MORPHOMETRIC STUDY OF SELECTED CATTLE BREEDS IN ZING LOCAL GOVERNMENT AREA OF TARABA STATE, NIGERIA.

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ABSTRACT

The research was conducted to characterize the White Fulani), Adamawa Gudali and the Red Bororo cattle. Three locations in Zing Local government area which were Bubong, Kwana and Zing town were selected for this study. Measurement of mature animals were on body weight and Body linear characteristics. Preliminary data assess level of education, management and herd structure. In Bubong and Kwana, feeding was basically on grazing (100%), while Zing town gave supplements (100%). Herd characteristics showed that bulls were 17.11%, cows 55.26%, heifers 14.47% and calves 13.16% in Bubong respectively. In Kwana, bull, cow, heifer and calf characteristics were 10, 53.75, 25and 11.25% respectively. Zing town has 60.71%, 37.50%, 0% and 1.79% for bulls, cows, heifers and Calves respectively. Body weights were 353.06±26.14, 383.91±25.22 and 471.46±23.09kg in Bubong, Kwana and Zing town respectively, which varied significantly (P<0.001) by location. Body length 153.32±7.53, 168.60±7.02 and 169.45±6.65cm in Bubong, Kwana and Zing town varied significant (P<0. 001). Chest length, girth, width and depth varied significantly (P<0. 001) by location. However, hump length, (P<0.001), width (P<0.05), tail length (P<0.01), canon bone circumference (P<0.05), udder circumference (P<0.01) and udder teat length (P<0.05) varied significantly by location. Breed effects revealed that White Fulani weighs 407.97±24.68kg, Adamawa Gudali, 394.43±25.14kg and the Red Bororo 406.04±24.49kg respectively, which were significant (P<0.05). Chest depth (86.91±2.77cm) in White Fulani, (84.46±2.82cm), Adamawa Gudali, (88.63±2.74cm) Red Bororo varied significantly (P<0.05) by breed. Hump length were significant (P<0.05), mouth circumference (P<0.05), face width (P<0.05), face length (P<0.05) and udder length (P<0.01) were also significant by breed. Sex effects showed that body weight for male was 402.81±23.64 kg and female 380.70±68.10 kg. Head width for male was 39.08±1.37 and female was 35.30±1.51. There were significant differences in all parameters measured (P<0.001) by sex. Most correlation were positive and significant at 1% (P<0.01). A few were at 5% (P<0.05). That majority of males kept and grazed cattle is an indication that the production system are basically a male occupation. The high percentage of cows showed that production is cultural rather than commercial. The differences in body weight in favour of Zing town which managed cattle intensively showed that ranching could lead to optimum productivity. The positive correlations observed are an indication that selection for body weight alone can improve other body parameters and this could hasten selection.

Keywords: Cattle breed, Morphometric, Body measurements, Body weight, Correlation

INTRODUCTION

Cattle are of special importance because they supply about 50 and 95% of the world meat and milk. Hides from cattle produce 80% of the materials used for shoes and other products in the leather industry (Okeh and Uguru, 2014). In Africa and indeed Nigeria there are different breeds which represent a rich source of genetic diversity that has not been well studied and exploited. These breeds include the Adamawa Gudali, White Fulani and Red Bororo cattle breeds of Nigeria. These animals differ physically and Genetically in a population. This differences are reflected in morphology, physiology and behavioural attributes between individuals, breeds and populations (Frankham*et. al*., 2002).

Phenotypic observations /characterizations and biometric measurements is currently the basis for genetic studies which involves description and measurements of gross morphology but sometimes including anatomy, physiology and productivity (Pesmen and Yardimen, 2008). In view of the importance of phenotypic characterization, the food and Agricultural Organisation of the United Nation (FAO, 2012) suggested that the physical attributes included in the observations and measurements must be suitably defined, uniform and universal. This would enable comparisons within and among breeds across the globe. Classification of animals was based on history and anthropological evidences (Mwacharo*et. al*., 2006) before the advent of genetic studies.

Conflicts between herders and farmers are on the increase leading to several deaths of cattle breeds and

loss of vital genetic information needed for the improvement of the cattle industry, there is a need to study and document these breeds for further genetic assessment.The white Fulani cattle represents 37% of the national herd. Pastoralists generally agree that, they are superior to all other breeds of Zebu in resisting diseases with the ability to thrive under a variety of conditions. The main limiting factors of this tropical breed of cattle include late sexual maturity, long interval between calving and short lactation length. The White Fulani cattle are, however, important for their genetic predisposition of hardiness, heat tolerance and adaptation to local conditions (Alphonsus et. al., 2012). The Red Bororo is the third most numerous breed of cattle in Nigeria, representing 22% of the national herd. Fulani pastoralists consider the Red Bororo an extremely prestigious breed. The Adamawa Gudali represents 2% of the national herd (Blench, 1993). The Adamawa Gudali, White Fulani and Red Bororo cattle are well known for their good meat and milk attributes and therefore be studied for productivity and other attributes

Characterization of these cattle breed would therefore provide information that would be useful in decision making on the development of breeding programmes for these breeds of cattle and their effective utilization. It would also enable the design of suitable management for the breeds. Furthermore, characterization would provide inventory for researchers and cattle owners to key in to the data bases and help improve their breeds.

MATERIALS AND METHODS

Zing Local Government Area of Taraba State is located in the North-Eastern part of Nigeria. The local government has an area of 1,030km^2 and a population of around 127,363 people as of 2006 Census. The Local Government has two distinct climates, the dry season (November-March) and the rainy season (April-October) with an average rainfall of 819 - 1761mm per annum. The local government is found on latitude 8^0 59'42.72 north and longitude 11^0 44'48.08) East. Sunshine duration is about 11.5 – 12.5-day length (hour). Vegetation cover is categorized into two zones, highlands mountain range and lowlands. The highlands occupy the southern region stretching from west to south in chains of mountain with elevation ranging from an average of 1,800 – 2,400 meters high forming the Atlantica, Shebshi and Adamawa massifs ranges. The lowland which occupies about 60% of the region hosts most of the settlements in the region. The relative humidity of the area is 26 - 30% and Temperature range of 28^0C – 37.5^0C. The major food crops cultivated in the area include yam, sorghum, Bambara nut, groundnut, millet and rice.

Animal used for the study

The animals that were used in this study were the White Fulani, Red Bororo and the Adamawa Gudali cattle kept and grazed freely by herdsmen in Zing Local Government area of Taraba State. Only matured productive ages of both sexes were assessed.

a. White Fulani (Bunaji)

b. Red Bororo (Rahaji)

c. Adamawa Gudali

Plate I: Cattle breeds used for the study

Sampling Procedure

Prior to commencement of the research, a reconnaissance survey of the study area was conducted. Multistage sampling was adopted in the study. The first stage involved the selection of three locations (Bubong, Kwana and Zing town) based on their suitability for cattle production, market and willingness of the people to participate.

The second stage was selection of households in each of the location. Third stage was identification and measurement of the mature animals. Preliminary data looked at the ownership of cattle, level of education, marital status, herd structure and size

Data collection

Data were collected on linear body measurements which were taken using measuring tape while actual live weight was measured using ruminant animal's weighing tape in kilogram. Body weight and linear body measurements were assessed from One Hundred and Ninety-three cattle each from Bubong, Kwana and Zing town respectively.

Cattle biometry

Measurements were carried out on the following parameters:

Body weight, Body length, forehead length, ear length, horn length, horn diameter, neck length, chest length, heart girth, wither height, hump diameter, thigh length, scrotal circumference, scrotal length, udder diameter, udder length, udder teat length and tail length as described below:

i. Body weight (BW) – Measured in the field by using a weight measuring tape and measuring the chest circumference of the animal behind the hump of the elbow – joint. After measuring the circumference in centimetre, the life weight is measured directly on the reverse side of the measuring tape.
ii. Head width (HW) -- measured as the distance from the right ear to the left.
iii. Head length (HL) - measured as the distance from the head to the mouth
iv. Body length (BL) – measured as the distance from the tail (first coccygeal) to the external occipital protuberance.
v. Body width (BW)- measured as where the stomach has extended at both sides.
vi. Body depth (BD) - measured from the spinal cord to the line of stomach at sternum.
vii. Facial length (FL) – measured as the longest portion of the fore head.
viii. Facial width (FW) - measured from the left to the right portion of the eyes.
ix. Horn length (HL) – measured as the longest portion of the horn.
x. Ear length (EL) – measured as the longest portion of the ear.
xi. Dewlap width (DW) – measured as the half length of the dewlap.
xii. Chest length (CL) measured as the distance from the coriniform cartilage of the sternum to the xiphoid cartilage of the sternum.
xiii. Chest Girth – measured as the circumference across the heart region
xiv. Chest width (CW) - measured from left to the right side of the brisket.
xv. Chest depth (CD) - measured from the cuneiform cartilage to xiphoid cartilage
xvi. Sternum height (SH) - measured as the distance from sternum to the ground that is from spinal cord to the ground at sternum.
xvii. Height at Withers (HAW) measured as the distance from the surface of the platform to the ground that is from the spiral cord to the ground.
xviii. Rump height (RH) - measured as the distance from spinal cord to the ground that is as the point of Rump.
xix. Rump length (RL) - measured as the distance from the head of the femur to the hock.
xx. Rump width (RW) - measured from left to the right of the hip bone.
xxi. Hump length (HuL) – measured as the longest portion of the hump.
xxii. Hump with (HW) – measured from left to the right of the hump

xxiii. Mouth circumference (MC) – Taken as the overall diameter of the mouth.
xxiv. Cannon bone circumference (CBC) – Taken as the overall diameter of the cannon bone.
xxv. Scrotal Circumference – taken as the overall diameter of the scrotum
xxvi. Scrotal length – Taken from the base of scrotal attachment to the longest distant portion.
xxvii. Udder length (UL) – Taken as the distance along the line that divides the udder into two craino – caudally.
xxviii. Udder diameter (UD) – Measured as the total circumference of the udder.
xxix. Udder teat length (UTL) – Measured as the longest portion of the teat
xxx. Tail length (TL) – measured as the longest distance of the tail.

Plate II: Linear body measurement

Statistical analysis

Data were classified into different categories, percentage calculated and linear measurements were subjected to analysis of variance observed as follows:

$$\mathbf{Y_{ijk} = \mu + Sb_i + Ssj + Sl_k + e_{ijk}}$$

Where:
Y_{ijk} = an observation on variables
μ = overall population mean
Sb_i = effect of breed
Ssj = effect of sex
Sl_k = effect of location
$\mathbf{e}_{ijk}$ = residual error

Significantly different means in a subset were separated using Ryan Einot Gabriel Welsch F- Test in Statistical package for Social Sciences SPSS Version 24 (2012). Person's Correlation co – efficient was computed to test the relationship between body measurements. Breed differences by sex for most parameters measured were similar, hence data were pooled across location and analysed for body measurement by sex.

RESULTS AND DISCUSSION

Table 1 showed the Socio -economic characteristics of farmers in the study area.Males 92%, 79.3% and 100% were actively involved in cattle management in Bubong. Kwana and Zing town, respectively. The majority of males who kept and grazed cattle in the study area is an indication that the production system are basically a male dominated occupation, this finding agrees with report of Bayola and Intong (2006), that women rarely participate in livestock production.

Most farmers do not have formal education in the study area, Bubong, Kwana and Zing town have 100%, 80%, and 0.0% without formal education. This finding disagrees with the work of Saleh (2018) who reported a high percentage value in favour of level of education in dairy cattle farmers but agrees with the observation of Dauda et al (2018**)** who opined that substantial population of cattle farmers had no formal education and further stated that lack of education may likely not enhance the awareness and adoption of new technologies needed to improve cattle production. Agwu and Anyanwu (1996) established that educational status of farmers had direct influence on farmers' perception and adoption of improved technologies.

Marital status showed that 91.20%, 46. 31%, and 98% were married in Bubong, Kwana and Zing town, respectively. Married people are in greater proportion in cattle business than those who are single, this may be due to the affluence attached to keeping large population of cattle as it was observed that men who kept more cattle are prone to marrying more wives and raising more children to continue the business of cattle herding. This observation agrees with the findings of Olorunnisomo et al (2010) and Dauda et al (2018) which revealed that greater percentage of farmers that engaged in cattle production are married.

Table 2 revealed major management practices in the study area. Bubong and Kwana manage their cattle extensively (100%), while Zing town kept their cattle

intensively (100%). In Bubong and Kwana, feeding was basically on grazing (100%) while Zing town gave supplements (100%). Source of drinking water revealed that cattle grazed in Bubong and Kwana access pond (100%) as source of drinking water while Zing town provides borehole (100%) as watering sources. Housing, feeding and watering was poor except in Zing town where housing was intensive. This may have been the reason why the performance was better for body weight in Zing town as management was intensive.

Table 1: Characteristics of farmers in the study area (%)

	Sex		Education		Occupation			Marital Status	
Location	Male	Female	Formal	Informal	Farming	Farming/herding	Herding	Married	Singles
Bubong	92	8	0.00	100	44	50	6	91.20	8.80
Kwana	79.30	20.70	20	80	0.00	12	88	46.31	53.69
Zing town	100	0.00	100	0.00	33	38	29	98	2

Table 2: Livestock management in the study area

	Housing			Feeding		Watering Source		
Location	Semi-int.	Intensive	Extensive	Supplement	Grazing	Borehole	Stream	Ponds
Bubong	0.00	0.00	100	0.00	100	0.00	0.00	100
Kwana	0.00	0.00	100	0.00	100	0.00	0.00	100
Zing	0.00	100	0.00	100	0.00	100	0.00	0.00

Herd characteristics by locations are presented in table 3. Bulls were 17.11%, cows 55.26%, heifers 14.47% and calves 13.16% in Bubong respectively. In Kwana, bulls, cows, heifers and calves' characteristics were 10, 53.75, 25 and 11.25% respectively, while Zing town has 60.71%, 37.50%, 0% and 1.79% for bulls, cows, heifer and Calves respectively. The high percentage of cows in the three locations showed that herders are interested in keeping greater number of cows which was more of a tradition to increase their cattle herd rather than commercial venture.

Table 3: Herd characteristics by location (%)

	Location		
Parameter	Bubong	Kwana	Zing Town
BULL	17.11	10.00	60.71
COW	55.26	53.75	37.50
HEIFER	14.47	25.00	0.00
CALF	13.6	11.25	1.79

Results of body measurements of cattle by location are presented in table 4. Results revealed that body weights were 353.06±26.14, 383.91±25.22 and 471.46±23.09kg in Bubong, Kwana and Zing town respectively, which varied significantly ($P<0.001$) by location. Head width and head length were not significant. Body lengths 153.32±7.53, 168.60±7.02 and 169.45±6.65cm in Bubong, Kwana and Zing town which varied significantly ($P<0.001$). Chest length, chest girth, chest width and chest depth varied significantly ($P<0.001$) by location. Sternum height, height at wither, rump height, rump length, rump width did not vary by location. However, Hump length, ($P<0.001$), hump width ($P<0.05$), tail length ($P<0.01$), canon bone circumference ($P<0.05$), udder circumference ($P<0.01$) and udder teat length ($P<0.05$) varied significantly by location.

Results for body measurements by breed are presented in table 5. White Fulani body weight were 407.97±24.68kg, Adamawa Gudali, 394.43±25.14kg and the Red Bororo 406.04±24.49kg respectively, which were significantly ($P<0.05$) different. Chest depth was 86.91±2.77cm in White Fulani, 84.46±2.82cm in Adamawa Gudali and 88.63±2.74cm in Red Bororo and varied significantly ($P<0.05$) by breed. Hump length ($P<0.05$), mouth circumference ($P<0.05$), face width ($P<0.05$), face length ($P<0.05$) and udder length ($P<0.01$) were also significant by breed. However, all other parameters measured (table 5) were not significant. The differences in body measurement which was higher in Zing town where management was intensive is an indication that cattle ranching could be of great benefit as the cattle did better in body weight than those on grazing hence, herders should be encouraged to ranch their cattle for optimum productivity.

The significant differences in udder length and udder teat length (table 5) which favours the Red Bororo is an indication that the Red Bororo can be studied for milk characteristics which may aid milk improvement, other reports (De Haas *et al.,* 2007) showed a positive correlation in teat length with milk yield as teat and udder measurements significantly affect milk yield (Tilki *et al.,2005).*

Table 4: Body measurements of cattle by Location (cm)

	Location			
Parameter	Bubong	Kwana	Zing Town	LS
Body weight (kg)	353.06±26.14^{c}	383.91±25.22^{b}	471.46±23.09^{a}	***
Head width	34.68±1.67	35.39±1.62	35.84±1.48	NS
Head length	55.91±2.72	53.51±2.63	55.28±2.41	NS
Body length	153.32±7.53^{b}	168.60±7.02^{a}	169.45±6.65^{a}	***
Body width	112.17±7.28^{b}	121.65±7.02^{a}	125.63±6.43^{a}	**
Body depth	96.91±4.76^{b}	99.45±4.60^{ab}	102.44±4.2^{a}	*
Chest length	30.58±1.26^{c}	32.57±1.22^{b}	35.57±1.11^{a}	***
Chest girth	159.78±4.97^{b}	163.28±4.80^{b}	171.44±4.39^{a}	***
Chest width	33.12±1.93^{b}	33.23±1.86^{b}	38.25±1.70^{a}	***
Chest depth	84.25±2.93^{b}	83.51±2.83^{b}	92.25±2.59^{a}	***
Sternum height	128.38±4.97	126.03±4.80	128.48±4.39	NS
Height at wither	121.60±5.61	123.16±5.42	123.70±4.96	NS
Rump height	129.47±3.95	129.96±3.81	132.30±3.49	NS
Rump length	43.39±1.40	43.61±1.35	43.41±1.24	NS
Rump width	44.73±3.78	44.46±3.65	41.54±3.34	NS
Hump length	19.14±1.57^{c}	21.52±1.51^{b}	24.99±1.38^{a}	***
Hump width	12.25±1.45^{b}	12.23±1.40^{b}	13.73±1.28^{a}	*
Horn length	47.44±4.41^{b}	43.69±4.25^{b}	53.38±3.89^{a}	***
Ear length	24.68±0.87^{b}	26.01±0.84^{a}	25.11±0.77^{b}	*
Dewlap width	23.28±2.86	24.77±2.76	23.38±2.52	NS
Tail length	106.28±7.07^{b}	113.37±6.82^{a}	112.47±6.24^{a}	**
Mouth circumference	52.35±2.13	52.57±2.05	52.72±1.88	NS
Canon bone circumference	17.39±0.75 ^{b}	17.53±0.72 ^{b}	18.04±0.66 ^{a}	*
Face width	23.81±0.64^{a}	23.57±0.61^{ab}	23.79±0.56^{b}	NS
Face length	52.53±3.22	51.90±3.11	51.10±2.85	NS
Udder length	22.28±2.11	19.85±2.03	21.07±1.86	NS
Udder circumference	23.81±1.25^{b}	25.79±1.20^{a}	25.84±1.10^{a}	**
Udder teat length	5.75±0.90^{a}	5.59±0.87^{a}	4.53±0.80^{b}	*

Note: LS = Level of Significant, NS = Not Significant, *= (P<0.05), **= (P<0.01), ***= (P<0.001). Means in row with different superscripts are significantly different.

Table 5: Body measurement of cattle by breed (cm)

	Breed			
Parameters	White Fulani	Adamawa Gudali	Red Bororo	LS
Body weight(kg)	407.97±24.68[a]	394.43±25.14[b]	406.04±24.49[a]	*
Head width	34.94±1.58	35.41±1.61	35.56±1.57	NS
Head length	54.47±2.57	54.22±2.62	56.00±2.55	NS
Body length	162.34±7.11	163.80±7.24	165.23±7.05	NS
Body width	118.23±6.87[b]	117.56±7.00[ab]	123.66±6.82[a]	NS
Body depth	99.32±4.50	97.78±4.58	101.69±4.46	NS
Chest length	33.12±1.19	32.70±1.21	32.90±1.18	NS
Chest girth	164.51±4.69	163.71±4.78	166.28±4.66	NS
Chest width	34.99±1.82	34.71±1.86	34.90±1.81	NS
Chest depth	86.91±2.77[a]	84.46±2.82[b]	88.63±2.74[a]	*
Sternum height	126.29±4.70	127.18±4.78	129.42±4.66	NS
Height at wither	120.93±5.30	122.27±5.40	125.26±5.26	NS
Rump height	129.55±3.73	130.10±3.80	132.08±3.70	NS
Rump length	42.90±1.32	43.62±1.35	43.89±1.31	NS
Rump width	43.16±3.57	42.03±3.64	45.52±3.54	NS
Hump length	21.96±1.48[b]	21.22±1.51[b]	22.47±1.47[a]	*
Hump width	12.65±1.37	12.84±1.39	12.72±1.36	NS
Horn length	47.40±4.16	49.81±4.24	47.30±4.13	NS
Ear length	25.42±0.82	25.04±0.84	25.33±0.82	NS
Dewlap width	24.19±2.70	22.64±2.75	24.60±2.68	NS
Tail length	108.64±6.67	108.96±6.79	114.52±6.62	NS
Mouth circumference	51.50±2.01[b]	51.96±2.05[b]	54.19±1.99[a]	*
Canon bone circumference	17.53±0.71	17.52±0.72	17.92±0.70	NS
Face width	23.62±0.60[b]	24.08±0.61[a]	23.47±0.60[b]	*
Face length	50.36±3.04[b]	50.44±3.10[b]	54.73±3.02[a]	*
Udder length	20.63±1.99[b]	19.34±2.03[b]	23.23±1.98[a]	**
Udder circumference	24.64±1.18	25.07±1.20	25.73±1.17	NS
Udder teat length	4.80±0.85[b]	4.89±0.87[b]	6.18±0.85[a]	**

Note: LS = Level of Significant, NS = Not Significant, *= ($p<0.05$), **= ($p<0.01$), ***= ($P<0.001$). Means in row with different superscripts are significantly different.

Body measurement by sex are presented in table 6. Result showed that body weight for male were 402.81±23.64kg and 380.70±68.10female. Head width for male were 39.08±1.37cm and female were 35.30±1.51cm. All the parameters measured indicates that they were significant difference ($P<0.001$) in sex.males were basically heavier than the female in most body parameters, this may have arisen due to hormonal activities which confers superiority to male in most body measurements than female. This observation disagrees with the report of Ige*et al* (2015) which gave Mean values of body measurement in favour of female cattle, but agrees with Seifemichael et al (2014) who opined that the influence of sex on body weight and some morphometric traits indicate the usual difference between sexes due to hormonal actions leading to differential growth rates.

Table 6: Body measurement of cattle by sex (cm)

	Sex		
Parameters	Male	Female	LS
Body weight(kg)	402.81±23.64[a]	380.70±68.10[b]	***
Head width	39.08±1.37[a]	35.30±1.51[b]	***
Head length	54.90±2.46[a]	58.03±1.87[b]	***
Body length	173.33±10.87[a]	163.79±6.81[b]	***
Body width	119.82±6.58[a]	107.48±5.90[b]	***
Body depth	106.13±6.45[a]	99.60±4.31[b]	***
Chest length	33.99±1.66[a]	32.91±1.14[b]	***
Chest girth	164.83±4.49[a]	155.84±15.88[b]	***
Chest width	34.87±1.75[a]	33.45±2.47[b]	***
Chest depth	86.67±2.65[a]	80.33±6.54[b]	***
Sternum height	127.63±4.50[a]	117.84±9.65[b]	***
Height at wither	122.82±5.08[a]	119.88±6.20[b]	***
Rump height	130.58±3.57[a]	121.23±7.65[b]	***
Rump length	49.49±2.29[a]	43.47±1.27[b]	***
Rump width	43.57±3.42[a]	36.09±2.50[b]	***
Hump length	31.31±6.96[a]	21.88±1.42[b]	***
Hump width	14.56±2.77[a]	12.74±1.31[b]	***
Horn length	40.44±7.48[b]	48.17±3.99[a]	***
Ear length	23.90±2.10[b]	25.26±0.79[a]	***
Dewlap width	23.81±2.58[a]	22.61±2.87[b]	***
Tail length	104.18±5.34[b]	110.71±6.39[a]	***
Mouth circumference	52.55±1.92[a]	40.03±1.84[b]	***
Canon bone circumference	17.65±0.68[a]	16.33±1.62[b]	***
Face width	26.96±1.80[a]	23.72±0.58[b]	***
Face length	47.11±1.29[b]	51.84±2.92[a]	***
Scrotal circumference	21.34±2.44		***
Scrotal length	18.81±2.81		***
Udder length		21.07±1.91	***
Udder circumference		25.15±1.13	***
Udder teat length		5.29±0.82	***

Note: LS = Level of Significant, NS = Not Significant, *= (P<0.05), **= (P<0.01), ***= (P<0.001). Means in row with different superscripts are significantly different.

Table 7a and b showed the correlation among body measurements. Correlation coefficients between body measurement revealed that almost all correlation values were positive and significant at 1% (P<0.01), A few were at 5% (P<0.05) while others are not significant.

Table7a Some correlations of the body measurements of indigenous breeds of cattle

	BW	HW	HL	BL	BW	BD	CL	CG	CW	CD	SH	HAW	RH	RL	RW
BW	1	0.297**	0.046	0.482**	0.589**	0.630**	0.667**	0.451**	0.621**	0.805**	0.193*	0.253**	0.240**	0.393**	0.011
HW		1	0.030	0.213*	0.117	0.001	0.219**	-0.007	0.082	0.225**	-0.200*	-0.071	-0.072	0.199*	0.166
HL			1	-0.015	0.004	0.106	0.040	0.029	0.029	-0.003	-0.001	0.065	-0.018	0.107	-0.028
BL				1	0.253**	0.358**	0.367**	0.377**	0.247**	0.475**	0.136	0.235**	0.500**	0.326**	0.345**
BW					1	0.441**	0.496**	0.330**	0.473**	0.512**	0.214*	0.261**	0.149	0.223**	0.205*
BD						1	0.539**	0.405**	0.594**	0.565**	0.279**	0.350**	0.214*	0.445**	0.147
CL							1	0.400**	0.689**	0.573**	0.123	0.227**	0.147	0.436**	0.218**
CG								1	0.426**	0.538**	0.357**	0.337**	0.274**	0.247**	0.175*
DW									1	0.609**	0.212*	0.189*	0.158	0.452**	0.108
CD										1	0.358**	0.336**	0.452**	0.431**	0.409**
SH											1	0.512**	0.457**	0.352**	0.000
HAW												1	0.345**	0.320**	0.510**
RH													1	0.159	0.109
RL														1	0.265**
RW															1

Note: *= (P<0.05), **= (P<0.01). Body weight (BW), Head width (HW), Head length (HL), Body length (BL), Body width (BW), Body depth (BD), Facial length (FL), Facial width (FW), Horn length (HL), Ear length (EL), Dewlap width (DW), Chest length (CL), Chest Girth (CG), Chest width (CW), Chest depth (CD), Sternum height (SH), Height at Withers (HAW), Rump height (RH), Rump length (RL), Rump width (RW).

Table7B: Some correlation of body measurement of indigenous breeds of cattle

	HUL	HUW	HOL	EL	DW	TL	MC	CBC	FW	SC	SL	FL	UL	UD	UTL
HUL	1	0.634**	-0.415**	-0.491**	0.163	0.098	0.160	0.394**	0.385**	0.091	0.407**	-0.124	0.027	0.301**	-0.226*
HUW		1	-0.187*	-0.362**	0.444**	0.162	0.316	0.509**	0.288**	0.051	0.440	-0.075	0.116	0.137	-0.123
HOL			1	0.403**	0.075	0.040	0.101	-0.122	-0.269**	-0.107	0.147	0.113	0.154	0.224*	0.350**
EL				1	0.110	0.134	-0.067	-0.163	-0.260**	-0.049	-0.239	0.165	-0.081	0.240*	0.119
DW					1	0.204*	0.348**	0.329**	0.017	-0.043	0.305*	0.106	0.204	0.102	-0.179
TL						1	0.234**	0.112	0.068	0.154	0.315*	0.148	0.247*	0.097	0.259*
MC							1	0.448**	0.281**	0.253	0.393**	0.100	0.345**	0.061	-0.200
CBC								1	0.450**	0.324*	0.381**	-0.002	0.128	0.168	0.010
FW									1	0.147	0.017	-0.140	-0.162	0.123	0.010
SC										1	-0.007	-0.007			
SL											1	0.217			
FL												1	0.216*	0.072	0.081
UL													1	0.288**	0.424**
UD														1	0.214*
UTL															1

Note: *= (P<0.05), **= (P<0.01). Hump length (HuL), Hump width (HW), Mouth circumference (MC), Cannon bone circumference (CBC), Scrotal Circumference(SC), Scrotal length(SL), Udder length (UL), Udder diameter (UD), Udder teat length (UTL), Tail length (TL)

Body weight is positive and significantly correlated with head width (0.634; P<0.01), body length (0.482; P<0.01), width (0.589; P<0.01) and depth (0.630; P<0.01); chest girth (0.451; P<0.01), length (0.667; P<0.01) width (0.667; P<0.01) and depth (0.805; P<0.01); rump length (0.393; P<0.01) and height at wither (0.253; P<0.01). Cannon bone circumference is correlated significantly with Scrotal circumference (0.324; P<0.05) and Scrotal length (0.381; P<0.01). Udder length is positive and correlated with Udder diameter (0.288; P<0.01) and Udder teat length (0.424; P<0.01).The positive correlations observed in body weight and other body measurements such as body length, width and depth; Cannon bone circumference with scrotal circumference and length as well as udder length being positively correlated with udder diameter and udder teat length are an indication that selection for body weight alone can improve other body parameters and can be used to hasten selection to improve the animal. This observation agrees with several works Gunawan and Jakaria (2010) who reported closed value of coefficient of correlation in Bali cattle. Maiwashe et al (2002) opined that moderate to high correlations coefficients between growth traits suggest that the two pairs of growth traits are influenced by a similar set of genes and selection of one is likely to increase the other which will result in high genetic gain. Alsiddig et al (2010) equally reported high coefficient of correlation for hearth girth in Sudan zebu cattle. Dim et al (2012) documented a similar high coefficient of correlation for chest girth and body length in their work, this further confirms that these traits have direct relationship with body weight and could be easily improved upon by direct selection as reported by Ige et al (2015).

CONCLUSION AND RECOMMENDATIONS

Conclusion

It can thus be concluded that;

1. The high percentage of cows in the three locations showed that herders are interested in the keeping of cows for replacement stock rather than commercial
2. The difference in body measurements by location which was highest in Zing town showed that cattle kept intensively do better for body weight than those on grazing. This differences observed should encourage herders to ranch their cattle for optimum productivity.
3. The Red Bororo showed a great promise for milk characteristics and should be assessed critically for the traits.
4. The positive correlations observed are an indication that selection for body weight alone can improve other traits.

Recommendations

1. Ranching should be strongly encouraged as cattle kept intensively had better performance than those on extensive management system
2. Deliberate selection for increase body weight and other traits should be carried out to improve on the performance of our indigenous breeds

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