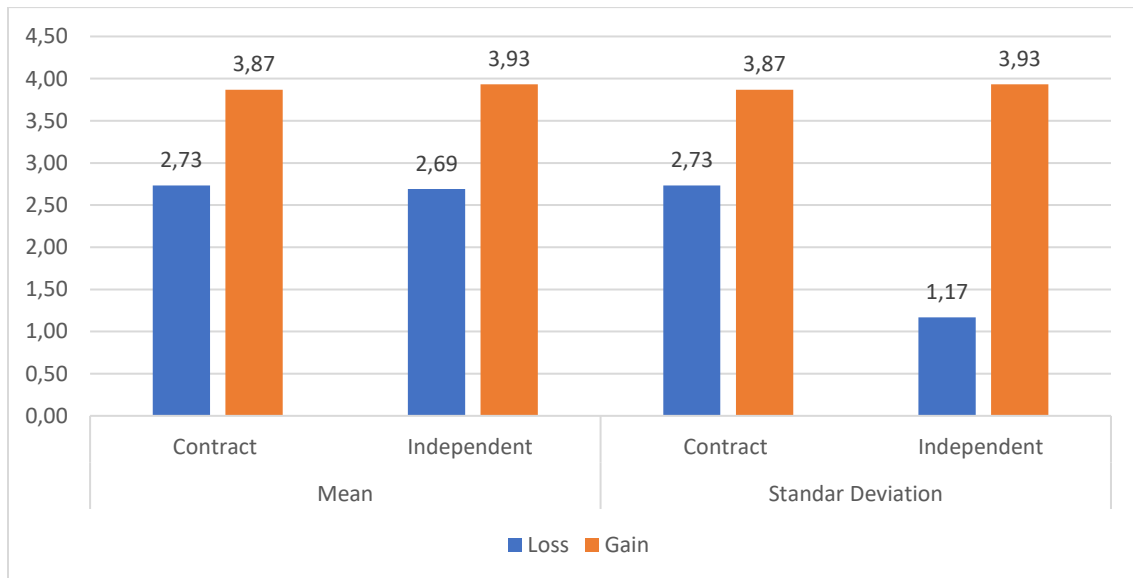


Figure 1. Mean Ratings of Message Framing Effects on Farmers’ Behavioural Intentions to Participate in Contract Farming

Estimation results in Table 4 indicate that the logistic regression model is statistically significant overall (Chi-square significance = 0.000), with relatively strong explanatory power (Nagelkerke $R^2 = 0.610$) and good model fit (Hosmer–Lemeshow significance = 0.457) (Jha & Gupta, 2021; Yusuf *et al.*, 2021). The framing variable (Gain > Loss) has an odds ratio of 2.114; however, its effect is not statistically significant ($p = 0.346$), suggesting that framing is not a primary determinant of farmers’ contract farming participation decisions in this model.

Table 4. Logistic Regression Estimates of Factors Influencing Maize Farmers' Participation in Contract Farming

Independent Variables	Coefficient	Std. Error	Significance	Exp(B)
Framing (1 = Gain > Loss; 0 = Gain ≤ Loss)	0.748	0.794	0.346	2.114
Education (years)	-0.184	0.083	0.026**	0.832
Farming experience (years)	-0.018	0.069	0.796	0.982
Age (years)	-0.161	0.078	0.039**	0.851
Farm size (ha)	2.572	1.304	0.049**	13.076
Profit (IDR million)	0.000433	0.000	0.000**	1.000
Household size (persons)	0.143	0.322	0.657	1.154

Notes: **significant at 95% confidence level; Number of observations = 120; -2 Log Likelihood (1) = 71.227 < -2 Log Likelihood (0) = 134.960; Chi-square significance = 0.000; Nagelkerke R² = 0.610; Hosmer–Lemeshow Test significance = 0.457. *Significant at $\alpha = 0.05$.

In contrast, several structural and economic factors significantly influence farmers' decisions to participate in contract farming. Education and age have negative and statistically significant effects on contract farming participation ($p < 0.05$). Meanwhile, farm size (Exp(B) = 13.076; $p = 0.049$) and farming profit ($p = 0.000$) have positive and significant effects. Farming experience and household size do not show statistically significant effects ($p > 0.05$). Overall, these results confirm that contract farming participation decisions are more strongly shaped by farmers' economic capacity than by responsiveness to message framing (Meemken & Bellemare, 2020).

3.2. Discussion

3.2.1 Loss gain Farming

Maize farmers' responses in Jelbuk Subdistrict to contract farming messages are influenced by the way such information is framed. Gain framing scores were consistently higher than loss framing scores among both contract farmers and independent farmers, and this difference was statistically significant based on the Wilcoxon Signed Rank Test ($Z = -7.477$; $p < 0.001$). These findings indicate that messages emphasizing the potential benefits of contract farming are more effective in encouraging farmers' intentions to participate than messages highlighting potential losses associated with non-participation, which is consistent with evidence that gain-framed messages can increase willingness to pay for improved or nutritionally enhanced maize when the behaviour is perceived as relatively low risk (Jada & Berg, 2022; Ngo *et al.*, 2022). The finding can be explained through behavioural economics, particularly the framing effect within the prospect theory framework, which suggests that individuals do not always make decisions solely on the basis of objective outcomes but are strongly influenced by how risks and results are communicated (Hameleers, 2021; Homar & Cvelbar, 2023). Farmer participation decisions in Jelbuk are not merely determined by contract prices or formal arrangements, but also by farmers' perceptions of benefits, trust, and their sense of control over farming risks (Dalhaus *et al.*, 2020; Khalili *et al.*, 2024).

Gain framing is more persuasive is consistent with Ngo *et al.* (2022), who reported that benefit-based messages are more effective in enhancing risk perceptions, efficacy beliefs, and farmers' intentions to adopt adaptation measures compared to loss-based messages. Similar patterns are found in other agricultural and nutrition-sensitive interventions, where gain-framed messages can modestly increase willingness to pay and adoption intentions

under certain risk perceptions (Jada & Berg, 2022). This reinforces the argument that in farmer communication, concrete messages emphasizing positive opportunities tend to be more influential in shaping behavioural intentions than narratives focused on threats or losses (Ngo *et al.*, 2022). Furthermore, the meta-analysis by Ferraro & Tracy (2021) indicates that while loss-framed incentives may increase effort under some conditions, their behavioural effects are relatively modest and can be accompanied by unintended responses such as counterproductive or unethical behaviour (Czibor *et al.*, 2022). Related evidence from environmental and climate domains also shows that loss framing does not uniformly dominate gain framing; loss-framed messages can sometimes raise effort or pro-environmental behaviour, but the advantages are context-dependent and often limited in real-world settings (Homar & Cvelbar, 2021, 2023).

Contract farming can expand farmers' access to inputs, technology, credit, and markets, thereby improving productivity, technical efficiency, and household income, although effects are heterogeneous across settings and contract types (Hoang, 2021; W. Zhang *et al.*, 2023). However, farmers' participation is not always optimal due to perceptions of complex standard operating procedures (SOPs), reduced autonomy, and unequal or opaque benefit distribution that foster mistrust and dissatisfaction (Meemken & Bellemare, 2020; Ruml & Qaim, 2021; Vamuloh *et al.*, 2020). In some schemes, farmers benefit economically yet still wish to exit because of perceived unfairness, information asymmetries, and lack of transparency in contract implementation (Ruml & Qaim, 2021). Therefore, contract farming designs that aim to support the economic sustainability of farm enterprises cannot rely solely on offering higher contract prices; they must also consider how these benefits are communicated, the clarity of contract terms, and the degree of trust they build with farmers (Gunadal *et al.*, 2025; Khalili *et al.*, 2024; Ruml & Qaim, 2021). Accordingly, a framing approach becomes relevant for designing more adaptive contract schemes oriented toward the economic sustainability of maize farming households, particularly in Jelbuk Village, Jember Regency, by aligning contractual benefits, transparency, and communication strategies with farmers' behavioural responses to gain- and loss-framed information (Jada & Berg, 2022; Khalili *et al.*, 2024; Ngo *et al.*, 2022; Ruml & Qaim, 2021).

3.2.2 *Factors Affecting Farmers' Decision to Participate in Maize Contract Farming*

Non-significant effect of framing in the regression model suggests that although gain-framed messages can shape farmers' intentions or perceptions, actual participation decisions are ultimately constrained by economic capacity and structural conditions such as land ownership and farm profitability. This finding suggests that framing shapes initial intentions or preferences for maize farmers in Jelbuk, but actual participation decisions ultimately depend on more powerful structural considerations. This pattern is consistent with behavioural economics literature, which emphasizes that framing effects are context-specific and often stronger at the level of attitudes or intentions than in real economic decisions involving long-term consequences (Ferraro & Tracy, 2021; Homar & Cvelbar, 2021). Gain-framed messages are more persuasive in shaping farmers' behavioural intentions, although their effectiveness remains conditioned by socio-economic circumstances and farmers' perceived control (Ngo *et al.*, 2022).

The odds ratio of 13.076 indicates that farmers with larger landholdings are substantially more likely to participate in contract farming schemes. Larger farm size increases production capacity and reduces transaction costs per unit of output, making contract arrangements

economically more attractive and feasible for these farmers. Research results confirm that farm size and farming profit have positive and significant effects on contract farming participation. This supports the argument that contract farming tends to be more attractive to farmers with greater production capacity and stronger market orientation, as contract schemes provide access to markets, inputs, and income stability (Chen & Chen, 2021; Hoang, 2021; Zhang *et al.*, 2023). The positive coefficient of farming profit indicates that higher farm income increases the likelihood of contract farming participation. In practical terms, farmers with higher profitability are more capable of meeting production requirements and transaction costs associated with contractual arrangements, making them more likely to engage in contract schemes.

In contrast, the negative effects of education and age suggest that older or more educated farmers may be more cautious and critical toward contract arrangements, particularly due to perceptions of complex standard operating procedures (SOPs) or the potential loss of autonomy. This aligns with the findings of Dubbert *et al.* (2021) and Zhang *et al.* (2025), who emphasize that contract farming is not universally accepted because of unequal benefit distribution, power asymmetries, and contractual requirements that may constrain farmers' flexibility.

The Practical implication of this study is that efforts to expand maize farmers' participation in contract farming cannot depend exclusively on framing-based communication approaches. Policy interventions and contract designs should place greater emphasis on the structural determinants of participation, such as improving profitability, ensuring market certainty, and facilitating access for farmers with smaller landholdings. Accordingly, contract schemes that aim to support farm economic sustainability must be designed to be more inclusive, transparent, and adaptive to smallholder realities, so that benefits are not captured only by farmers with larger production capacity.

These findings contribute to the literature, which has largely focused on institutional and formal contract dimensions, by demonstrating that framing plays a role in preference formation, while final participation decisions remain dominated by economic capacity and structural conditions. This study also extends the contract farming literature that has largely emphasized institutional arrangements and structural determinants of participation, as highlighted by Meemken and Bellemare (2020). While previous studies mainly examine contract design, market access, and power relations between firms and farmers, the present study introduces a behavioural perspective by examining how loss–gain framing shapes farmers' perceptions and preferences toward contract participation. The findings demonstrate that although framing can influence farmers' evaluative responses, the final participation decision remains predominantly driven by economic capacity and production scale. This integration of behavioural communication effects with structural determinants provides a more nuanced understanding of how contract farming participation decisions are formed among smallholder maize farmers.

Nevertheless, this study has several limitations. First, it was conducted in a single maize-producing region, so generalization of the results should be made with caution. Second, framing was measured through a single perception-based scenario, which may not fully capture the complexity of real-world contract arrangements. Future research is therefore encouraged to examine framing effects within more specific contract contexts, incorporate broader institutional dimensions, and apply experimental designs or panel data approaches to

strengthen causal inference regarding the role of framing in contract farming participation and farm economic sustainability.

4. Conclusion

Gain–loss framing influences how maize farmers perceive contract farming messages, with gain-framed communication generating stronger participation intentions than loss-framed messages. However, the regression results show that actual participation decisions are primarily determined by structural and economic factors. Farm size has the strongest effect on participation (odds ratio = 13.076), indicating that farmers with larger landholdings are substantially more likely to engage in contract farming schemes. These findings suggest that expanding maize contract farming requires not only effective communication strategies but also institutional arrangements that strengthen farmers' production capacity and economic resilience.

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