Market Margin Distribution Along the Beef Cattle Market Chain in Longido District, Arusha

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Abstract
The distribution of market margins plays a crucial role in the performance of the beef market chain. However, there is a lack of understanding about the fairness of this distribution among the chain's participants. This study examines the margin shares among actors in the beef cattle market chain in Longido and Arusha districts. Data were collected from 270 respondents in these areas and analyzed using SPSS software. Through a cost-benefit analysis, the study assessed the distribution of market margins among the actors. The results showed that livestock keepers and traders receive a smaller portion of the net gross margin, 18% and 29.2% respectively, compared to their cost shares of 21.1% and 32.8%. Meanwhile, butcher operators obtain 52.8% of the market margin against a production cost share of 46.1%. These findings suggest that actors are equitably compensated. However, the study identified issues such as traders' reluctance to use weighing scales, which negatively impacts livestock keepers. Additionally, there is a regulatory gap with laws, such as selling livestock by weight at all markets, not being enforced. Addressing these issues could promote better husbandry practices, increase cattle value, and improve income distribution for farmers.

Keywords: Market margin, value distribution, cost-benefit analysis and asset specificity

Introduction

Background Information

Tanzania is endowed with a huge livestock population ranking second in Africa after Ethiopia. The livestock population in Tanzania is 37.9 million cattle, 27.6 million goats, 9.4 million sheep, 3.9 million pigs and 103.1 million chickens (Ministry of Livestock Development and Fisheries (MLDF), 2024). However, the contribution of livestock to the national GDP was only 7.4 percent in year 2022 and dropped to 6.7 percent year 2023. The annual growth rate of the livestock sector has raised to 5% per annum in year 2023 from 2.2 percent in year 2022. which mostly represent an increase in numbers of livestock rather than productivity gains by farmers (FAOSTAT, 2017; MLDF, 2024). Despite the low growth rate, the demand for livestock products is increasing. The demand for livestock such as meat products in Tanzania has been increasing partly because of increasing human population and rising income levels. The meet production in Tanzania has increased from 803 264 kg to 963 856 which beef contributed 662 808 tons which is 68.76 percent that caused by domestic meat demand and regional market (MLDF, 2024). The recommended annual per capita meat consumption is fifty kilograms. However, the current per capita meat consumption is estimated to be only sixteen kilogram (MLDF, 2024), which is 45.5% higher than the consumption in 2009 which was at 11 kilogram (USDA, 2009). There is enormous potential to increase local demand and room to expand external market opportunities.

In other studies, such as (Yuzaria *et al.,* 2020) it was set up that processors earn more of the market margin than farmers, traders and middlemen. Meanwhile, Kibona and Yuejie (2022) contend that the marketing margins were equitably shared among key actors along the beef cattle market chain in the Manyara region. The livestock sector plays a significant role in building a strong national economy by

increasing household food security, income, animal draught power, manure, foreign currency and employment opportunities. The analysis of governance should therefore go beyond dyadic analyses, seeking to involve a set of transactions. By integrating the set of transactions of the chain, it is possible to analyze the dynamics in all segments, beyond the producer segment emphasized in the upgrading model. Furthermore, integrating the governance of the transaction and the governance of the chain allows us to understand the dynamics of the functioning of the chain, which would not be possible in isolation, for example when it comes to the value distribution (Sengere *et al.,* 2019). Despite this, research gaps linked to the two levels of governance (chain and transaction) have been identified: the relationship between these concepts, and especially how the governance of the transaction influences the governance of the chain, is not clear. Furthermore, the network graph does not show important words when related to the governance of global value chains, such as incentive, asymmetric information, and efficiency. Thus, studies focused on these subjects can contribute to a better understanding of the impact of governance on the upgrading of these chains (Abate *et al.,* 2019; Lawal *et al,.*2020).

For the marketing chain to be sustainable, each participant must be satisfied with the exchange process and the effort they invest in adding value to the product. If any member is dissatisfied with the transaction, they might choose to withdraw. Kamugisha et al. (2017) and Nguyen *et al.* (2020) reported that over 90% of farmers in Mwanza and Arusha avoided selling beef cattle directly to processing factories due to low prices. Darko-Koomson *et al.* (2019) found limited trust among actors in the cassava value chain in Ghana. Market information inefficiencies result in equity issues in sharing market margins among participants. The primary issue is that buyers do not use standards and weight during purchases. Hailemariam et al. (2009) surveyed marketing systems in Ethiopia, focusing on major exportable live animals and meat, mapping the marketing channels and value chains, and estimating the distribution of costs, margins, and prices among different participants in these value chains.

The distribution of market margins among key actors has been relatively understudied in Tanzania, particularly in the Longido and Arusha districts within the livestock sector. Few studies have examined how market margins are shared among the primary participants in the Tanzanian beef cattle market chain. The way value is distributed affects farmers' decisions, as they must weigh the benefits of selling beef cattle. Despite the significant potential for accessing external markets, few farmers can do so due to limited information. This study aims to determine the share each actor receives from the final price paid by consumers in the beef cattle market chain.

Objectives

This study assesses market margin distribution among actors of the beef cattle market chain in the Longido and Arusha districts. The specific objectives were:

i) To determine the share of the last price paid by consumers across actors in the market chain.
ii) To estimate the cost incurred by each actor along the market chain.
iii) To assess major sources of the market information farmers.

Hypothesis and research questions

The study's first objective was met by testing the null hypothesis, which posits that each actor in the beef cattle market chain receives a share of the final consumer price proportional to their value contribution to the final product (Digby, 1989; Leiblin, 2003). Mathematically, this can be represented as in equation 1.

Equitable benefits distribution
(hypothesis ri=ji …(1)
ri=net benefit, ji =cost)

Research questions

Objectives two and three were guided by specific research questions. The second objective focused on identifying the major costs incurred by each group of actors involved in transactions. The third objective examined whether the sources of information were trusted by each category of actors in the market chain.

Literature Review

The referenced studies indicate that there is an inequitable distribution of marketing margins in the beef cattle market chain, particularly at the butchering stage, where downstream actors like traders and butcher owners receive a higher share of the final price paid by consumers compared to upstream actors like farmers (MMA, 2018; Nguyen *et al.,* 2020; Kibona and Yuejie, 2022). This issue of unfair margin distribution has been documented across various countries, including Uganda, Kenya, South Africa, Vietnam, and Tanzania (Nyikwa, 2015; Kamugisha *et al.,* 2017; MMA, 2018). Despite this recognition, there are no effective strategies to ensure equitable distribution between sellers and buyers. The current study aims to conduct an in-depth analysis of market margin distribution among different actors in the beef cattle market chain to identify solutions to these inequities.

Market margin analysis

The marketing margin is assessed by comparing prices between two markets, which can either be located in different areas or in the same area but involve different actors or nodes (Wohlgenant, 2001). This margin is calculated by assigning all transaction-related costs to each node, including trekking, transportation, livestock movement permits, negotiation, and information search costs. Although the actors aim to maximize profits from exchanges, the cost of fixed assets is excluded from the market margin analysis due to measurement uncertainties (Digby, 1989; Rifin *et al.,* 2015).

For this study, the definitions used are as follows:

Market Chain: Authors like Kaplinsky *et al.* (2011) describe the market chain as encompassing all stages from production to final consumption, including value addition and competitive strategy, focusing on the entire product lifecycle.

Market Channel: Wang (2013) defines the market channel as the specific routes products take from producers to consumers, emphasizing the roles of intermediaries and distribution efficiency.

Beef cattle market structure

Kilimo Trust (KT) (2010) argues that numerous projects and programs in the East African livestock sector have failed due to poor quality data for planning. This highlights the longstanding neglect of data collection and analysis by all stakeholders. The unreliability and unavailability of baseline statistics have led to the pursuit of inadequately identified objectives in many interventions. Additionally, there is poor integration among different projects and programs, causing duplication and gaps, and poor vertical integration of livestock value chains. For instance, there is limited knowledge about market dynamics and the acceptable standards and grades for livestock and livestock products in East African countries.

Margin Distribution in Agricultural Value Chains

Darko-Koomson *et al.* (2019) noted that there is no single correct method for conducting a value chain analysis, as the approach depends on the specific research question. Kaplinsky and Morris (2000) identified four key aspects of value chain analysis in agriculture:

1. Mapping the actors involved in the production, distribution, marketing, and sales of agricultural products.
2. Analysing the distribution of benefits among actors by examining margins and profits, which is crucial in developing countries where the poor are vulnerable to globalization.
3. Highlighting the role of upgrading within the chain.
4. Emphasizing the importance of governance in the chain.

This study utilized the second approach to analyze the distribution of benefits across the beef cattle market chain in the Longido and Arusha districts. An example of successful cooperatives is the Tanga Fresh milk factory in Tanga, which involves farmers in the management team and shares the market margin with them (Akyoo *et al.,* 2017). Similarly, the sugar industry in Tanzania has empowered outgrowers' cooperatives, allowing them to share in the proceeds from the supplied sugar cane.

The average cattle herd size in the study was 119.7 heads, with 98.4% being local breed cattle. The gross margin and benefit-cost ratio were $136.8 and 2.9, respectively, while the household commercialization index was 3.9%. Medication costs accounted for 44% of the total variable costs in beef cattle production in Simanjiro District, Manyara region (Kibona and Yuejie, 2022).

Theoretical Review

The economic theory of transaction costs is employed to illustrate how certain fundamental assumptions and components may be compromised in explaining the observed phenomena within the market channel. How do actors interact to reduce the transaction cost and increase the participation of beef cattle farmers in the market chain(Williamson, 1979)? The contribution of the study to policymakers is to propose better ways of managing the auctions using competitive and fair practices. The market margin each actor anticipates from value-added activities depends on the costs incurred. Arrows indicating direction represent a one-way relationship, whereas bi-directional arrows signify ongoing relationships among actors in the market. The research questions were addressed using three theories: Transaction Cost Economics, Principal-Agent Theory, and the Theory of the Firm, combined with market analysis (Bullock *et al.,* 2018).

According to Transaction Cost Economics, a principal will decide to exchange goods when the benefits exceed the costs, assuming good access to information. The principal-agent theory posits that middlemen act as agents for farmers (the principals) in auctions, fulfilling the principals' conditions while also pursuing their interests. Agents manage transactions so that the commission costs are shared by both the principal and the buyer. These agents play a crucial role in making the beef cattle market chain efficient by handling all information from the principal. Their performance could be enhanced with a well-coordinated market chain led by a central authority overseeing all activities (Kano, 2018).

In auctions, the price for live cattle is accepted by farmers and traders based on expected returns after deducting all associated transaction costs. According to the Theory of the Firm, each actor aims to maximize profit (Williamson, 1979). However, in Tanzania, some actors, like farmers, often sell cattle due to an urgent need for cash rather than profit-making. Farmers sell their cattle through middlemen in a principal-agent relationship, where middlemen will sell on behalf of the farmer only if the expected commission from the negotiated price exceeds a certain threshold. Consequently, it is rare for any party to engage in an exchange without focusing on maximizing market margins. Goohue (2011) analyses different incentive contracts based on the evaluation of quality requirements and concluded that contracts are different according to the possibility of measurement. Also analysing the different contractual arrangements, Ali & Kumar (2015) found nine different contractual arrangements in mango transactions in India. Sengere *et al.* (2019) focused on the partnership and collective actions between coffee value chain actors in Papua New Guinea. Bullock *et al.* (2018) analyzed the New Institutional Economics, political economy and the value chain analysis framework, focusing on how the contractual arrangements promote gender inclusion in an organic spice chain in Tanzania. This paper suggests that if all actors are satisfied with the transaction, the flow of funds and income from each stage of value addition will be acceptable, ensuring that everyone in the chain receives a market margin proportional to their efforts (Minten *et al.,* 2018). According to Transaction Cost Economics theory, farmers, viewed as individual firms, will decide to transact based on the sufficiency of information. Farmers must decide whether to accept or reject the offered price in the market. The Theory of the Firm, which emphasizes profit maximization, indicates that each firm will strive to minimize transaction costs or maximize profit (Jobirov *et al.,* 2022). Each actor aims to maximize income and reduce transaction costs to stay competitive (Guvheya *et al.,* 1998). Combining these three theories provides a comprehensive understanding of the decision-making challenges faced by actors before transactions occur (Guimarães *et al.,* 2023).

The integrated theories highlight that improved farmer income, increased wealth, and government tax revenue from exported beef cattle products are the outcomes. Integrating these theories can foster trust and cooperation among actors, enabling them to operate as a cohesive team (Hernandez and Pedersen, 2017). The suggested intervention involves creating a platform for price discovery and a grading system to ensure fair value distribution, which will increase cattle sales and beef supply at auctions, contributing to the economy. Based on previous studies by Mushi *et al.* (2009a) and Mushi *et al.* (2009b), Rege *et al.* (2003) they established the average carcass weight of 137.5 for matured male Short Horn Zebu cattle. The price for retail was average price found to all four categories of meat (mixed, steak, offal and boneless)

This conceptual framework begins with producers who enter the market by offering cattle to other actors. The analysis involves calculating net benefit margins and net costs, testing the net margin ratio differences using student t-statistics, and developing strategies to improve the subsector, leading to the desired outcomes and impact (Wohlgenant, 2001;Rifin *et al* .,2015; Adeniji *et al.,*).

Conceptual Framework: Distribution of Market Margins in the Beef Cattle Market Chain

Theoretical Foundations:

1. Transaction Cost Economics (TCE)
2. Agency Theory
3. Firm Theory

Key Analysis:

- Market Margin Analysis
- Hypothesis Testing for Equity (Equitable Value Distribution)
  - -- Hypothesis: ri=ji where
  - -- ri=net benefit ri = net benefit
  - -- ji=cost ji = {cost}ji=cost

Flow of Transactions:

1. Farmers sell cattle to traders/middlemen.
2. Traders/middlemen sell cattle to butchers.
3. Butchers process and sell meat to consumers.
4. Processors add value and may sell to consumers or export the product.
5. Exporters sell processed beef to international markets, adding further value at the destination.

Value Addition:

Exporters and processors play a significant role in value addition before the product reaches its destination.In this value adiition is where we have extracted the benefit and costs from each market node along the market channels.

The diagram visually depicts the flow with arrows indicating the direction of transactions and relationships among actors. It starts with the primary actors from upstream to downstream, followed by the market channels, and finally the margin analysis, as illustrated in Figure 1.

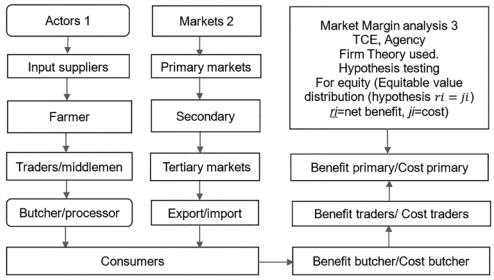

Figure 1: Conceptual Framework:
Source: Authors

METHODOLOGY

Study Design and Location.

The study used a cross-sectional design. A questionnaire was administered to 225 people with different statuses along the market chain in Longido district and Arusha City Council. For the other categories, a checklist was used with key informant interview.

Table 1 presents different actors and service providers who were interviewed. The processors were two out of four, butchers nine out of seventy-two and key informant included staff from the Longido district office and from the Ministry of Livestock and Fisheries Development.

Longido is one of four districts in the Arusha region, situated at the Kenya border. It was chosen for this study due to its central role in beef cattle production, making it a key center for livestock improvement programs in Tanzania.

Its proximity to Kenya also offers potential for obtaining research-based information on livestock marketing in primary, secondary, and terminal markets across the border. According to the 2022 census, Longido's population was 175,915, with 82,887 males and 93,028 females. Arusha district was selected because it serves as the primary market for most cattle from the Arusha region. Arusha district had a population of 449,518, with 211,650 males and 237,868 females, while Arusha Municipal Council had 617,631 people, including 292,771 males and 324,860 females, according to the 2022 Tanzania census (NBS, 2023). Markets in Kenya offer higher prices compared to those in Tanzania (Nyikwa, 2015), leading some cattle from Longido to be sold in Kenyan markets. Map for Longido and Arusha districts see figure 2

Table 1: Respondent's composition

Farmers (Livestock Keepers)	Traders	Processors	Butcher	Input dealer	Key informant
225	27	2	9	2	5

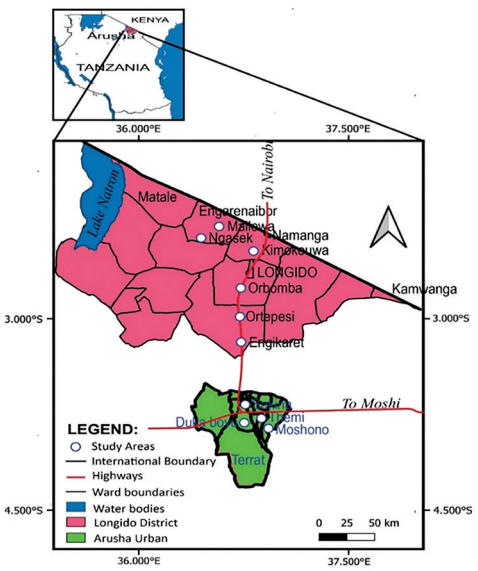

Figure 2: Longido and Arusha District map

Analytical framework

The first specific objectives was analyzed using market margin analysis and partial correlations, respectively. This method was used by Rupindo (2015) and Wilson (2015) because it captures production costs directly and is interpreted as a proportion of the value added which include all variable costs at each node. The Match Makers Association (MMA), (2018) used a simplified gross margin analysis to study the returns for actors in livestock markets in Longido and Simanjiro. The analysis involved collecting all costs data and expected revenue followed by an analysis of such costs of actors share of the value added.

Whereas the Trader's share is TY, trader's selling price is (Tp) and trader's buying price (Tc) butcher's selling price is Bp

$$TY = \frac{(Tp - Tc)}{Bp} \quad \ldots\ldots\ldots (2)$$

Where Butcher's share = BY, Butcher's selling price =Bp, butcher's buying price=Bc)

$$BY = \frac{Bp - Bc}{Bp} \quad \ldots\ldots(3)$$

The first objective of this study was achieved by testing the hypothesis whether the share of the final buyers' expenditure on the final product is equitably distributed. This equitable was measured by benefit cost ratio analysis then the ratios put in the hypothesis through equation number 4.

Hypothesis testing: The student t- test was done.

$Ho: ji = r_i$ ...(4)

Where ji and ri are the proportion net marketing margin and cost incurred as shown in the equation below.

$AS = r_1 v + r_2 v + r_3 v$ .....(5

cj=j1C+j2C+j3C .....(6)

AS=final price paid by customer at butcher, *V*=total benefits and *Cj* is the cost for value addition; *C*=total cost for value addition

The first research question was addressed by estimating the cost incurred by each actor to transact in the channel. The second research question was addressed by analysis the source for marketing information to each group of actors.

Results and Discussion

The results in table 2 show age of respondent with minimum age of 18 and maximum 85 years with a mean age of 41 which represent workforce of the family members. The average cattle owned was thirty-seven with an average plot size of 3 hectares average family size of 12 people average cattle sold per month was 3 cattle. The finding is different from the one conducted in Simiyu and Manyara region in 2021 and 2022 respectively by Kibona and Yuejie, 2021 and Kibona and Yuejie 2022 for pastoral families in these two locations. The results revealed that the average age of the pastoralists was 47.7 years with a family size of 10.9. On average, the pastoralists had about 26.4 years of farming experience(Kibona and Yuejie, 2022). The respondents in Longido were younger than those in Simanjiro districts imply that they can provide more labour than the others with large family size.

Results in Table 3 revealed that each actor got a fair share of the final price paid by the consumer. In addition, butchers; owners get higher returns on both benefit and incurs higher costs. The net margin ration for benefit and costs reveal that farmers get 17.9 percent of benefit which is like net margin in costs of 21.09 % of the cost. Traders also get 29.21% of net benefit and incurred 32.81% of net costs. The hypothesis assessed whether each actor is equitably rewarded or not. The ratios for net margin and net benefit were used in the t-test to check if there is difference in benefit-cost ratio for each actor along the market chain. The hypothesis test results show that P-value >0.05 which led us to not reject null hypothesis and concluded that value distribution is fair.

Table 4 presents results on whether farmers knew the price in advance before visiting the market. The results show that 35.6% of the respondents knew the price before reaching the

Table 2: Household characteristics

Household characteristics	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic
Age of the respondent	18	85	41.27	11.88
Cattle owned by household	2.00	310.00	36.55	51.48
Size of the plot owned in hectares	0.1011	80.93	2.99	6.67
Family size	1.00	60.00	11.63	9.73
Price of the cattle in TZS	250 000.00	450 000.00	340 822.22	37 067.32
Number of cattle sold per months	1.00	22.00	2.76	3.00

Table 3: Actors Market margin analysis

Revenue	Year 1 (TZS)	Year 2	Year 3	Year 4	Discounted 9.18% (TZS)	Net benefit (TZS)	% Revenue	%Costs
Farmers	350000	350000	350000	360000	1,136,474.07	567,978.10	0.2059	0.2174
Traders	550000	550000	550000	450000	1,704,452.17	975,384.95	0.3087	0.3077
Butchers	825000	825000	825000	850000	2,679,837.13	2,679,837.13	0.4854	0.4749
Total revenue	1725000	1725000	1725000	1660000	5,520,763.37			
						Net cost	Costs ratio	
Farmers	270000	270000	270000	290000	885,354.83	0.21743		
Traders	420000	400000	400000	320000	1,252,801.66	0.3077	0.3077	
Butchers	600000	598000	599000	600000	1,933,730.54	0.4749	0.4749	
Total costs	1290000	1268000	1269000	1210000	4,071,887.03			
Net flow	251,119.25	Farmers						
	451,650.51	Traders						
	746,106.58	Butchers						

market centre and 64.4% did not know the price before getting to the market. The results implied that most farmers incur search costs and when they do not sell increase the additional trekking cost to their home. Hence, two third of farmers who do not know the auction price information could not avoid using the middlemen to sell their livestocks. Market information is held by middlemen who takes advantage of the information held and farmers and traders must use middlemen as agent of farmers.

Table 4: Knowing price in advance before visiting the market

Response	Frequency	Percent
Yes	80	35.6
No	145	64.4
Total	**225**	**100.0**

Results on Table 5 revealed that social network contributed to 34.2 percent as source for information of prices and 58.7 percent must visit the market to get the price information and these represent the majority who depends on the brokers/middlemen to conduct the business. This implies that few farmers were accessing information on price from their network of friends or farmers. This would improve by using associations of farmers which use meeting to communicate with members all issues happening at the auction.

Table 5: Sources of information about the prices in the Market

Source of information	Frequency	Percent
Friends/fellow cattle keepers	77	34.2
Radio/news paper	2	0.9
Direct visit to the market	132	58.7
Traders	12	5.3
Others (specify)	2	0.9
Total	**225**	**100.0**

Results on Table 6 show that 90.2% of the respondents have no contract such that they do trade on spot market. Such on the spot trading involved searching costs, movement permit and transport costs. Meanwhile, contracts require commitment from the principal and the agent such that each actor is expected to fulfil their duty and wait for rewards as per contract. In the year 2021 discussions with General manager from Elia food company limited showed concern regards insufficient supply of beef cattle and goats from the Longido district council and few farmers who are ready to sign long-term contract. The presence of contract would ensure that the factory get enough supply of animals from Longido and nearby district.

Table 6: Contracts for selling

Response	Frequency	Percent
Yes	22	9.8
No	203	90.2
Total	***225***	***100.0***

Due to this problem of insufficient supply, Elia food company would like to establish own ranch and fattening blocks at Namanga to create sustainable supply of the beef cattle and goats with good quality.

What were costs incurred by each actor refer to table 7 the majors costs incurred by farmers, traders and butcher are shown below.

Table 7: Majors costs incurred by each group of actors

Farmers majors costs	Traders costs	Butcher's cost
Grazing labour	Buying herds	Buying cattle
Supplementary feeds	Labour costs for grazing	Transport
Veterinary services	Transport costs	Transport permit
Shelter	Inspection fees	Handling labour
District levy/fees	Transport permit	Slaughter fees
Transport costs	License	Trading license

Conclusion

The study indicates that the distribution of market margins among actors is fair. However, there are other issues that require immediate attention to enhance farmers' commitment to buyers. Implementing proper use of weighing scales will ensure competitive price determination, allowing all actors to receive fair rewards. A significant portion of farmers, over two-thirds, face challenges with accessing market information, such as prices and demand for beef cattle. Increasing the

availability of market information to farmers through established village associations that promote good husbandry practices, including grading and fattening, can increase the trade of beef cattle at fair prices, ultimately improving farmers' income.

Recommendations

It is suggested that the private sector should contribute to building trust and commitment among actors, enabling most farmers to enter into contracts with processors and traders. This will reduce costs associated with searching, bargaining, and transporting. Trust will ensure that both sellers and buyers fulfil their responsibilities as per the contract.

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