ANALYSIS OF SHEEP CHARACTERISTICS INFLUENCING SELLING PRICE IN DAMBAM LIVESTOCK MARKET OF BAUCHI STATE, NIGERIA

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ABSTRACT

The study evaluated the influence of sheep characteristics on selling price in Dambam livestock market of Bauchi State, Nigeria. Multi-stage sampling technique was used to select 810 sheep traders. Data were collected using structured questionnaire for 37 weeks and analyzed using descriptive statistics, Gini coefficient and general linear model. The result reveals that all sheep traders were males (100%). The findings also revealed a Gini coefficient of 0.20, exhibiting oligopolistic market structures. The result of general linear model reveals coefficient of multiple determination (R^2) value of 0.78, implying that 78% variations in selling price of sheep were explained by the independent variables included in the model. The findings also reveals that size and body condition of sheep significantly influence ($p < 0.001$) selling price in the study area. The selling price of large size animal (₦36,985.82) was significantly higher than that of medium size animal (₦25, 297.04) and small sized animal (₦17,773.84). The study concludes that the selling price of very fat animal (₦27,043.06) attracts highest price among all categories in the study area. The selling price of Yankasa breed commanded higher price (₦ 30, 311.33) among the different breeds. While Uda, Balami and West African Dwarf breeds attracted ₦26,614.54 , ₦26, 531.10 and ₦26,475.12, respectively. The study recommends the need to introduce standardized unit of measurement and educate farmers on how to improve those attributes in the study area to enable them to obtain better price for their livestock and empower them to adopt modern management practices.

Keywords: Animal, Characteristics, Measurement, Price, Selling, Standardize.

INTRODUCTION

It is generally hypothesized that products have attributes that confer utility and that the values of those attributes contribute to the price of the product. Therefore, a composite of the implicit prices of the product's attributes is reflected in the observed price of a product. An implicit price of a product in a competitive market will be a function of the product attributes alone. This implies that only products are differentiated, while their markets, buyers and sellers are not (Lapar *et al.,* 2003). However, in most empirical studies, price has been found to be related to the product attributes as well as attributes of the buyers and sellers, implying some non-competitiveness in the market (Jabbar and Diedhoudu, 2003). Prices of small ruminants are determined by many attributes/factors. Many of these attributes/factors influence prices of small ruminants. These factors include animal attributes (sex, age, breed, coat color, body size, and body condition and tail type for sheep). Terfa *et al.* (2013) have employed hedonic pricing model to value traits of indigenous sheep. The empirical results indicate that phenotypic traits of traded indigenous sheep (age, breed, color, body size, and tail condition) are major determinants of price implying the importance of trait preferences in determining the price of sheep in local markets. Other factors affecting sheep prices were attributes of buyers and sellers, such as gender, marital status, educational background, occupation and source of capital to serve as proxies for bargaining power.

The size and age of sheep normally related to their productivity. Larger sized animals usually produce more meat than smaller animals. The size of an animal should be considered in relation to its age allowing for evaluation of growth performance used as a component in deciding which animals to buy, sell, cull or mate. A study conducted by Gezahegn *et al*. (2006) indicated that age was significantly and negatively influenced price of sheep. That is, price per animal increased with age but declined for older or over mature animals. Similar study by Samuel and Salako (2008) indicated that age influenced sheep price negatively implying sheep command a higher price up to a very old age and the price will fall down as age goes up in central Ethiopia.

Small sized sheep in the observed market was considered as base category or reference variable to compare with medium and big sized sheep. According to Terfa *et al.* (2013), body size was another trait of sheep that significantly affected price of sheep. Intuitively, sheep with a large body size receive higher prices and hence sheep with a large body size were found to fetch about 15.8% higher price premium compared with small sized sheep. Therefore, it is hypothesized that body size is expected to have positive effect on sheep prices. Good body condition sheep in observed market was considered as base category or reference variable to compare with average and poor body condition sheep. A study by Maikasuwa and Jabo (2014) estimated coefficients of body condition and all had positive sign in the linear regression analysis. Gezahegn *et al.* (2006), indicated that, there is significant price penalty as body condition became poorer compared to the good condition. According to Tekelwold *et al.* (2009) buyers paid significantly higher premium for sheep with excellent body condition. An increase in body score added to an estimated cost of animal. Similar Tesfaye (2008) also reported that sheep marketed with good body condition command 15.66% higher prices than those which are poor (base level) and 7% higher than those with average body condition. Therefore, it is hypothesized that body conditioned is expected to have positive or negative effect on sheep prices.

It is important to understand the market structure because it helps in building a profitable business (Mubi *et al.,* 2013). Sheep producers and sellers seek to establish a preference for their products by differentiating those products in ways which are meaningful to consumers. Jabbar (1995) reported that live weight, sex and physical conditions are the most important criteria used by buyer and seller in bargaining and arriving at the price of an animal. Similarly, Juma (2008) observed that price of sheep at market level was affected by size, body score, weight, sex, age and breed. There is a need to improve marketing of sheep to make it commercially more viable and market oriented. In order to plan better marketing of sheep, studies are essential to provide vital information on the operations and efficiency of the sheep marketing system. Therefore, the present study was designed to evaluate the sheep characteristics influencing selling price in Dambam livestock market, Bauchi State, Nigeria. The research was aimed at answering the following questions: what are the socio-economic characteristics of sheep traders in the study area? What are influences of animal characteristics on the price of sheep in the study area?

The broad objective of this paper is to analyze sheep characteristics influence on selling price of sheep, based on the physically observable characteristics. Such characteristics include breed, size of the animal and body condition of the animal. The specific objectives were to: Describe the socio-economic characteristics of sheep traders in the study area; describe the sheep marketing structure and concentration of sheep traders; and examine the influence of animal characteristics on selling price of sheep.

The hypotheses of the study were as follows: H_0: There is no significant difference in the mean selling price of sheep breeds in the area; H_0: There is no significant difference in the

mean selling prices of sheep of different sizes; and H_0: There is no significant difference in the mean selling prices of sheep body conditions.

MATERIALS AND METHODS

The Study Area

The study covers Dambam Local Government Area of Bauchi State. The area is located in the Northern guinea Savannah between Latitude 8^0 42' to 10^0 30' North and Longitude 11^0 45' to 11^0 50' East of the Equator and of the Greenwich Meridian. Most of the inhabitants of Dambam L.G.A are predominantly farmers and traders with established market for livestock in each district (Dambam, Dagauda and Jalam) the predominant small ruminants are goats (breeds includes Sokoto red, Sahel and West African Dwaft) and sheep (breeds include Uda, Yankasa and Balami) with few other breeds are also found. Rearing of small ruminants, crop production and marketing form the major economic activities in the study.

Sampling Technique and Sample Size

The sampling technique adopted was multi-stage, consisting of purposive sampling and random sampling technique. In the first stage, Dambam Local Government area was purposively selected due to the fact that sheep marketing is one of the major economic activities in the study area. In the second stage, random sampling technique was employed to select 810 sheep traders. According to Allen *et al*. (2002), the use of probability methods such as random sampling to derive the final sampling units improves the precision of the estimates, ensures representativeness, and permits hypothesis testing.

Method of Data Collection

Data were obtained for the period of 37 weeks using a semi-structured questionnaire. Interview was conducted in local language for individuals who could not read or understand English language. The method involved observation, inspection and asking the sheep traders verbal questions regarding price and animal characteristics that determined selling price of the animal such as age, breed, and body condition. Live weight of animal was measured in Kilogram and obtained using weigh scale. The live weight was the difference between the initial weight of the enumerator and the weight of the animal. The study classified sheep based on their sizes into small, medium and large, each category weighing approximately <30kg, 30 – 50kg and >50kg respectively. This classification was adopted from Mohammed *et al.* (2013) whose classified cattle based on their sizes into small, medium and large, each category weighing approximately <350kg, 350 – 480kg and >480kg, respectively, in Gombe metropolis. Data for body condition scoring in sheep was an estimate of the muscle and fat cover of animal by palpation of different regions of the body. The method adopted for this study was originally described by Khan *et al.* (2006) in small ruminant, consisting of a scale of six scores; from 0 to 5, body condition was determined by visual assessment to identify any physical deformity. It is done by feel with hand thoracic, hind leg, hump parts and tail of the animal to assess the fat content which indicates the state of health and nutrition of the animal as well as quantity of meat and fat deposited. Breeds were identify based on phenotypic characters (type of horn, ears, tail, size of face and coat color).

Analytical Techniques

There are many analytical techniques available for use in research of this nature, and the choice of a particular one depends on the type of data collected in order to achieve the specified objectives. These include; descriptive statistics were used to give description of the target population (Lucey, 2002). The major tools used were frequency and percentage. Also, Gini-coefficient was adopted to describe the structure and concentration of sheep traders using the formula,

G.C=1-∑XY   … (1)
where;
G.C = Gini Coefficient; X = Percentage of traders;   Y = Cumulative percentage of sales.

The general linear model based on multiple linear regression analysis was adopted to examine the animal characteristics (live weight, age of animal, body size, body condition and breed) determining selling price of sheep in the study area. Williams *et al.* (2003) used multiple linear regression models to analyze the determinants (live weight, age of animal, body size, body condition and breed) of selling price of sheep and goat.

$Y = a + D_1X_1 + D_2X_2 + D_3X_3 + D_4X_4 + D_5X_5 + D_6X_6 + e$ …(2)
where;
Y = Selling price of Sheep (₦)
a = Constant
X_1 = Sex (0=Male, 1= Female.
X_2 = Body condition (1 = Very lean, 2 = Lean, 3= Moderate, 4 = Fat and 5 = Very fat)
X_3 = Breed (1 = Uda, 2 = Yankasa, 3 = Balami and 4 = West Africa Dwaft)
X_4 = Breed* Body condition
X_5 = Sex*Body condition
X_6 = Breed *Size

RESULTS AND DISCUSSION
Socio-Economic Characteristics of Sheep Traders

Sex is a term used to classify human beings into male and female biologically. According to Karshi (2010), sex is sensitive to certain occupation. The result in Table 1 shows that male (100%) dominated sheep marketing in Dambam market, even though gender is not a barrier to participants. This agrees with the findings of Bose (2008) who reported that male (100%) dominated cattle marketing in Akko Local Government Area of Gombe State, Nigeria. Marital status distribution is very important as it helps to have an idea of a marketing participant's devotion to the marketing process and the likely outcome of this on his /her business activities. The result in Table 1 shows that most (88.40%) of the sheep traders were married. while 11.60% were single. Meaning that marketing of sheep in the study area was dominated by married men. This agrees with findings of Abu *et al.* (2012) and Makama *et al.* (2011) who found that 95% and 85% of people engaged in agricultural marketing activities in Nasarawa State and Jigawa State, Nigeria were married men.

Education background improves the ability of traders to make accurate marketing decisions (Ibrahim and Aliero, 2012). It is expected that higher levels of educational attainment by a market stakeholder, may lead to a better understanding of the market dynamics and thus better profit from use of sound business principles and wise business decisions. The results reveal that sheep traders with non-formal education had the highest proportion (39.38%), primary education (29.01%), secondary education (13.58%) and tertiary education had the lowest proportion (2.35%). Sheep traders that never attended any school constituted 15.68% indicate the status of traders in sustaining their livelihood (Maikasuwa and Jabo, 2014). The results show that 52.10% of the traders had trading as their major occupation, 27.16% were farmers, 5.93% were civil servants and 11.48% were hunters. While only 3.33% of the traders engaged in other type of occupation. This finding agrees with that of Salau and Attah (2012) who reported that most of the marketing activities were carried out on part time basis by people engaged in other occupations. Their involvement in different types of occupation was to augment household income. Capital availability and accessibility tend to have great influence in the marketing process. Table 1 shows the result shows that, 38.27% of the traders got their

capital through personal savings. Furthermore, 21.48%, and 24.20% got their capital from friends and relatives, respectively, while 10.0% and 6.05% got their capital through money lender and commercial banks, respectively. Meaning that, informal sources of capital form the major source of acquiring capital in the study area.

Table 1: Socio-economic Characteristics of Sheep Traders

Variables	Frequency	Percentage
Sex		
Male	810	100
Marital status		
Single	94	11.60
Married	716	88.40
Education background		
Never attended any school	127	15.68
Non formal education	319	39.38
Primary school	235	29.01
Secondary school	110	13.58
Tertiary institution	19	2.35
Occupation		
Farming	220	27.16
Trading	422	52.10
Hunting	93	11.48
Civil servant	48	5.93
Others	27	3.33
Source of capital		
Personal savings	310	38.27
Friends	174	21.48
Relatives	196	24.20
Money lender	81	10.00
Bank loan	49	6.05
Total	**810**	**100**

Table 2 presents the results of the sheep marketing structure and concentration of sheep traders in the study area. Market structure consists of the characteristics of the organization of a market which seems to influence strategically the nature of competition and pricing within the market. In the study area, majority of the sheep traders used both open display and persuasive methods to draw the attention of customers (Olukosi *et al.,* 2005). A Gini-coefficient of 0.20 shows inequality in size distribution and traders concentration which is a reflection of inefficiency of the sheep market structure. Thus, the non-competitive structure implies a poor market performance. The concentration ratios show that Dambam market exhibit oligopolistic market structures, for only a few handle the bulk of the trade. This also in line with the findings of Mu'azu (2005) who reported low concentration (0.21) of sheep markets in Zamfara State and described the market structure as oligopolistic in nature. Therefore, it is very difficult to rule out collusive tendencies in the three markets, which further reflect imperfection among traders. The result disagrees with findings of Adeleke and Afolabi (2012) who reported a Gini – coefficient value of 0.53 for fresh fish market in Ondo State, Nigeria, which shows high level of concentration and consequently high inefficiency in the Ondo State fish market structure.

Similarly, Ismail *et al*. (2014) in their findings indicated that value of Gini coefficient greater than 0.35 is high, indicating inequitable distribution of sales income/sales among marketers. However, the difference in Gini coefficient between markets could have stemmed from differences in their access to ownership and control of physical marketing facilities, trading experience, fund availability and differences in market behavior and conducts.

Table 2: Distribution of Sheep Traders by Weekly Sales in Dambam Market

Sales range (₦)	Number of traders (freq.)	% of traders (x)	Cum.% Traders	Total value of weekly sales (₦)	% of total sales	Cum.% of sales (y)	∑Xy
50,000-100,000	564	69.63	69.63	4,587,612.31	58.81	58.81	0.041
100,001-150,000	138	17.04	86.67	2002,500.73	25.67	84.49	0.144
150,001-200,000	65	8.02	94.69	854,750.41	10.96	95.45	0.008
200,001-250,000	43	5.31	100	355,233.32	4.55	100.00	0.005
Total	810	100		7,800,096.77	100		0.198

The independent variables included in the model are breed, size, and body condition. The results in Table 3 reveals that coefficient of multiple determination (R^2) had a value of 0.78, implying that 78% variations in selling price of sheep were explained by the independent variables included in the model. The corrected model (F = 583.238) was statistically significant at ($p < 0.001$). The individual independent variables indicates that size and body condition have significant influence ($p < 0.001$) on selling price of sheep in the study area. Furthermore, the analysis also shows interaction between size and body condition significantly influence selling price of sheep ($p < 0.05$).

Table 3: Determinant of Sheep Selling Price in the Study Area

Sources	Df	F-statistic	P-value
Corrected model	34	583.238	0.001***
Intercept	1	6649.139	0.001***
Breed	3	0.872	0.455
Size	2	1619.252	0.000***
Body condition	4	118.561	0.001***
Breed*Body condition	12	0.994	0.451
Size*Body condition	7	71.822	0.045*
Breed *Size	6	1.247	0.279
Error	5635		
Total	5670		
Corrected total	5669		
R^2	0.779		

Note: ***Significant at $p \leq 0.001$ *Significant at $p \leq 0.05$

Table 4 shows effect of factors, e.g., breed, size and body condition that determined sheep selling in the study area. The four commonly identified breeds of sheep in the study area are Yankasa, Balami, Uda, and West African Dwarf. The observed effect of breed on selling price of sheep is presented on Table 4. The result shows that there was significant ($p \leq 0.05$) difference in the selling price of different breeds of sheep found in the study area. The Yankasa breed commanded highest price (₦ 30, 311.33) among the different breeds, while Uda, Balami

and West African Dwarf breeds attracted ₦26,614.54, ₦26,531.10 and ₦26,475.12, respectively. Furthermore, there was significant difference (p < 0.001) in selling price of Yankasa compared to Uda Balamiand West African Dwarf counterparts. This probably may arise because of the meat quality and taste of Yankasa breed as confirmed by butchers. Another reason is that Yankasa was the most common breed of sheep reared in the study area. In addition, Uda, Balami, and West African Dwarf placed in the markets by traders lack sufficient feeding.

The Table 4 further presents the effect of size on selling price of sheep. The result revealed that differences in size of animal significantly (P < 0.05) influence the selling price of sheep in the study area. The selling price of large size animal (₦36,985.82) was significantly higher than that of medium size animal (₦25, 297.04). The small sized animal attracted ₦17,773.84. Thus, the difference in selling price of large size animal compared to medium size animal and small size animal were statistically significant at (P < 0.001). It can thus, be concluded that larger sheep command higher selling price compared to the other categories in the study area. The effect of body condition on selling price of sheep was also disclosed in Table 4. Body condition scoring in sheep is an estimate of the muscle and fat cover of animal by palpation of different regions of the body. Table 4 also shows the effect of body condition on selling price of sheep.

Table 4: Effect of Breed, Size and Body Condition on Selling Price of Sheep

Variables	Frequency	Mean(₦ per head)*
Breed:		
W/African Dwarf	23	26,475.12[a]
Balami	320	26,531.06[a]
Uda	144	26,614.54[a]
Yankasa	483	30,311.33[b]
Size:		
Small	191	17,773.83[a]
Medium	290	25,297.04[b]
Large	489	36,985.82[c]
Body condition:		
Very lean	289	25,206.30[a]
Lean	54	25,818.52[b]
Moderate	112	26,397.43[b]
Fat	164	26,963.10[c]
Very fat	351	27043.06[c]

 *Means with the same letter are not statistically different at (p < 0.05).

The result reveals that body condition significantly (P < 0.05) influenced selling price of sheep in the study area. The selling price of very fat animal (₦27,043.06) attracts highest price among all categories, while selling price of fat, moderate, lean and very lean animals attracted ₦26,963.10, ₦26,397.43, ₦25, 818.52 and ₦25,206.30, respectively. Furthermore, the result shows that there were significant (P < 0.001) differences in the selling price of very fat animal when compared to their moderate, lean and very lean counterpart. The variation in the price of sheep in the study area may be as a result of assessment carried out by buyers in terms of quantity of fat deposit found in very fat animal when compared with moderate, lean and very lean.

CONCLUSION AND RECOMMENDATIONS

Considering the findings of this study, the result shows animal characteristics such as age of animal, live weight; size of animal, body condition, as well as number sold significantly influenced the selling price of sheep in the study area. Based on the findings, the following recommendations were made: (i) Since animal characteristics such as age, live weight, body condition and body size significantly influence price of sheep in the study area, there is need to educate farmers on how to improve those attributes which will enable them to obtain better price for their livestock and adopt modern management practices. (ii) Sheep traders should introduce standardized unit of measurement (sell on weight basis), this will help both the buyer and seller to be free from risk of over or under pricing due to lack of information and or experience.

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