Research Article

Determinants of Livestock Grading and Market Value for Export and Local Consumption in Bosaso, Somalia

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Abstract

Background: Livestock grading is a crucial determinant of market value and export suitability, yet limited information exists on the key factors influencing grading systems in Somalia.

Objective: This study aimed to assess the major factors affecting the grading of livestock intended for export and local consumption in Bosaso City, Somalia.

Methods: A cross-sectional study was conducted in March and April 2021 on 150 animals, including camels, cattle, goats, and sheep. Data on sex, age, body condition, and conformation were collected and analyzed using the Chi-square test to determine associations with market price.

Results: Of the total animals examined, males represented 79.3% and females 20.7%. Based on age, 28.7% were young (<3 years), 52.0% adult (3-6 years), and 19.3% old (>6 years). The Chi-square test revealed significant associations between price and age (p = 0.032), body condition (p < 0.001), and body conformation (p < 0.001). Animals with good to excellent body condition and conformation achieved higher market prices, reflecting their desirability for export.

Conclusion: Body condition emerged as the most influential factor in livestock grading and valuation, followed by body conformation and age. The study underscores the need for improved feeding, management, and breeding practices to enhance the export quality and market competitiveness of Somali livestock.

Keywords: Livestock Grading; Body Condition; Animal Conformation; Export Market; Bosaso; Somalia

Introduction

Livestock production is a fundamental pillar of Somalia's economy, contributing over 60% of national export earnings and supporting the livelihoods of the majority of rural households [20]. The country exports millions of live animals annually—mainly camels, cattle, sheep, and goats—to Gulf countries, particularly Saudi Arabia, Oman, and the United Arab Emirates [11]. Recent projections indicate that livestock export revenues could exceed one billion US dollars by 2025, demonstrating the sector's growing regional and international importance [4].

Livestock grading plays a critical role in determining market value, facilitating trade, and ensuring compliance with the quality requirements of importing countries [13]. Grading systems allow buyers to differentiate animals based on measurable quality attributes, improving price transparency and market efficiency [14]. However, in Somalia, livestock grading practices remain largely informal and unstandardized, relying on subjective visual assessment rather than harmonized national criteria [11]. This lack of consistency contributes to price variability, weak market coordination, and reduced competitiveness in export markets [9].

Previous research from pastoral systems in the Horn of Africa indicates that physical characteristics—such as age, sex, body condition score (BCS), and body conformation—are major determinants of livestock pricing [19]. Among these factors, body condition has been consistently identified as the strongest predictor of market price because it reflects nutritional status, health, and potential carcass yield [7]. Similarly, body conformation provides a visual indicator of structural soundness and muscularity, attributes that strongly influence buyer preference, especially in export chains [12].

Age is also a significant contributor to price variation, with adult animals (3-6 years) typically valued higher because they offer optimal meat quality and live weight, while younger and older animals receive lower prices due to suboptimal growth or declining productivity, respectively [13]. Thus, understanding how age interacts with other physical traits is essential for improving valuation practices in markets such as Bosaso.

Bosaso City, located in Puntland State, is one of the largest livestock export terminals in Somalia, serving as a major gateway for live animal shipments to Middle Eastern markets [9]. Despite its commercial significance, relatively few empirical studies have examined the factors that influence grading outcomes and price formation in this context [19]. Addressing this gap is essential for designing evidence-based grading frameworks that strengthen market performance and enhance the competitiveness of Somali livestock in international markets.

Therefore, this study investigates the key physical factors influencing livestock grading and pricing in Bosaso. It specifically examines the associations between market price and age, body condition, and body conformation. By identifying the traits that exert the greatest influence on valuation, the findings aim to provide scientific evidence that can support the development of standardized grading systems, improve market.

Objectives of the study
General objective
To evaluate the factors influencing the grading of livestock for export and local slaughter in Bosaso City, Somalia.

Specific objectives
- To identify the factors that affect the grading of livestock.
- To determine the primary factors influencing livestock export suitability.
- To assess stakeholders' awareness of the livestock grading system and its criteria.
- To examine the relationship between livestock market prices and grading factors.

Materials and Methods
Study area
The study was conducted in Bosaso, Puntland, Somalia, a rapidly growing city located in the northeast along the Gulf of Aden. Bosaso is a major commercial hub, hosting active seaports and the largest livestock market in the region. The climate is predominantly warm and dry throughout the year. Summer temperatures can reach up to 40°C during the day and drop to approximately 25°C at night, while the remaining months are cooler, with average daytime temperatures of 27°C and nighttime temperatures of 18°C. Rainfall is limited and occurs mainly in November and December.

Study design
A cross-sectional study was conducted in March and April 2021 to investigate factors influencing livestock grading for export and

local slaughter in Bosaso, the administrative capital of the Bari region. The study included three sites: two national animal quarantine stations and the Bosaso livestock market. Simple random sampling was applied, following authorization from the market authorities, quarantine administrators, and livestock owners.

Sample size and sampling procedure

A total of 150 animals were sampled, with 50 animals from each study site: Bosaso livestock market, Bosaso National Animal Quarantine, and Saudi-Emirate National Quarantine. Animals were properly restrained during data collection. Age was estimated through dental examination based on the appearance and wear of teeth. Sex was determined via visual inspection of the perineum and ventral region, identifying the vulva in females and the scrotal sac in males. Breed identification was based on physical characteristics, while body condition and conformation were assessed visually.

Data collection

Data were gathered using a structured questionnaire administered to livestock traders, owners, and administrators at quarantine stations and the livestock market. The questionnaire focused on factors affecting livestock grading for export and local slaughter, including animal characteristics, management practices, and awareness of grading criteria.

Data analysis

Data were analyzed using SPSS version 20. Descriptive statistics, including means and frequencies, were used to assess participants' awareness of livestock grading systems and associated factors such as age, sex, species, body condition, and conformation. The Chi-square test was applied to evaluate associations between grading factors and animal prices, while correlation analysis was used to examine relationships between these variables. Results were presented in tables, bar charts, and pie charts.

Results

Frequency distribution of grading factors (sex, age, body condition, body conformation, species) is shown in the following tables.

Sex of animals

The results of this study showed that the data were collected from 150 animals. The total number of males was 119 (79.3%) from all animals, while the total number of females was 31 (20.7%). The Chi-square test showed that there is no significant association between the price of the animal and the sex of the animal (p-value = .05), (0.092 >0.05), as you can see in these tables. · Pearson Chi-Square is significant (p = 0.016) → there is some association between sex and price.
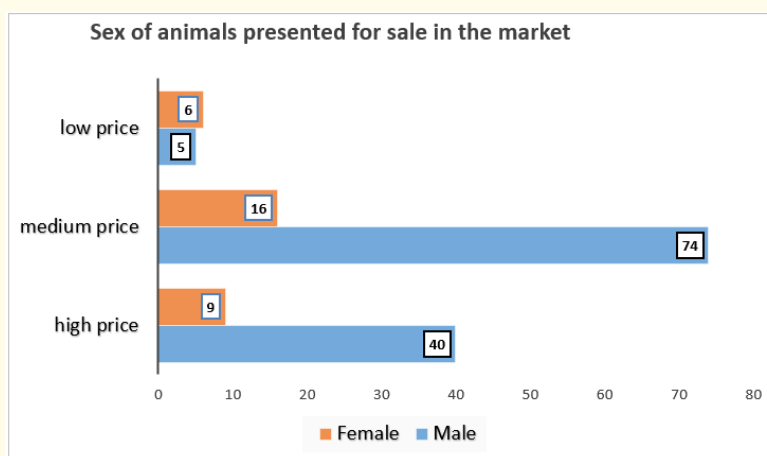

Figure 1: Sex of Animals Presented for Sale in the Market.

Table 1: Relationship Between Animal Gender and Sale Prices.

Price		High price	Medium price	Low price	Total	Sign
Sex	Male	40	74	5	119	0.035
	Female	9	16	6	31	
	Total	49	90	11	150	

The above bar chart displays the sex distribution of animals for sale by price category. In the low-price group, there are 6 females and 5 males. The medium-price category has 16 females and 74 males, while the high-price category shows 9 females and 40 males. Overall, males are more prevalent, particularly in the medium price range.

Age of animals

One hundred fifty animals of various ages were collected for the data in this study. The result shows that animals less than 3 years (young) were 43(28.7%), while the adult (3-6 years) were 78 (52 %), and old animals (>6) were 29 (19.3).
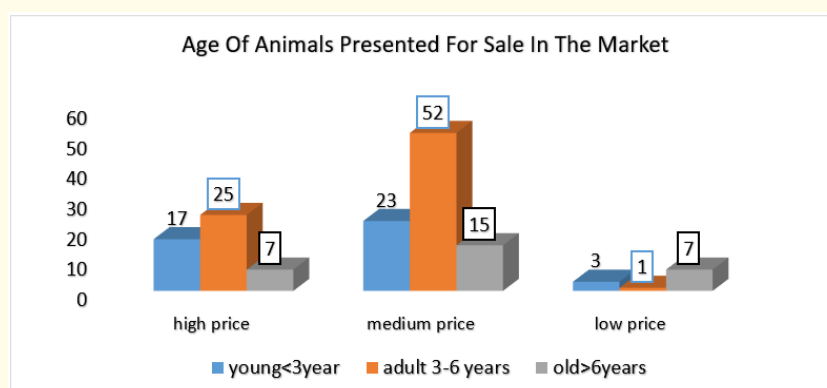
The chi-square test showed that there is a statistically significant association between the price of animal and age of animal (p-value = 0.05), (0.032< 0.05) (table).

Table 2: Age Distribution of Market Animals: Chi-Square Analysis.

		Price			Total	Sign.
		High price	Medium price	Low price		
Age	Young <3 year	17	23	3	43	0.002
	Adult 3-6 years	25	52	1	78	
	Old > 6 years	7	15	7	29	
Total			49	90	11	150	

The bar chart in Figure 2 shows the age distribution of animals for sale by price category. In the high-price group, there are 17 young and 7 adult animals. The medium-price category has 52 adults, 25 young, and 3 older animals. The low-price category features only 3 young and 1 adult animal, indicating that younger and adult animals are more prevalent, especially at medium prices.

Figure 2: Age of Animals Presented for Sale in the Market.

Body condition

The result showed that thin animals were 7 (4.7 %), while the medium were 118 (78.7%) animals, and the fat were 25 (16.7%).

The chi-square test showed that there is a highly statistically significant association between the price of an animal and the body condition of the animal (p-value =0.05), (0.000< 0.05) (table).

Table 3: Chi-Square Analysis of Body Condition and Pricing.

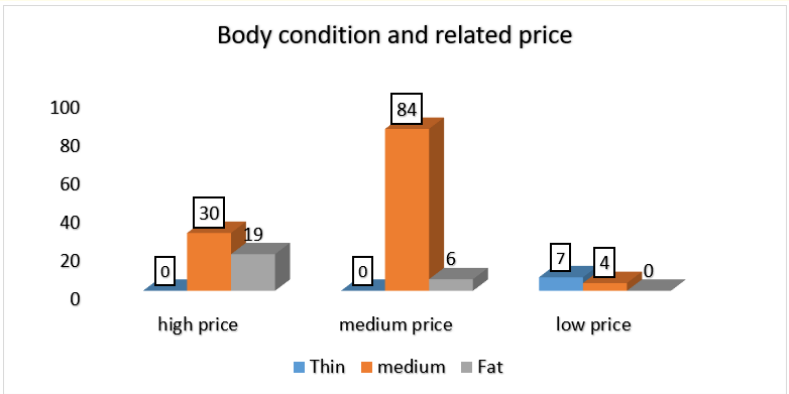|		Price			Total	Sign.
		High price	**Medium price**	**Low price**		
Body conditions	Thin	0	0	7	7	0.000
	medium	30	84	4	118	
	Fat	19	6	0	25	
Total		49	90	11	150	

Figure 3: Body condition and related price.

The above bar graph shows that Animals with medium body condition dominate all price categories, especially in the medium price group (84). Fat animals are mostly in the high price group (19), while thin animals appear only in the low-price group (7). No fat animals are sold at a low price, and no thin animals at a high or medium price.

Body conformation

As for body conformation, 72 (48%) animals were excellent, 69 (46 %) animals were good, and 9 (6%) animals were fair according to their body conformation (table 4), with a high statistically significant association between the price of the animal and body conformation of the animal (p < 0.000.

The above bar graph shows that animals with excellent body conformation are mostly found in the high and medium price categories (43 and 29, respectively), while those with good conformation dominate the medium price range (61). Animals with fair body conformation are very few and appear only in low and high price categories. Overall, excellent and good body types are linked with higher prices, while low-priced animals are mostly of good or excellent conformation but in smaller numbers.

Table 4: Chi-Square Analysis of Animal Body Conformation in Market Sales.

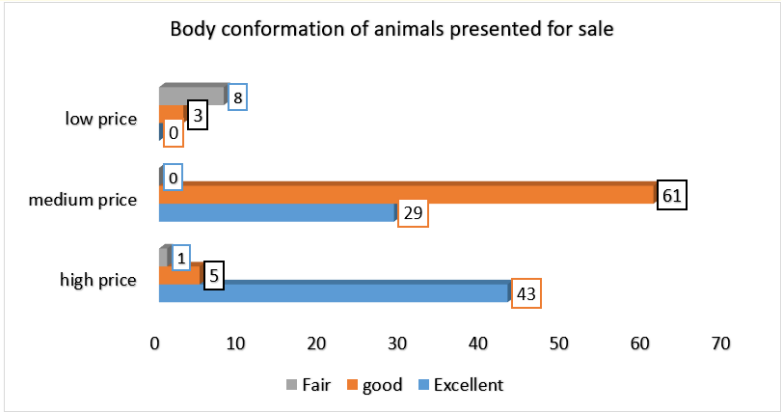|		Price			Total	Sign.
		High price	Medium price	Low price		
bdcf	Excellent	43	29	0	72	
	Good	5	61	3	69	
	Fair	1	0	8	9	
Total		49	90	11	150	0.000

Figure 4: Body conformation of animals presented for sale.

Species

The result showed that 47 (31.3) of the animals were goats, while 55 (36.7) were sheep, 26 (17.3) were camels, and 22 (14.7) animals were cattle (Table 5). There was no significant association between the price of the animal and the species of the animal.

The bar graph in Figure 5 shows that sheep and goats are the most common in the market, mainly in the medium price range.

Sheep lead with 30 medium-priced, followed by goats with 27. Camels and cattle are fewer, with cattle having no low-priced entries. Overall, medium-priced animals dominate, while low-priced ones are the least available.

Correlation test tables showing the relationship between the grading factors and the prices of the animals.

Table 5: Chi-Square Analysis of Species and Market Prices.

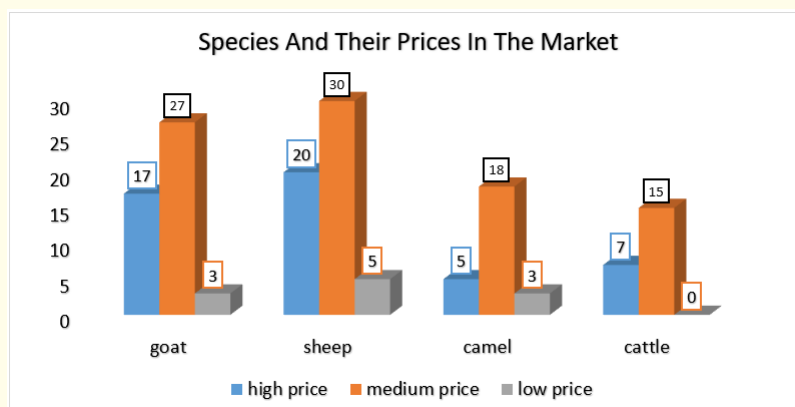|		Price			Total	Sign.
		High price	Medium price	Low price		
Spp	Goat	17	27	3	47	
	Sheep	20	30	5	55	
	Camel	5	18	3	26	
	Cattle	7	15	0	22	0.54
Total		49	90	11	150	

Figure 5: Species And Their Prices In The Market.

There is a significant positive correlation between the price of the animal and its body conformation (.649), meaning that if the body conformation of an animal increases, the price.

And also, there is a positive and significant correlation between the price of animals and their body condition (553), meaning that if the body condition of an animal increases, the price might increase.

Discussion

This study aimed to assess factors that affect the grading of livestock intended for export and local consumption.

In the Bosaso livestock market, four main traits are considered when grading the livestock are sex, age, body condition, and conformation.

The traits ranked in relative order of importance were: 1. body condition; 2. conformation; 3. age; 4. sex.

The most important factor that affects the grading system of small ruminants and camels is the body condition, depending on the season, and this is important because it significantly influences the grade.

In this study, there was a positive correlation between the price of the animal and body condition, meaning that if the body condition of the animal increases, the price might increase. Also, there was a positive correlation between the price of the animal and body conformation, meaning that if the body conformation of the animal increases, the price might increase.

These findings are evident because the dry season was associated with reduced feed, perhaps watering frequency, and as a result, most animals lose body condition, which is naturally associated with degradation and lowered price. This list of traits is not entirely new, as a number of them have been mentioned in several past studies. For example, (18) reported sex, age, body condition, estimated weight, and breed as some of the key traits influencing the purchase of livestock in local markets in Kajiado district of Kenya. (1) detailed the importance of age and estimated weight as important traits in the marketing of shoats in Nigeria. However, some studies (e.g., 19; 17) that focused on livestock production within African pastoral systems have laid emphasis on adaptive traits like resistance to diseases and the ability to walk long distances.

The significance of categorizing small ruminants and camels to aid in price determination was another finding from this study, which involved livestock producers, brokers, and dealers. It makes the market flawless and makes it easier for customers to compare prices because of the grades that have been defined.

The major livestock market in Puntland is Bosaso, which is a catchment region. It sells a variety of animals, including small ruminants like goats and sheep. Sales based on grade are made for a variety of purposes, including export and domestic breeding, among others.

The term body condition refers to the fleshiness of an animal and is one way of assuring the quality of meat. Several body conditions scoring approaches exist, depending on the production system in question **(8).** As expected, the categories (levels) of body condition scores in use in classifying export livestock in Somalia varied from one species to another: Those in cattle included excellent, good, and fair; whereas in sheep and goats, these were: fat, normal, and thin. In camels, only two levels: excellent and good were used. The brokers reported that the body condition scores were not static throughout the year, but showed variations from one season to another (i.e., dry and wet). The average score was reported to be higher during the wet periods, probably due to abundant pasture and water. As a result, what was considered excellent in the dry season may correspond to a good during the wet season, but fetched prices similar to excellent in the wet season. These shifts in boundaries while allocating quality scores were first reported by Erdman (1950), who observed that the principal idea behind assigning quality was to maximize return to sellers. The body score was assigned through visual appraisal of specific body parts. The extent to which specific skeletal body parts (like hips, hooks and pins, rump, shoulders, back (spinous processes of the thoracic vertebrae), ribs, etc. were either hidden or smoothed (by in conformation, conformation was described to entail the symmetry, size, and shape of the various body regions. Confirmation entails the visual features used in the selection of an animal for specific uses.

(2) noted that the indicators of conformation include the frame size, muscle and body structure, predisposition to waste, feet and leg structure, and adherence to breed character. Regarding the body structure, the neck of the animal should be moderately long, the loin and rump should be long, of the traders also take grade. The method used - a series of discussions and workshops with market actors - was the first application of this approach in Somalia, to the authors' knowledge. The grading system used in Somalia is defined in terms of traits that are easy to measure, sex, age, body condition, and conformation.

Three levels of conformation encompassing all the identified features were noted to include: 1. Excellent: Animal of good height (tall), with a large frame and long and straight rump, loin and back, large heart girth and straight legs. 2. Good: Animals of medium height (not as tall as the one with excellent conformation), with medium frame, shorter but straight rump, loin, and back, medium heart girth, and straight legs. 3. Fair: Animals showing some problems/defects such as being very short and small frame, a small heart girth in relation to the overall body size; features on the skeletal size such as lordosis or kyphosis, or feet and legs such as being post-legged, buck-kneed, splay-footed, sickle-hocked, etc.

Conclusion and Recommendation

This study concluded that body condition is the most important trait in the grading of livestock, while body conformation and age are also main effects on the grading of livestock export and those for local slaughter.

It is recommended that the mechanism of the grading system be improved to identify high-quality animals and their prices.

The Body condition and confirmation of the animal must be improved during dry seasons by giving supplemented feed and water.

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