Factors Influencing Farmers' Participation in the Beef Market Chain: the Case of Arusha City and Longido district, Tanzania

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Abstract

The performance of the beef industry in Tanzania is heavily dependent on the participation of a few actors in it. The decision to participate in the beef market chain is likely to be influenced by several factors. However, there is a paucity of knowledge on the determinants of farmers' decisions to participate in the beef market chain. Therefore, this paper assesses factors that influence farmers' participation in the beef market chain in Longido District and Arusha City. Data for this study were collected from 270 respondents in Longido District and Arusha City. Quantitative data were analyzed using SPSS software. The number of cattle sold used as a proxy variable for participation in the beef market chain. Data were analyzed using the linear regression model. Factors that were identified to have a significant positive influence on the famers' participation in the beef market chain were distance to the nearby auction (p = 0.026), number of cattle owned by the household (p = 0.05), plot size for improved pasture development (p = 0.000), and repeated transaction (p = 0.008). Meanwhile, a farmer's age had a significant negative influence on the farmers' participation in the beef market chain (p = 0.097). The results show that 56.4% of the respondents kept cattle, 39.1% kept shoats, 1.8% were self-employed providing veterinary services and 2.7% were casual labourers. The results also show that distance positively influenced participation in the beef market chain because farmers from a distance villages once they reached the auction were forced to sell whatever stocks they brought. The opportunity cost was too high for them to return with their animals if they do find the price at the auction too low. In conclusion, policies should emphasize equipping the auction with infrastructure that shall reduce transaction costs to all actors. This will enable a fair price determination in which each actor will have a commitment and participate to get a good price based on live weight.

Keywords: Farmers participation, beef market chain, regression analysis, Tanzania

Introduction

The livestock market in Tanzania is endowed with low turnover and poor performance which emanated from low farmers participation. The livestock sector is not doing well because of the difference between the demand and supply of animals in the auctions (MATCH MAKER, 2018). This gap leads problem to operate meat processing factories such that some closed their factory like SAAFI in Sumbawanga and Orpul in Manyara because of the low supply of quality cattle (Kamugisha *et al.*, 2017). There is a gap between the demand and supply of livestock in the market. Nonetheless, the livestock subsector remains very important for food security, income, animal drought, manure, foreign currency, and employment.

The demand for meat and other livestock products has been increasing in Tanzania, partly because of the increasing human population, meat processing factories, and rising income, including the proportion of individuals with middle-income levels. Meat production in Tanzania had incresead from 299,581 metric tons in 2013 to 506,798 metric tons in 2019 (Kamer, 2022). According to Nyikwa (2015), there was a very low offtake rate of beef cattle among farmers in the Longido and Monduli Districts. Many livestock keepers are interested in survival strategies rather than raising their livestock from a business orientation. Furthermore, there

is room for expanding the supply to local and external markets, however, the low offtake and market turnover limit the contribution of the subsector to the economy. According to Sotsha *et al.*, (2018), factors influencing communal livestock farmers to participate in the national red meat market development programme in South Africa include distance to the market, stock size, days of fattening, and contribution to the programme.

Farmers are the primary actors who supply beef cattle to the market. Increasing supply, will among other things, depend on livestock keepers' participation in the markets. Hence, it is useful to understand the factors that influence farmers' participation in the beef market chain in Longido, Tanzania. A study by Kibona and Yuejie, (2021) in Meatu districts established that the volume of beef cattle sold was affected by the age of the respondent, family size, the number of cattle owned, and the size of the plot owned and distance to the market. In another study, Temesgen and Wegari (2021) found that farmers' participation in the beef cattle market in Ethiopia was influenced by the number of cattle owned, the animals' body condition, the frequency of farmers' access to market information, the grazing land owned, education level, and household size. The contribution to the bdy oof research knowledge is to enable farmers use the weighing scales to get good value for their cattle.

This paper aims to establish factors that encourage or discourage farmers from participating in the beef cattle market chain in the Longido District where most farmers depend on livestock for their cash income. The specific objective of the study was to assess factors influencing farmers' participation in the cattle market chain. The study findings are envisaged to enable policymakers to make informed decisions in devising measures of improving farmers' participation in the beef cattle market chain and hence improve the performance of the sector in the country. These previous studies however were carried outside the Longido district and Arusha Region. Moreover, livestock keepers in Longido depend on the livestock as a major economic activity. Their lifestyle could be different from the farmers of other locations in terms of culture, economic activities, and traditions. Hence, factors influencing farmers' participation in the beef market chain in the study area may differ from other areas.

Farmers sell their cattle at the auction (primary market near the village) to meet their daily family expenses and emergencies when they occur. Alternative income sources, such as remittances from family members make farmers less likely to sell their cattle. A study by Kibona and Yuejie, (2021) revealed that farmers 'participation in cattle markets in Simiyu region, Tanzania is influenced by such factors as access to information, credit, veterinary services, membership in cooperatives, and engagement in cattle fattening. Similar studies in Kenya, Ethiopia, India, and South Africa (Alene *et al.,* 2007; Rupindo, 2015; Yuzaria *et al.*, 2020; Kibona and Yuejie, 2021) also revealed that the factors that influence farmers' decision to sell their cattle include family size, distance to the market, grazing land, age of the farmer, market information access, number of cattle owned, education level and access to credit. In another study, Kibona and Yuejie, (2021) revealed that the volume of beef cattle sold was affected by the age of the farmer, family size, the number of cattle owned, the size of the plot owned, and distance to the market. Temesgen and Wegari (2021) revealed that factors that influence farmers' participation in the beef cattle market in Ethiopia include the number of cattle owned, body condition, and frequency of farmers' access to the market information, grazing land owned, education level, and household size. This study selected some factors reported and find evidence from the study location to contribute to the body of knowledge.

Conceptual and Theoretical framework

The conceptual framework is guided by two theories, the transaction costs economic theory and the agency theory. The theories were used as the lens to understand the factors influencing farmers' participation in the market. The transaction cost economic theory deals with the cost of searching for a buyer, negotiation cost, the buyers' information and conditions, conditions for entry, and the existing levies as the conditions that make a rational farmer

decides whether to sell the cattle or not. Agency theory involves costs for commitment between principal and agent to conditions set forth.

The study conceptual framework is presented in Figure 1. It begins with actors in the market chain and then an analysis of the supply gap and the market characteristics which again lead to the outcome of the subsector to increase offtake, improved participation, and increase the supply of cattle in the market.

nearest auction, education level, the market, and price determination. As pastoralists, their priority is to increase the number of cattle owned. This means that the decision to participate in beef cattle marketing is also influenced by market characteristics and household factors. Market characteristics include market information such as quantity, quality, and the price of live cattle at each centre. The household factors include income sources, age, family size, and herd size

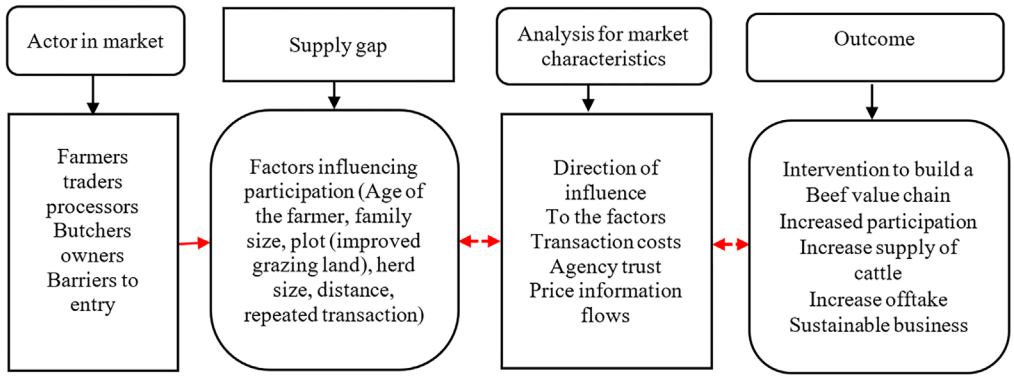

Figure 1: Conceptual framework,
Source: Own construction

The conceptual framework in figure 1 shows factors that affect farmers participation in the beef market chain, consequently, would increase income to different actors as well as the sustainable supply of beef cattle in the beef market chain. The main outcome for the good participation of farmers in the market chain is contribution to economic development. Based on transaction economic theory and agency theory, it is assumed that a farmer will select dimensions and a course of action that leads to an output level that when transacted improves their income and well-being. Such repeated transactions would build relations among the actors that develop confidence and trust among them (Williamson, 1979). In due course, coordination would improve, making the actors operate as a team. Farmers are the primary sellers, participating in the auction to raise cash income required for family needs, including daily family expenses and emergencies. Some factors which are supposed to influence farmers' participation in the livestock market include the age of the farmer, family size, distance to the that created influence of participation in the market.

Market information is a critical factor and as (Kibona and Yuejie, 2021) revealed only 38.5 percent of the non-market participants had access to market information compared to 63.8 per of market participants. However, there was no significant difference in access to credit as 4.5 and 5.1 percent of market participants and non-market participants, respectively had access to credit. Meanwhile, access to veterinary services was higher among non-market participants 41 percent compared to only 31.6 percent of market participants. About 6.8 percent of market participants were engaged in cattle fattening but none of the non-market participants did. Kibona's findings do not answer the question, of why very few farmers are likely to fatten. This is because some farmers, in the arid areas of Longido District, depend solely on livestock for their livelihood, thus they need a sustainable scheme. Studies in Ethiopia, India, and South Africa revealed that family size, distance to the market, grazing land, age of the farmer,

market information access, number of cattle owned, education level, and access to credit are among the factors that influence farmers' participation in livestock markets (Montshwe, 2006; Kgosikoma and Malope, 2016; Temesgen and Wegari, 2021). The current study focused on the age of the farmer, distance from the village centre to the nearby auction, family size, plot size owned, number of cattle owned, and repeated transactions as the factors which are assumed to influence farmers' participation in the market in the study area.

Materials and Methods

Study Area

This study was conducted in Longido District and Arusha city, both in Arusha region, a leading area for beef cattle production and processing in the country. Longido is one among four districts of the Arusha region located in the Northeast of Tanzania. Longido District was selected because of its central role in beef cattle production which has made it a major centre of livestock improvement programmes in Tanzania. Also, its proximity to Kenya makes the district potential for gathering research-based information regarding livestock marketing in primary, secondary, and terminal markets in the neighbouring country. Arusha city was selected because it is the end market for most of the cattle in Arusha region. However, some of the cattle from Longido reach cattle markets in Kenya, a neighbouring country where buyers offer higher prices compared to the prices offered by buyers in Tanzania (Nyikwa, 2015; MMA, 2018).

Data Collection

The interview involved 270 respondents from different categories of actors in the beef market chain. Four wards were selected randomly and then two villages were selected randomly to make a sampling frame. The study used a cross-sectional design. A questionnaire was administered to 270 respondents with different statuses along the market chain including farmers, traders, processors, butcher operators, input suppliers, and key informants from the government and other facilitating organisations in Longido District and Arusha City Council. The study interviewed 270 respondents as follows: 225 farmers, 25 traders, 2 processors, 9 meat shop' owners, 2 input dealers, and 5 key informants from the district office.

Data Analysis

Model Selection

A regression model was used to analyse the factors that influence farmers' participation in the beef cattle market chain. The multiple linear regression model was used in estimating the various parameters for the model given the nature of the data and the expected influence from the independent variables were assessed without any discrepancies and violation of the assumptions such as normality, multicollinearity, and heteroscedasticity. The number of cattle sold per month used to the participation while the independent variables were the age of the farmer, the number of cattle owned, the size of the plot (improved grazing land), family size, distance to the auction, and repeated transactions. Sinha (2016) used panel regression to analyse the determinants of India's import, the methods captured two things simultaneously, that is scalar effect and dynamic effects. Islam *et al*. (2021) used mixed methods for comparing content analysis and partial least square models. But this study used a multiple linear regression which relates the number of cattle sold per annum against the factors. The measurement of the factors were continuous variables and a few categorical.

Analytical framework

Regression analysis was used to determine factors that influenced the level of farmers' participation in the beef market chain. The dependent variable measured by the number of cattle sold per month to represent the participation in the beef market chain was regressed against independent variables including the age of the farmer, family size, distance to the market, repeated transactions, plot size, and the number of cattle owned (Equation 1).

$$Number\ of\ cattle\ sold\ per\ month\ (Y) = \theta + \beta iXi + \varepsilon \quad \text{.....(1)}$$

Where Y=Number of cattle sold per month is a dependent variable. Xi=vector for independent variables factors such as the age of the farmer,

family size, cattle owned, the size of the plot (improved pasture area), distance to the nearest auction and repeated transaction. βi is the coefficient to be estimated. The parameter θ is the constant. ε=the error term

The assumptions which were not violated in the model specification were:

i) Constant variance
ii) Linearity in parameters
iii) Independent of the error term
iv) No multicollinearity
v) No heteroscedasticity
vi) Exogeneity

After all these assumptions we performed the test for checking the normal distribution of the dependent variable through histogram and found it was biased to the left then we transformed it into a logarithm and carry out other tests such as collinearity diagnostic and correlations analysis of the independent variable and found that they were ok except for variable that had higher correlation were not picked in the model variables such total costs, total variable costs and price of the cattle during the dry season. Table 1 shows the hypothesized model results for the factors analysed in the model.

The hypothesized sign for each variable to show the direction of the influence either for or against participation

Results and Discussion

Role of actors and price setting

The results in Table 2 described the farmers' role in the livestock market chain. The findings show that 56.4 percent of the respondents raise cattle through grazing, and 39.1 percent raise goats. A very small number (1.8%) of the respondents provide veterinary services to other farmers within the community. About 2.7 percent of the respondents are employed by other villagers as casual labourers. Most farmers kept both cattle and shoats (goats and sheep); however, much effort has been directed to raising shoats since they can survive during dry seasons without much loss of weight and without succumbing to diseases. These small stocks are sold more regularly to meet basic family needs including food. Most farmers raise cattle to cover major family expenses which may occur, including prolonged sickness, ceremonies (weddings and funerals), debts, and other emergencies. This implies in Longido district that main occupation of the farmers was livestock keeping as over 95.5 depends on livestock production.

The results in Table 3 show further, that marketing challenges with high ranking were price fluctuations which suggests 35.1% of the respondents were affected by this and 13.8

Table 1: The analytical framework for this study

Model (dependent variable Market Participation)	Expected sign
Age of the respondent (measued as continuous variable)	+
Distance from the village centre to the nearby auction(numeric)	-
Family size (numeric)	+
Cattle owned by household (numeric)	+
Plot size improved pasture development(numeric)	+
Repeated transactions (numeric)	+

Table 2: Main functions of farmers in Longido

Main functions	Frequency	Percent
Raise cattle (grazing-free land)	127	56.4
Raise Shoats	88	39.1
Provide veterinary service	4	1.8
casual labourers (trekking animals to auctions)	6	2.7
Total	**225**	**100.0**

complains about a lack of market information, 20% claimed that prices offered in the market were low and not covered the costs incurred. The implication is that the need for alternative market information sources is inevitable due to increasing demand for the right information about the number, quality, and history of the cattle as required by the buyers.

The cattle auction is organized by a silent system where the farmers at the auction hand over their cattle to the middlemen who eventually look after the traders and meat shop owners. The farmer waits for the middlemen to negotiate the reserved price upwards to enable him to get his commission from a successful transaction. However, where the reserved price from the farmer is higher than the price offered by the buyer(traders), the final decision is with the farmer to revert or accept.

Production challenges facing farmers in Longido district

There is a big problem for range land and grazing due to drought as reported in Table 4 about 96.9 % of the respondents ranked it as the first challenge in the area. such that few farmers can afford to fatten their cattle. From the observation, the grazing land has been invaded by Iloqwash herb which grows faster and reduce grazing land, especially in overgrazed areas in the Longido district.

Plate 1 shows the status of the grazing land which is fully covered by the herb photo for illoqwash herb (challenges for grazing land in Longido).

The results in Table 5 indicate the power to set the price at the auction. The findings show that almost two-thirds of the farmers reported having the power to set the price without

Table 3: Market challenges facing farmers

Challenge	Frequency	Percent
Lack of market information	31	13.8
unreliable markets (price fluctuation)	79	35.1
Low prices of cattle as compared to the cost of rearing	45	20.0
selling process consumes more time	3	1.3
A low number of buyers in the market	17	7.6
lack of market information	3	1.3
Absence of weighing scale	21	9.3
The Problem of marketing infrastructure	2	0.9
absence of livestock farmers association	6	2.7
Others	18	8.0
Total	**225**	**100**

Table 4: Production challenges facing the farmers in Longido District

Production Challenges in keeping cattle in Longido	Frequency	Percent
Drought (shortage of water and pastures)	218	96.9
Lack of credit facilities	1	0.4
Others	2	0.9
High drug costs	1	0.4
Presence of wild animals	1	0.4
Prevalence of diseases	2	0.9
Total	**225**	**100.0**

Plate 1: Illoqwash herb during rainfall in December 2019 at Orbomba ward

negotiating downward. About 59.1 percent of the farmers had the powers to set the price while 19.1 percent said the buyers set the price and 21.3 per cent reported negotiating between sellers and buyers. Discussions with the respondents revealed that if buyers found the price offered by sellers or their agents was too high, they decline from transacting. For example, at Themi, a secondary market in Arusha city, a seller from Kondoa in the Dodoma region presented two bulls that had been fattened, since the price set was too high, he could not sell. This happened in October 2019. Under such circumstances, the farmer goes back home with their animals until the next time. However, the transaction costs were high because of poor infrastructure at the market that the buyer is forced to transport and take the cattle to the next nearby auction.

Challenges facing traders and butchers 'owners

The results in Table 6 show further that 14.3 per cent of the respondents reported having challenges with the use of EFD machines, 28.7 percent of the butchers' owner find that the plastic table should be removed from their shops and 57.1 percent said that high costs of transaction and taxation system. This implies that the costs of doing business would reduce the number of new entrants even the foreign investors to invest in the value addition. The setting of high prices by farmers that restricts buyers from accepting the offer adds to transaction costs. As a result, a farmer who does not sell incurs additional costs including searching for new buyers and trekking to and from the auction several times until a sale is made. It was reported by farmers that in most cases the market facilities such as holding ground, weighing scale, water point, and sick pen are not functioning. If these services were available, the cattle could have been retained at the holding ground for a few days until the next auction date is due when a farmer would offer them to new buyers. This would be cost-saving if the cost of keeping the animals per head was less than the cost of trekking them to and from the nearby or far auctions.

The results for the multiple linear regression model show that model fitted the data well and

Table 5: Basis for price-setting power in Longido

Description	Frequency	Per cent
Buyers (traders cum butchers 'owners)	44	19.55
Sellers (farmers)	133	59.1
Both Negotiate	48	21.3
Total	**225**	**100.0**

Table 6: Challenges facing traders and butchers in Longido

	Frequency	Percent
Use of EFD machine	1	14.3
Remove of the wood table	2	28.6
Licensing and taxation are high	4	57.1
Total	**7**	**100.0**

was robust to predict the sign of the factors. The autocorrelation test showed that there was no violation, and there was multicollinearity between age and age squared thus one variable was dropped from the model, and age was maintained.

The results in Table 7 show that age influenced the farmer's beef market chain participation negatively. The distance to the market showed a positive sign instead of a negative sign such that as the distance to the market increased, the level of participation also increased. Now distance is no longer a limitation for accessing the market, many farmers are more likely to sell at large auctions that are far from their villages. Also, the family size was expected to have a negative sign, but the results suggest the opposite. These findings are in contrast with the findings in the previous studies (i.e., Kibona and Yuejie, (2021); Kgosikoma and Malope, 2016; Temesgen and Wegari, 2021). This means in a rural setting where the means of livelihood is dependent on livestock also, as the family size increases, the level of beef market chain participation increases. Distance to the nearby auction, cattle owned, the plot size for improved pasture, and repeated transactions were found significant and influenced farmers' beef market chain participation. The age of the farmer was the only factor that had negatively affected the beef market chain participation as older farmers tend to hold more cattle to maintain wealth. The farmers were keeping cattle for emergency purposes and not as a business that should maximize profit. In addition, any cost incurred to improve or reduce the herd size was not preferred by farmers because it was interpreted as reducing their wealth.

The difference in the results between the current the previously reported studies regarding the aforementioned factors in influencing farmers' participation in the market

Table 7: Regression results for factors influencing farmers' participation

Model (dependent variable Market Participation)	Standardized Coefficients	T	Sig.
	Beta		
Age of the respondent	-0.113	-1.670	0.097*
Distance from the village centre to the nearby auction	0.146	2.252	0.026**
Family size	0.011	0.147	0.883
Cattle owned by household	0.141	1.972	0.050**
Plot size improved pasture development	0.378	5.162	0.000***
Repeated transactions	0.176	2.666	0.008***
R square	0.246		
F statistics	9.97		
Durbin Watson	1.637		0.000***

**** indicates significance at 1%; ** indicates significance at 5% and * indicates significance at 10%*

Plate 2: Orbomba auction day December 2019

can be attributed to the location and culture of the respondents in Longido which is unique from those in other areas. For example, the distance was expected to be negative, but the results were the opposite sign which explains the farmers did not incur the cost extra trekking to distant markets if accessible when the price is not attractive. The results of this study are consistent with the results in a study by (Kibona and Yuejie, 2021) except for one factor, that

is, the age of the farmers. The previous study revealed that the age of the farmer increased participation, while in this study the age of the farmer reduced participation. This implies that farmers in the study area are using small ruminants as a quick fix for their cash demand such that they do not sell cattle in the market. Detailed information for the regression is given in appendices 7 and 8.

Table 8 The factors considered for price determination are based on body condition by 60.4% of the respondents, 21.3% determine the price based on age, meanwhile 13.3% based on weight. Although, the majority determine the price based on body condition still to maintain fair play all should use a weight which is not favouring any, and each would get fair compensation.

Table 8: Factors Considered for Pricing the Cattle

Factors	Frequency	Percent
Weight	30	13.3
Age	48	21.3
Breed	11	4.9
Physical condition	136	60.4
Total	**225**	**100.0**

Conclusion and recommendations

This research paper addressed the problem of beef market chain participation by analysing factors influencing beef market chain participation in arid areas of Longido District. This paper makes an important contribution to the literature by identifying what positively influenced beef market chain participation such as improved pasture area, repeated transactions, family size, cattle owned, and distance to the auction factors centre.

This study revealed that family size, cattle-owned land for improved pasture, age, and repeated transaction were having positive coefficients, hence influencing farmers' participation in the cattle market in Longido districts. The age variable had a negative coefficient which implies that as the household head becomes older, he becomes more reluctant to participate in the cattle market. In old age, the preference is for a farmer to handle the emergency cash needs by selling small ruminants an alternative source of income.

Drawing upon the findings and analysis presented in this paper, the following policy recommendations can be made to improve the performance of the beef cattle market chain. First, the efforts should be directed at encouraging old farmers to offer more beef cattle for sale at the auctions and do away with cattle accumulation as a store of value and a symbol of wealth. If land owned by each household is well-fenced with developed pastures, it would exclude others from making it open communal grazing land which would increase the levels of participation in the market. Repeated transactions tend to build trust upon exchange among actors. This repeated transaction increased household income and the number of cattle sold per month. This can be achieved by improving access to information to increase the level of farmers' participation in the market. Policies enacted should cater to improving access to the nearby market through modern equipment and facilities. Policy directions should focus on improving access to market information, land ownership, and maintaining the number of cattle according to the land carrying capacity such that farmers would be motivated to participate in the cattle market. If these factors are addressed, more farmers would participate in the livestock markets.

Limitations of the study

The study was limited by time and funds to collect longitudinal data for a long-term period to showcase the trend of farmers' participation in the market. However, the findings of the study are still useful for subsector development as the results depict reasonably the key issues in the Tanzanian beef industry.

Areas of further research

A similar study could be accrued out for small ruminants in the Longido district such you can compare the price discovery in the Kenyan market and Tanzanian market.

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