

# An Analysis of Quantitative and Qualitative Factors Influencing Cattle Price in Trans-Border Trade Between Nigeria and Niger Republic

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## ABSTRACT

**Background and Objective:** Cross-border cattle trade is an important economic activity in the agricultural sector which provide income to the market participants. The objective of the study is to examine quantitative and qualitative factors influencing cattle price in trans-border trade and to determine the price of cattle based on categories of buyers, seasons of sale and body conditions of the animal. **Materials and Methods:** Maigatari and Dungass cattle border markets were purposively selected from Nigeria and Niger Republic, respectively. Eighty-five and fifty traders were randomly selected from the respective markets. Also, a sample of 1,046 bulls and 371 cows were selected from the two markets. The data were analyzed using descriptive and inferential statistics. **Results:** The result shows that the LS mean prices of cattle were ₦94,115.20 (\$243.19) and ₦89,677.43 (\$231.72) at Maigatari and Dungass, respectively. The price of cattle in Maigatari (terminal) was significantly ( $p < 0.01$ ) higher than that of the Dungass (supplying) market. Also, the result reveals that sex, weight and market supply had positive coefficients and significant ( $p < 0.001$ ) influence on cattle price. Seasons of sale and types of buyers had positive coefficients and significant influence on the market price at  $p < 0.001$  with a value of  $R^2$  of 0.933. **Conclusion:** Thus, the study recommends proper breeding and management practices on the factors influencing cattle prices. Market information that updates producers on buyers' requirements and seasons of sale should be provided.

## KEYWORDS

Cattle price, quantitative and qualitative factors, trans-border trade, Nigeria, Niger Republic, cross-border, markets

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## INTRODUCTION

Cattle marketing provides a range of employment and income-earning opportunities for populations on both sides of the border countries. Contributions of cattle trade to the cash incomes and purchasing power of various population groups within pastoral areas are significant<sup>1</sup>. According to Ekiru *et al.*<sup>2</sup> livestock is a critical sector for the growth of the economies of many countries, regions and communities throughout the world. The sector is essential because it constantly provides food, income, nutrition,



employment and trade, it facilitates the socio-economic transformation of smallholder farmers' livelihoods and is a source of capital for small and medium businesses. Similarly, despite the seasonality of cattle demand and prices, the cattle trade has a multiplier effect on local economies through the creation of employment opportunities, wealth and extensive inter-sectorial linkages. Some of the population groups benefiting from the livestock sector include cattle owners, hired cattle herders, breeders, wholesalers, retailers, transport owners, drivers, commission agents, loaders, butchers, brokers, sellers of fodder and water, veterinary professionals and other animal health assistants, truck owners, money vendors among others<sup>1</sup>.

In general, African countries such as Ethiopia Kenya, Nigeria, Cameroon, Chad, Benin, Togo and Niger Republic have an immense history of cross-border trade (CBT), which represents a significant proportion of economic transactions<sup>3</sup>. The CBT, carried out across the national boundaries or between people or business entities is therefore defined as: The flow of goods and services across international border lands within a reach of distances<sup>3</sup>.

The CBT is broadly categorized into, formal (official) cross-border trade (FCBT) which refers to the type of international trade in legal goods and services which is carried out by legally registered traders that fulfil all the legal requirements of the trading countries. On the other hand, informal (unofficial) cross-border trade (ICBT), was, however, defined as illegal and unregulated (unregistered, undocumented, or officially unaccounted) trade and consequently, criminalizes the traders and their economic activities<sup>3,4</sup>. Traditional cattle marketing remains the major source of livestock and livestock products in developing countries. Cross-border trade (CBT) especially livestock trade in Nigeria and West Africa in general is based on live animals<sup>5</sup>. In view of the foregoing conditions, information gathered in this study will be useful to potential producers, buyers, researchers and policymakers.

The specific objectives of the study were to:

- Examine quantitative and qualitative factors influencing cattle prices in the study area
- Determine the price of cattle based on categories of buyers, seasons of sale and body conditions of the animal

**Hypothesis:** The following null hypotheses were provided for this study:

- **H<sub>0</sub>:** Cattle price in cross-border markets is not significantly influenced by market locations, sex, buyer, breed, body conditions, weight, age and cattle supply
- **H<sub>0</sub>:** There were no significant differences in prices within the categories of buyers, seasons of the year and body conditions of the animal

## **MATERIALS AND METHODS**

**Study area:** The study was conducted from January, 2013 to December, 2014 in Jigawa State, Nigeria and the Zinder Region of Niger Republic. Jigawa State is located between latitudes 11°North and 13°North and longitudes 8°East and 10°East. The minimum and maximum temperatures were 15 and 25°C, respectively. The average rainfall is about 800 mm and vegetation was characterized by Sudan savannah and Guinea savannah in the northern and southern parts of the State, respectively. The State has an estimated population of about 5,041,491 with a total land area of about 23,287 Km<sup>2</sup>. The State shares borders with Zinder Region in Niger Republic to the North, to the South with Bauchi State, to the West with Kano State and Yobe State to the East. The majority of the populace were Hausa-Fulani whose main

occupations are farming and trading. The farming activities in the State include arable crop production, irrigated vegetable production, livestock production and fish production.

The Zinder Region of the Niger Republic is located between Latitudes 13°N and 8°N and Longitudes 0°E and 8°E. The average annual temperature and rainfall of Zinder are 28.0°C and 380 mm, respectively. The region has an estimated population of about 291,424 persons and a total land area of about 145,430 km<sup>2</sup>. The average rainfall recorded in the Zone was about 411 mm. It shares a boundary with Agadez Region in Niger Republic in the North, Jigawa State of Nigeria to the South, Yobe State to the Southeast and Katsina State to the Southwest. The Zone is dominated by Touareg, Toubout, Fulani, Kanuri and Arabs, while French is the official language. The people engaged in animal production such as cattle, sheep, goats and dromedaries as an important occupation, in addition to cereal production, especially millet and sorghum.

**Sampling technique and sample size:** Maigatari and Dungass cattle markets were purposively selected from Jigawa State, Nigeria and Zinder Region, Niger Republic, respectively as in studies on cross-border cattle trade<sup>3</sup>. The markets were selected for this study because of the large volumes of cattle trade and also because both markets are located along the border of Nigeria and the Niger Republic. Eighty-five and fifty traders were randomly selected from the respective markets, thus, totaling 135 marketers. In determining the sample size, a list of functional cattle marketers was collected from the traders' association from each market, which was used as a sampling frame<sup>4</sup>. The sample was obtained using Taro Yamane's (1967) model<sup>4</sup>. The model is given as:

$$n_{MGT} = \frac{N}{1+N(e)^2} \quad (1)$$

Where:

$n_{MGT}$  = Sample size of the traders in the Maigatari market

$N$  = Total number of functional traders in the association at Maigatari

$e^2$  = Error term (0.05<sup>2</sup>)

$$n_{DNG} = \frac{N}{1+N(e)^2} \quad (2)$$

Where:

$n_{DNG}$  = Sample size of the traders in Dungass market

$N$  = Total number of functional traders in the association at Dungass

$e^2$  = Error term (0.05<sup>2</sup>)

**Data collection:** The data for this study was collected with the aid of structured questionnaires that were designed in both open and close-ended formats and recurrent data collection form. The data were collected by the researcher and trained enumerators. At the primary data collection stage, a recurring survey was used in this study to reveal market prices for cattle with respect to age, sex, weight, breed, type of buyer, body condition and season of sales. Sample price observations on 718 cattle in Maigatari and 699 cattle in Dungass were collected for 1 year on a fortnightly basis. These totaled 1,417 cattle (1046 male and 371 female) from the two market locations. Both Maigatari and Dungass markets were visited twice every month (fortnightly) from January to December. Thus, 24 visits at each of the markets and this gave a total of 48 visits in the two markets studied.

**Methods of statistical analysis:** The general linear model (GLM) was used in analyzing factors influencing cattle prices with the aid of SAS software version 6.1. The results were obtained at 1 and 5% significant levels. The model was specified as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + e \quad (3)$$

Where:

- Y = Cattle Price (₦/FCFA)
- X<sub>1</sub> = Market location (1 Maigatari, 0 Dungass)
- X<sub>2</sub> = Season of sale (1 if the early dry season, 0 otherwise for the late rainy season, early rainy season and late rainy season)
- X<sub>3</sub> = Sex (1 bull, 0 cows)
- X<sub>4</sub> = Type of buyer (1 if regional buyer, 0 otherwise for wholesaler, rural buyer, speculator, butcher, breeder)
- X<sub>5</sub> = Breed (1 if Bunaji, 0 otherwise for Bokoloji, Rahaji and Azwak)
- X<sub>6</sub> = Body condition (1 if Lean, 0 otherwise for moderate fat, fat and very fat)
- X<sub>7</sub> = Age (years)
- X<sub>8</sub> = Weight (kilograms)
- X<sub>9</sub> = Cattle supply (number of heads)
- a = Constant term
- b<sub>1</sub>-b<sub>9</sub> = Regression coefficients
- e = Error term

## RESULTS AND DISCUSSION

**Least-square means of cattle prices:** Least-squares means (LS means according to Scheffe test) for cattle price on markets location and sex is presented in Table 1. The result shows a sample of 1,046 bulls and 371 cows from the two market locations. The result shows the average price of a bull and cow were ₦95,002.70 and ₦88,789.90, respectively and the price of a bull was significantly ( $p < 0.001$ ) higher than the price of a cow in the study area. This could be attributed to the weight and excellent body condition of the bull which in turn attract high prices. Also, the result reveals that the average prices of cattle were ₦94,115.20 and ₦89,677.43 at Maigatari and Dungass, respectively. It can be seen that the price of cattle in Maigatari (terminal) was significantly ( $p < 0.01$ ) higher than the price at Dungass (supplying) market. Ahmed *et al.*<sup>6</sup> reported that the location of the market had a positive coefficient (0.6434526) and significant ( $p < 0.01$ ) effect on the monthly number of livestock traded for export showing that the monthly number of livestock transacted for export is 90% higher in Burao market compared to Hargeisa market in Somalia.

**Quantitative and qualitative factors influencing cattle price:** The result in Table 2 shows a value of R<sup>2</sup> of 0.933 implying both quantitative and qualitative variables jointly account for about 93% of the variation in the price of cattle in the study area. This was confirmed by the F-value of 1027.26 which was statistically significant at  $p < 0.001$ . Thus, the null hypothesis that factors like sex, weight, breed, buyer, etc. do not influence cattle price was rejected and it was concluded that these factors had a significant influence on cattle price. The result further reveals that market location had a negative coefficient and significance at  $p < 0.01$ . This implies that the proximity of the market location influences the price of cattle because less transportation costs will be recorded. Season of sales (late dry and early rainy seasons) had a significant influence on cattle price at  $p < 0.001$ . This may be attributed to demand and supply which varies within the seasons of the year and affects the prices. According to Musa *et al.*<sup>6</sup> season has a significant influence on the number of livestock transacted for export in Somaliland's terminal markets. The coefficients with respect to sex were positive and significant at  $p < 0.001$ . This implies that the sex of the animal had an

Table 1: Least-squares means of cattle prices based on sex and market location (₦ per head)

Sex	Sample size	LSmean	Std. error	t-values	Prob. level
Male	1046	95,002.70	916.12	7.499***	0.000
Female	371	88,789.90	1098.30		
<b>Market locations</b>					
Maigatari	718	94,115.20	1119.12	3.099**	0.009
Dungass	699	89,677.43	1214.82		

\*\*Implies  $p < 0.01$ , \*\*\*Implies  $p < 0.001$ , Currency exchange rate as of July 2020, 1.00 USD = 387.00 NGN, 1.00 USD = 583.00 FCFA, 1.00 NGN = 1.45 FCFA, 1.00 NGN = 113.00 IRR, NGN: Nigerian Naira, FCFA: West African CFA franc and IRR: Iranian Rial

Table 2: Factors influencing cattle price in the study area

Variables	Coefficients	t-values	Prob. level
Constant	-726.74	-0.27	0.7861
<b>Market locations (<math>x_1</math>)</b>			
Maigatari	4437.77	-3.10**	0.0020
Dungass	0.00		
<b>Seasons (<math>x_2</math>)</b>			
Early dry	1727.59	1.23 <sup>NS</sup>	0.2191
Late dry	4545.53	4.61***	0.0001
Early rainy	4362.62	4.82***	0.0001
Late rainy	0.00		
<b>Sex (<math>x_3</math>)</b>			
Male	6212.75	7.50***	0.0001
Female	0.00		
<b>Buyers (<math>x_4</math>)</b>			
Regional wholesaler	10260.78	7.90***	0.0001
Local wholesaler	6488.81	5.86***	0.0001
Rural buyer	-222.03	-0.11 <sup>NS</sup>	0.9098
Speculator	4569.24	3.88***	0.0001
Butcher	4139.08	3.22**	0.0013
Breeder	0.00		
<b>Breeds (<math>x_5</math>)</b>			
White Fulani	4984.56	2.10*	0.0363
Bokoloji	-64.32	-0.02 <sup>NS</sup>	0.9824
Rahaji	2316.41	1.26 <sup>NS</sup>	0.2061
Azwak	0.00		
<b>Body conditions (<math>x_6</math>)</b>			
Lean	-14216.60	-8.31***	
Moderate fat	-14698.47	-11.54***	
Fat	-8413.03	-8.31***	
Very fat	0.00		
<b>Age (<math>x_7</math>)</b>	614.37	3.96***	0.0001
<b>Weight (<math>x_8</math>)</b>	262.28	53.14***	0.0001
<b>Supply (<math>x_9</math>)</b>	4.11	3.51***	0.0005
R <sup>2</sup>	0.933		
F-value	1027.26***		

\*Implies  $p < 0.05$ , \*\*Implies  $p < 0.01$ , \*\*\*Implies  $p < 0.001$  and NS: Not significant

influence on the price. This might be attributed to the reason for the purchase of the animal which might be for breeding or fattening purposes. Similarly, the coefficients of buyer categories (regional wholesalers, local wholesalers and speculators) were positive and significant at ( $p < 0.001$ ). Also, Table 2 shows Breeds (white Fulani) had a positive coefficient and was significant at  $p < 0.05$ . Body conditions of the animal (lean, moderate fat and very fat) had a positive coefficient and significant ( $p < 0.001$ ) effect on the cattle price. This might be connected to the reason for buying the animal which might be for consumption, breeding, or fattening purposes which in turn influence price. Age had a positive coefficient and significance ( $p < 0.001$ ), implying that as the age of the animal increases, the price also increases other things being equal. Weight had a significant ( $p < 0.001$ ) influence on cattle price and this is expected because the increase in weight might attract a good price. Similarly, cattle supply had a positive coefficient and

Table 3: Comparisons of least-squares means of cattle prices based on seasons of sale (₦ per head)

Seasons	Price LSmeans	Std. error	1 t-value	2 t-value	3 t-value	4 t-value
Early dry	90,964.97	1340.98	1			
Late dry	93,782.91	1055.88	2.532887 <sup>NS</sup> (0.0936)	1		
Early rainy	93,599.99	1190.55	1.707455 <sup>NS</sup> (0.4052)	-0.17252 <sup>NS</sup> (0.9986)	1	
Late rainy	89,237.38	1096.58	-1.22946 <sup>NS</sup> (0.6797)	-4.6115 <sup>***</sup> (0.0001)	-4.81859 <sup>***</sup>	1

Figures in parentheses represent probability levels, \*\*\*Implies  $p < 0.001$  and NS: Not significant, Currency exchange rate as of July 2020, 1.00 USD = 387.00 NGN, 1.00 USD = 583.00 FCFA, 1.00 NGN = 1.45 FCFA, 1.00 NGN = 113.00 IRR, NGN: Nigerian Naira, FCFA: West African CFA franc and IRR: Iranian Rial

Table 4: Comparisons of least-squares means of the cattle prices paid by buyer categories (₦ per head)

Seasons	Price LSmeans	Std. error	1 t-value	2 t-value	3 t-value	4 t-value	5 t-value	6 t-value
Regional wholesaler	97,951.11	1164.53	1					
Local wholesaler	94,179.14	1080.94	-3.962 <sup>**</sup> (0.0080)	1				
Rural buyer	87,468.30	1969.36	-5.24797 <sup>***</sup> (0.0001)	-3.50383 <sup>*</sup> (0.0317)	1			
Speculator	92,259.58	1225.12	-4.52472 <sup>***</sup> (0.0011)	-1.74095 <sup>NS</sup> (0.6952)	2.390445 <sup>NS</sup> (0.3356)	1		
Butcher	91,829.42	1315.27	-4.35719 <sup>**</sup> (0.0020)	-1.86934 <sup>NS</sup> (0.6243)	2.092879 <sup>NS</sup> (0.4964)	-0.3133 <sup>NS</sup> (0.9998)	1	
Breeder	87,690.34	1140.32	-7.90477 <sup>***</sup> (0.0001)	-5.86454 <sup>***</sup> (0.0001)	0.113259 <sup>NS</sup> (1.0000)	-3.88299 <sup>*</sup> (0.0103)	-3.21699 <sup>NS</sup> (0.0666)	1

Figures in parentheses represent probability levels, \*Implies  $p < 0.05$ , \*\*Implies  $p < 0.01$ , \*\*\*Implies  $p < 0.001$ , NS: Not significant, 1.00 USD = 387.00 NGN, 1.00 USD = 583.00 FCFA, 1.00 NGN = 1.45 FCFA, 1.00 NGN = 113.00 IRR

significant influence on cattle at  $p < 0.001$ . This could be probably due to the fact that an excess supply of cattle at a particular location and time may lead to low prices. But if there was a low supply of cattle, the price will be high.

**Comparisons of least-squares means of cattle prices based on qualitative factors:** Least-squares means of cattle prices based on seasons of the year. The price of cattle in the late dry season was ₦93,782.91 and significantly ( $p < 0.05$ ) higher than the prices in the late rainy season (₦89,237.38). Also, the results indicate that the price recorded in the early dry season was ₦93,599.99 and significantly ( $p < 0.001$ ) higher than the prices of cattle in the late rainy season (₦89,237.38) as shown in Table 3. Despite the fact that the rainy season has relatively enough supply of feed to the livestock, the demand for cattle during the late rainy season is low thereby affecting the price. This implies that seasons of the year had a significant influence on cattle prices. The highest price recorded in dry seasons could be attributed to the high demand for animals because the period coincides with festivities such as Christmas and New Year celebrations. Thus, making the price of cattle high. This result was in agreement with the findings of Mohammed *et al.*<sup>7</sup> that periods of sales and place of sales stood as half-way factors that influence the pricing of cattle.

Least-square means cattle price paid by buyer categories. Prices offered by regional wholesalers were ₦97,951.11 and significantly ( $p < 0.001$ ) higher than prices paid by the rural buyer (₦87,468.30), speculators (₦92,259.58) and breeders (₦87,690.34). Also, the prices they paid were significantly different from the prices offered by local wholesalers (₦94,179.14) and butchers (₦91,829.42) at  $p < 0.05$ . Similarly, the result shows that the price offered by local wholesalers (₦94,179.14) was significantly higher than the prices paid by the rural buyers (₦87,468.30) and breeders (₦87,690.34) at  $p < 0.001$  as shown in Table 4. The price paid by the speculator was significantly higher than the price offered by the breeder. This could be probably due to the reasons for buying the animals (demand), which include marketing, consumption and fattening purposes which affect the price of the cattle.

The strong positive relationship between body condition and cattle price. The result reveals that the price of lean cattle was ₦87,011.74 and significantly ( $p < 0.001$ ) lower than the price of fat (₦92,815.31) and very

Table 5: Comparisons of least-squares mean of cattle prices on categories of body conditions (₦ per head)

Seasons	Price LSmeans	Std. error	1 t-value	2 t-value	3 t-value	4 t-value
Lean	87,011.74	1506.60	1			
Moderate fat	86,529.87	1041.54	-0.39191 <sup>NS</sup> (0.9847)	1		
Fat	92,815.31	1011.67	4.215946 <sup>***</sup> (0.0005)	6.909104 <sup>***</sup> (0.0001)	1	
Very fat	101,228.34	1216.15	8.313028 <sup>***</sup> (0.0001)	11.53946 <sup>***</sup> (0.0001)	8.312634 <sup>***</sup> (0.0001)	1

Figures in parentheses represent probability levels, \*\*\*Implies  $p < 0.001$ , NS: Not significant, Currency exchange rate as of July 2020, 1.00 USD = 387.00 NGN, 1.00 USD = 583.00 FCFA, 1.00 NGN = 1.45 FCFA, 1.00 NGN = 113.00 IRR, NGN: Nigerian Naira, FCFA: West African CFA franc and IRR: Iranian Rial

fat (₦101,228.34) animals were confirmed by Table 5. Also, the prices of moderate fat were ₦86,529.87 and significantly lower than the price of fat cattle and very fat animals. Similarly, the price of fat cattle was significantly lower than the price of very fat animals. This is not surprising as the body condition especially the weight of the animals is a key factor that influences the price of cattle.

The implication of cattle price on market location and sex could be attributed to the weight and excellent body condition of the bull which in turn attract a high price. Also, the proximity of the market location influences the price of cattle because less transportation costs will be obtained by the producers.

Both quantitative and qualitative variables influenced cattle prices such as market location, age, weight, seasons of sale, buyer and body condition, as highlighted below:

- Age of the animal had a significant influence on price, implying that as the age of the animal increases, the price also increases, other things being equal
- Weight of cattle is an important factor that influences price and this is expected because the increase in weight might attract a good price
- Similarly, seasons of sale (late, dry and early rainy seasons) may be attributed to demand and supply which varies within the seasons of the year and affects the prices
- Premium paid by buyer categories had a significant influence on price. This could be probably due to the reasons for buying the animals (demand), which include marketing, consumption and fattening purposes that affect the price
- Body conditions of the animal (lean, moderate fat and very fat), could be connected to the reason for buying the animal which might be for consumption, breeding, or fattening purposes which in turn influence price

The application of this study is mainly manifested in the provision of market information that updates producers and buyers on the market situation, especially as relates to the pricing of the animals, for them to make sound decisions on disposing or purchasing the animals, as the case may be. Producers should be encouraged to use good breeding management practices on the quantitative and qualitative factors that influence cattle prices.

Due to financial and time constraints, the study is limited to only two selected border markets even though there are other border markets along the boundaries of the two countries. Conducting a study on cattle trade which involves interviewing traders at busy hours of the day is a difficult task, as sometimes the trader's attention is not on what you are asking them for. Most traders do not keep records, hence, everything is based on how best they could remember their transactions in the market, thus, may not give exact answers to some of the questions asked. Despite those challenges, however, the researcher used available resources and trained enumerators to carry out the research work successfully.

## CONCLUSION

The study examined factors influencing cattle prices. A sample of 1,046 bulls and 371 cows from the two market locations were selected. The average prices of cattle were ₦94,115.20 and ₦89,677.43 at Maigatari and Dungass, respectively. It can be noted that the price of cattle in Maigatari (terminal) was significantly

( $p < 0.01$ ) higher than the price at Dungass (supplying) market. Similarly, the price of a bull (₦95,002.70) was significantly ( $p < 0.001$ ) higher than the price of a cow (₦88,789.90) in the study area. Both quantitative and qualitative factors had a significant influence on price whereby the variables jointly account for about 93% of the variation in cattle price. Furthermore, there was a positive relationship between price and seasons of sales, type of buyers and body conditions of the animal. Thus, the study recommends proper breeding and management practices on the quantitative and qualitative factors influencing cattle prices. Also, the provision of market information, that updates producers with buyers' requirements and seasons of the sale in order to get rewarding prices for their animals in the study area, is imperative.

### **SIGNIFICANCE STATEMENT**

Cattle production and marketing play a key role in the Nigerian economy as well as the source of livelihood for local breeders, wholesalers, retailers, transport owners, drivers, transport commission agents, loaders, butchers, etc. The result reveals that sex, weight and market supply had positive coefficients and significant ( $p < 0.001$ ) influence on cattle price. Also, seasons of sale and types of buyers had positive coefficients and significant ( $p < 0.001$ ) influence on market price. The value of  $R^2$  (0.933) implies that the variables jointly account for about 93% of the variation in the cattle price. Quantitative and qualitative factors influencing cattle prices will be useful to potential producers, buyers, researchers and policy-makers.

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