Research Article

Prediction of Live Weight for Brahman Crossbred Cattle Using Linear Body Measurements in Rural Area

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Abstract | The present study was carried out to investigate the relationship between morphometric measurements and weight and to predict live weight of Brahman X Local crossbred cattle using linear body measurements. A total of 100 male and 85 female Brahman X Local crossbred cattle of 6 to 33 months age were used for the study. The study revealed that most of the morphometric measurements were linearly increased with the advances of age. The body weight had highest correlation coefficient with heart girth (HG) around the chest (r=0.95) and lowest with ear length (r=0.70) compared with other body measurements. Grouping of data according to age indicated that correlation coefficients of heart girth with body weight were similar for all age groups. The stepwise regression models indicated that heart girth singly accounted highest variation (91%) in body weight for all animals. Thus, the general equation for prediction of live weight (Y) of Brahman crossbred cattle was Y=4.447HG – 390.2 (±11.3). The regression equations for the live weight were Y=2.554HG – 173.90(±12.3), Y=3.988HG – 336.3(±11.0) and Y=5.854HG – 596.0(±30.0) for equal or less than 12 months, above 12 to 24 months and above 24 months age groups, respectively. Body length (BL) and HG combined together gave the best fitted model for estimating body weight for all animals, which was Y=3.549HG + 1.251BL – 408.85(±11.7). The results suggested that prediction equations based on HG or in combination of HG and body length can be used efficiently to predict live weight of Brahman crossbred cattle in rural condition.

Keywords | Body measurements, Brahman crossbred, Correlations, Heart girth, Regression equations

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INTRODUCTION

Prediction of live body weight using body measurements is practical, faster, easier and cheaper in the rural areas where the resources are insufficient for the breeder (Nsoso et al., 2003). A crossbreeding program between Brahman sire and local zebu cows was undertaken by the Department of Livestock Services in different parts of Bangladesh, due to the increased number of Brahman crossed cattle in rural areas. The smallholder farmers are often being involved in fattening of these crossbred male cattle in recent years. The basic knowledge of body weight estimation of these cattle is often unavailable to farmers due to unavailability of weighing scales, which are costly to purchase and heavy to transport to farmers' house especially in rural areas. Currently, animal keepers, livestock staffs and cattle traders depend on visual assessment to measure live weight. In absence of weighing scales, the main method of determining the weight of animals is to estimate the weight using body measurements those are readily measured. Some studies have been conducted using body linear measurements to estimate the live weight in cattle (Dineur and Thys, 1986; Goe et al., 2001; Mekonnen and Biruk, 2004; Abdelhadi and Babiker, 2009). Among body measurements, heart girth can be used with great accuracy in estimating live weight for all classes of crossbred dairy cattle (Msangi et al., 1999) and for Boran cattle (Nicholson and Sayer, 1987). Usually, body weight is regressed on body measurements to determine a weight-prediction equation (Yakubu, 2010; Kashoma et al., 2011). However, different

prediction models might be needed to predict body weight in different breeds and environmental conditions (Touchberry and Lush, 2007).

Hence, the objectives of this study were to investigate the relationship between morphometric measurements and live weight and to formulate equations for predicting live weight of Brahman X Local crossbred cattle using linear body measurements.

MATERIAL AND METHODS

Animals and Management

Live body weight and morphometric measurements of 100 male and 85 female F_1 Brahman X Local crossbred cattle reared at farmers' houses of 6 Upazilas of 6 different districts (Thakurgaon, Dinajpur, Rajshahi, Bogra, Sirajgong and Jessore) were recorded manually at different ages (6 to 33 month) over a period from the year 2010 to 2014. The age of animal was determined from the birth register maintained at Livestock Offices of respective districts. The animals were living in semi-intensive management system.

Parameters Measured

Live body weight (LBW) and eight morphometric measurements were taken on each animal (Figure 1). The parameters measured were heart girth (HG), body length (BL), hip height (HH), wither height (WH), ear length (EL), tail length (TL), canon length (CL) and canon width (CW). Each measurement taken was recorded in centimeter while the weight was recorded in kilogram.

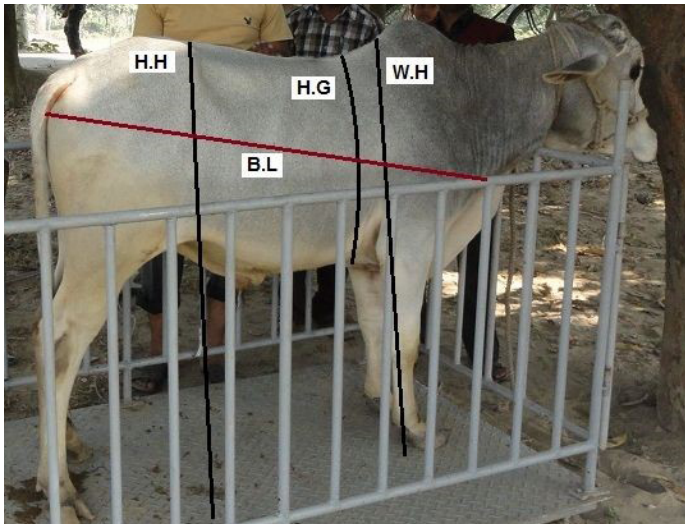

Figure 1: Brahman X Local F_1 crossbred cattle
WH: Wither height; **HG**: Heart girth; **BL**: Body length; **HH**: Hip height

The body weight was taken using a digital platform weighing scale and recorded to the nearest kilogram (kg), and the body measurements were taken using the tailor's tape. The WH and HH measurements were taken using the measuring plastic tape marked in centimeter (cm) and a special measuring stick made with two arms; one (plastic made) which is held vertical and the other (wooden) at right angle to it sliding by hand vertically up and down to record height while the animals were in standing position on four legs with head maintained in an upright position as described by Goe et al. (2001).

Heart girth was measured taking a circumferential measure by the measuring tape around the chest just behind the front legs and withers. Body length was measured as the distance between the point of the shoulder (lateral tuberosity of the humerus) and the pinbone (tuber ishii), which was taken from the left-side of the animal. Care was taken to ensure that the backbone is straight in both vertical and horizontal planes. Hip height was measured as the distance from the surface of a platform on which the animal stands to the mid-sacrum on the dorsal midline. Wither height was measured as the distance from the surface of a platform to the highest point on the withers. Tail length was measured as the distance between the tip of the tail and the base end tail touching the body of the animal. Ear length was measured as the distance between the tip of the ear and the base of the ear. Fore cannon bone length was measured as the length of the lower part of the leg (metacarpus bone) extending from the carpal joint to the fetlock joint. Canon bone width was measured as the circumference of left metacarpus at its narrowest. The measurements of animals were taken by six trained individuals assigned for six districts throughout the study period.

Data Management

In total, 268 sets of HG, BL, HH and WH measurements, 143 TL measurements, 164 EL measurements, 154 CL measurements and 155 CW measurements were considered for descriptive analysis and to calculate correlation coefficient. The data were divided into eight age categories for morphometric analysis; 6-9 months, >9-12 months, >12-15 months, >15-18 months, >18-21 months, >21-24 months, >24-27 months, >27-30 months and >30-33 months age group. Data were also divided into three age groups; equal or less than 12 months (≤12 months), above 12 to 24 months (>12-24 months) and above 24 months (>24 months) to calculate correlation coefficient and coefficient of determination between LBW and linear measurements.

Statistical Analysis

The data obtained were expressed as least squares mean. Collected data were handled in Microsoft Excel whereas statistical analyses were done by using Statistical Analysis System (SAS, 2003). The general linear model (GLM) procedure was used to get descriptive statistics and correlation coefficient between LBW and linear measurements. Stepwise multiple regression analysis was used by includ-

ing HG, BL, HH and WH measurements individually and collectively to identify the best predictor variable for estimating the LBW. The choice of the best fitted regression model was selected using the coefficient of determination (R^2). Each model was assessed using R^2, adjusted R^2 and RMSE (Root mean squares error).

RESULTS

Linear Body Measurements

Overall body weights and morphometric measurements of Brahman crossbred cattle are shown in Table 1. Age had significant influence (p<0.001) on all body measurements. Most of the body measurements did not differ among 6-9 and >9-12 months and among >24-27, >27-30 and >27-30 months age categories.

Pairwise Correlation

Bivariate correlations among LBW and body measurements of Brahman crossbred cattle are shown in Table 2. LBW was highly associated with morphometric traits (r=0.70-0.95; p<0.001). The body weight had highest positive correlation with heart girth (0.95) and lowest with EL (0.70). The relationships of TL, EL, CL and CW with either of LBW, HG, BL, HH and WH were similar. Among the linear type traits, the highest correlation was observed between HH and WH (0.98) while the lowest estimate (0.65) was recorded for EL and CW. HG shows higher correlations with CW (0.82) compared to CL (0.73).

The correlation coefficients between live body weight and

Table 1: Morphometric statistics of body weight and linear body measurements (LS Means±SE) of Brahman crossbred cattle

Parameter	Age (month)									P- value
	6-9 (M=12, F=5)	>9-12 (M=11, F=13)	>12-15 (M=19, F=20)	>15-18 (M=23, F=13)	>18-21 (M=19, F=22)	>21-24 (M=21, F=15)	>24-27 (M=19, F=12)	>27-30 (M=10, F=13)	>30-33 (M=14, F=7)	
Age (month)	7.43 ±0.35 (17)	10.3± 0.14 (24)	13.7± 0.13 (39)	16.5± 0.15 (36)	19.4± 0.13 (41)	22.3± 0.14 (36)	25.4± 0.17 (31)	28.3± 0.15 (23)	31.5± 0.21 (21)	<.0001
Body weight (Kg)	91.8 ±7.63 f (17)	97.5± 5.35 f (24)	128.1± 8.79 ef (39)	164.0± 9.40 de (36)	179.2± 11.0 cd (41)	219.6± 13.1 bc (36)	248.2± 21.5 b (31)	241.2± 18.6 b (23)	303.5± 35.7 a (21)	<.0001
Hip height (cm)	95.5 ±2.30 e (17)	97.2± 1.24 e (24)	103.7± 1.50 d (39)	109.2± 1.45 cd (36)	110.5± 1.74 c (41)	117.1± 2.10 b (36)	119.2± 2.12 ab (31)	120.7± 2.25 ab (23)	123.4± 3.60 a (21)	<.0001
Wither height (cm)	91.3 ±1.97 f (17)	94.1± 1.43 ef (24)	99.7± 1.44 de (39)	105.3± 1.50 cd (36)	106.6± 1.82 c (41)	113.1± 2.06 b (36)	114.4± 2.15 ab (31)	115.7± 2.23 ab (23)	119.9± 3.60 a (21)	<.0001
Body length (cm)	88.3 ±2.62 e (17)	91.8± 1.30 de (24)	97.6± 2.30 d (39)	105.3± 1.95 c (36)	107.5± 2.33 c (41)	115.5± 2.24 b (36)	119.0± 2.60 ab (31)	118.2± 3.04 ab (23)	125.2± 3.35 a (21)	<.0001
Heart girth (cm)	103.8 ±2.68 e (17)	106.4± 2.14 e (24)	115.4± 2.45 d (39)	127.0± 2.52 c (36)	129.5± 2.54 c (41)	138.6± 2.74 b (36)	143.1± 3.41 b (31)	144.2± 3.80 b (23)	154.0± 5.42 a (21)	<.0001
Tail length* (cm)	58.2 ±2.31 d (9)	61.6± 3.22 d (9)	66.1± 3.32 cd (16)	72.1± 1.80 bc (19)	72.7± 2.56 bc (29)	74.6± 1.53 bc (18)	79.7± 1.54 ab (18)	85.6± 3.48 a (13)	86.0± 4.20 a (12)	<.0001
Ear length* (cm)	18.2 ±0.62 e (11)	19.9± 0.71 de (12)	22.0± 0.70 cd (19)	22.8± 0.47 bc (21)	23.3± 0.68 bc (32)	24.1± 0.60 abc (22)	23.3± 0.56 bc (20)	24.9± 0.85 ab (15)	25.8± 1.17 a (12)	<.0001
Canon length* (cm)	18.8 ±0.46 c (12)	19.3± 0.39 c (12)	20.5± 0.52 bc (17)	20.4± 0.36 bc (20)	21.6± 0.59 ab (30)	21.7± 0.48 ab (19)	22.3± 0.55 ab (18)	22.6± 0.72 a (14)	23.2± 1.09 a (12)	<.0001
Canon width* (cm)	11.8 ±0.59 d (12)	11.7± 0.31 d (12)	11.9± 0.34 d (17)	13.0± 0.34 cd (20)	13.5± 0.38 bc (29)	14.3± 0.37 ab (20)	14.9± 0.47 a (18)	15.2± 0.53 a (15)	14.8± 0.37 a (12)	<.0001

M= number of male; **F**= number of female; Least squares means without a common superscript differed significantly (p<0.001); Figures in the parenthesis indicate the number of observation; *some data could not be obtained during body measurements

Table 2: Phenotypic correlations of body weight and morphometric measurements in Brahman crossbred cattle (6-33 month of age)*

Parameters	HH	WH	BL	HG	TL	EL	CL	CW
LBW	0.912	0.913	0.913	0.954	0.878	0.701	0.772	0.770
HH	-	0.981	0.902	0.922	0.860	0.697	0.794	0.782
WH	-	-	0.900	0.920	0.850	0.670	0.811	0.792
BL	-	-	-	0.926	0.877	0.660	0.764	0.790
HG	-	-	-	-	0.884	0.696	0.732	0.822
TL	-	-	-	-	-	0.810	0.761	0.710
EL	-	-	-	-	-	-	0.704	0.646
CL	-	-	-	-	-	-	-	0.706

LBW= Live body weight; **HH**= Hip height; **WH**= Wither height; **BL**= Body length; **HG**= Heart girth; **TL**= Tail length; **EL**= Ear length; **CL**= Canon length; **CW**= Canon width; *Significant at p<0.001 for all correlations

Table 3: Age and sex wise correlation coefficients between live body weight and morphometric measurements of Brahman crossbred cattle

Measurements (cm)	Age group (months)						Sex of animals			
	≤12		>12-24		>24		Male		Female	
	N	CRC	N	CRC	N	CRC	N	CRC	N	CRC
Heart girth	41	0.962***	152	0.967***	75	0.959***	148	0.955***	120	0.973***
Body length	41	0.835***	152	0.923***	75	0.918***	148	0.918***	120	0.929***
Hip height	41	0.811***	152	0.910***	75	0.912***	148	0.922***	120	0.897***
Wither height	41	0.771***	152	0.910***	75	0.922***	148	0.921***	120	0.896***
Tail length	18	0.859***	82	0.822***	43	0.884***	66	0.916***	77	0.828***
Ear length	23	0.429*	94	0.585***	47	0.738***	83	0.754***	81	0.586***
Cannon length	24	0.633***	86	0.651***	44	0.819***	74	0.776***	80	0.743***
Cannon width	24	0.588**	86	0.814***	45	0.586***	74	0.707***	81	0.894***

N= Number of observation; **CRC**= Correlation coefficients; *: p<0.05; **: p<0.01; ***: p<0.001

the linear body measurements according to age group and sex of animals studied are shown in Table 3. The correlation coefficients between live weight and all linear measurements in all age groups and both sexes were significant (p<0.001). The correlation coefficients between body weight and heart girth were neither influenced by age (r=0.96, 0.97 and 0.96, respectively) nor by sex of animals (r=0.96 and 0.97, respectively). These results indicated similar accuracy of heart girth in predicting live weight of cattle in all ages and for both sexes. The correlations between LBW and BL, HH, WH, EL and CL were lower in the animals of ≤12 months age (r=0.84, 0.81, 0.77, 0.43 and 0.63, respectively) compared to those in other age groups whereas correlations between LBW and BL, WH and HH were not affected by sex of animals. Correlation coefficients for TL, EL and CL were higher in male than female cattle whereas reverse result was found for CW.

Regression Analysis

The prediction equations to estimate body weight from linear body measurements using Stepwise Multiple Regression Analysis for Brahman crossbred cattle are summarized in Table 4. The regression models revealed that heart girth singly accounted highest variation in LBW compared to WH, HH and BL in all ages, and these were 93, 94 and 92% in ≤12, >12-24 and >24 months age group. The RMSE in this case was 7.80, 18.7 and 36.3 for three age groups, respectively. The variation due to HG was slightly decreased to 91% for all animals. The model involving heart girth and body length slightly improved the efficiency of the prediction equations (R^2 and RMSE were 0.95 and 6.76, 0.95 and 16.5 and 0.94 and 32.4, respectively in three age groups). A slight or no improvement was obtained from the model involving the combination of HG, BL, HH and WH. However, the best model for estimating LBW was obtained using HG and BL for all animals. This was because both the R^2 (0.92) and adjusted R^2 (0.92) of this model were highest, while the RMSE (30.0) was almost lowest. All prediction models derived from the present study indicate that heart girth around the chest is the most reliable measurement for prediction of live weight and easiest to measure. The regression equation of LBW (y) on HG (x) for live weight of all animals indicated that an increase or a decrease of one cm of heart

Table 4: Regression equations for the prediction of live body weight from linear body measurements of Brahman crossbred cattle

Category	N	LBW range (kg)	HG range (cm)	Equations	R^2	Adj. R^2	RMSE
Age (month) of animals							
≤12	41	53-176	86-131	BW=2.905WH –174.91 (±35.8)	0.595	0.585	18.2
				BW=3.014HH – 195.65 (±33.6)	0.658	0.650	16.7
				BW=2.759BL – 154.2 (±26.4)	0.697	0.690	15.7
				BW=2.554HG – 173.90 (±12.3)	0.926	0.924	7.80
				BW=2.095HG + 0.737BL – 192.15 (±11.7)	0.946	0.943	6.76
				BW=2.098HG + 0.738BL – 0.008HH – 191.93 (±14.1)	0.946	0.941	6.85
				BW=2.075HG + 0.772BL – 0.285HH + 0.301WH – 193.6(±14.4)	0.946	0.941	6.90
>12-24	152	70-485	92-183	BW=5.737WH –436.48 (±23.2)	0.822	0.821	30.9
				BW=5.852HH – 471.76 (±24.1)	0.828	0.827	30.4
				BW=4.496BL – 305.94 (±16.4)	0.853	0.852	28.1
				BW=3.988HG – 336.33 (±11.0)	0.935	0.935	18.7
				BW=2.960HG + 1.346BL – 348.35 (±9.97)	0.949	0.949	16.5
				BW=2.666HG + 1.072BL + 0.875HH – 378.15 (±13.7)	0.952	0.951	16.1
				BW=2.646HG + 1.018BL + 0.131HH + 0.847WH – 377.7(±13.6)	0.953	0.952	16.1
>24	75	119-710	112-212	BW=8.969WH –781.91 (±51.7)	0.850	0.848	49.6
				BW=8.963HH – 821.83 (±57.2)	0.833	0.830	52.4
				BW=7.845BL – 683.66 (±48.1)	0.843	0.841	50.7
				BW=5.854HG – 595.98 (±30.0)	0.919	0.918	36.3
				BW=4.224HG + 2.546BL – 663.87 (±30.8)	0.937	0.935	32.4
				BW=3.191HG + 1.984BL + 2.555HH – 753.7 (±33.3)	0.952	0.950	28.6
				BW=3.196HG + 1.986BL + 2.603HH – 0.058WH – 753.76(±33.6)	0.952	0.949	28.8
Sex of animals							
Male	148	53-710	86-212	BW=7.525WH – 622.45 (±29.3)	0.848	0.847	47.7
				BW=7.487HH – 646.48 (±30.0)	0.849	0.848	47.4
				BW=6.063BL – 467.33 (±24.4)	0.843	0.892	48.4
				BW=4.781HG – 432.78 (±16.7)	0.913	0.912	36.1
				BW=3.796HG + 1.394BL – 455.98 (±17.7)	0.918	0.917	35.0
				BW=3.170HG + 0.921BL + 1.680HH – 511.03 (±24.5)	0.924	0.922	34.0
				BW=3.142HG + 0.877BL + 1.017HH + 0.771WH – 511.90 (±24.6)	0.924	0.922	34.1
Female	120	61-326	87-162	BW=5.402WH –397.22 (±25.5)	0.803	0.802	28.6
				BW=5.273HH – 407.08 (±25.8)	0.804	0.803	28.6
				BW=4.180BL – 274.70 (±16.0)	0.864	0.862	23.9
				BW=3.573HG – 284.22 (±9.72)	0.947	0.947	14.8
				BW=2.666HG + 1.231BL – 299.4 (±8.71)	0.961	0.960	12.8
				BW=2.544HG + 1.149BL+ 0.326HH – 310.80 (±12.8)	0.962	0.961	12.8
				BW=2.490HG + 1.149BL – 0.386HH + 0.834WH – 313.52(±12.3)	0.963	0.961	12.6
All animals	268	53-710	86-212	BW=6.882WH – 550.61 (±20.4)	0.833	0.832	42.1
				BW=6.844HH – 574.23 (±21.1)	0.832	0.832	42.2
				BW=5.493BL – 407.05 (±16.4)	0.834	0.833	42.1
				BW=4.447HG – 390.18 (±11.3)	0.910	0.909	31.0
				BW=3.549HG + 1.251BL – 408.85 (±11.7)	0.916	0.915	30.0
				BW=3.062HG + 0.903BL + 1.285HH – 450.95 (±16.4)	0.920	0.919	29.3
				BW=3.006HG + 0.866BL + 0.298HH + 1.139WH – 452.04(±16.4)	0.921	0.919	29.2

N= Number of observations; **LBW**= Live body weight; **HG**= Heart girth; **BL**= Body length; **HH**= Hip height; **WH**= Wither height; **RMSE**= Root mean squares error

girth around the chest gave an increase or a decrease of 4.45 kg of live weight: Y=4.447HG – 390.18 (±11.3).

The separate equations of three age groups estimated that a one cm change in heart girth would result in weight change of 2.55 to 5.85 kg, which were 3.57 and 4.78 kg for female and male cattle, respectively (Table 4). The regression equation for three age groups provides an accurate estimate of live weight of Brahman crossbred cattle, when heart girth measurements and live weights ranged from 86 to 131 cm and 53 to 176 kg, from 92-183 cm and 70 to 485 kg and from 112 to 212 cm and 119 to 710 kg, respectively for ≤12, >12-24 and >24 months age group.

DISCUSSION

The mean values of live weight, heart girth, wither height and hip height measurements of >30-33 month age group in the present work were similar to those found by Abdelhadi and Babiker (2009) for Sudanese indigenous Baggara bulls (266 kg, 150.6 cm, 120 cm and 126.2 cm, respectively). Alsiddig et al. (2010) observed similar wither height (116 and 119 cm) and heart girth (140 and 149 cm) and slight higher body length (121 and 129 cm) for Baggara zebu bulls (Nyalawi) of 217 and 267 kg average live weight, respectively compared to the animals of more than 24 months old in this study.

Bag et al. (2010) obtained wither height, body length and heart girth for adult female RCC of 54 months as 106, 107 and 137 cm whereas theses were 94, 105 and 127 cm, respectively for North Bengal Grey cows of similar age (Al-Amin, 2004). Hadiuzzaman et al. (2010) reported that heart girth, body length, hip height and wither height measurements of Red Chitagong Cattle at different age groups were much lower compared to those for similar age groups of this study. Namikawa et al. (1984) reported that the wither height and hip height at 24 months of age were 100 and 103 cm, respectively for Bangladeshi native cattle. The results of the aforementioned studies were very much lower compared to the present study.

In agreement with the present study, Namikawa et al. (1984) found that the heart girth of Bangladeshi native cattle of >2 years old was 151 cm. Bhuiyan et al. (2007) reported that the wither height and body length were 118 and 148 cm for Pabna cows, which were partially supported by the present results. In another study, Mwambene et al. (2014) found that the body weight, heart girth, body length and height at withers were 299 and 246 kg, 148 and 142 cm, 110 and 106 cm and 105 and 101 cm, respectively for indigenous bulls and cows of Tanzania. All these differences between present study and other researches might be due to the variation in genotypes, environment and management practices.

The calculation of correlation coefficients showed that live weight was highly correlated with HG compared to the other body measurements, which evidently indicated that HG is the most reliable measurement for prediction of live weight of Brahman X Local crossbred cattle. This is in accordance with the results of other studies, which reported high correlation coefficient between live body weight and heart girth measurement (Msangi et al., 1999; Malau-Aduli et al., 2004; Nwacharo et al., 2006; Abdelhadi and Babiker, 2009; Yakubu, 2010). The significant relationship found between BW and morphometric measurements in this study suggests that either or combination of these morphometric traits could be used to estimate live weight in cattle fairly well in the situation where weighing scales are not available.

In the present study, HG explained the highest variation in LBW compared to BL, WH and HH irrespective of age and sex of animals, which are in accordance with the findings of Francis et al. (2002), Bagui and Valdez (2007) and Yakubu (2010) where the prediction equation for LBW from HG gave R^2 value of 0.97, 0.94 and 0.88, respectively. Dodo et al. (2001) conducted a similar study on Azawak Zebu in Niger and accentuated the significance of HG as a predictor of LBW. Furthermore, a high genetic relationship between LBW and HG had been reported by Afolayan (2003), which justified its use for both selection purposes and weight estimation. However, the combination of HG and BL together gave the best fitted prediction equations with LWG for all age categories, which was agreed by a previous study conducted by Mutua et al. (2011) in pigs.

In this study, the regression analysis for three age groups, both sexes and all animals under study indicated the significant existence of a linear relationship between LBW and HG, which was agreed by the findings of Msangi et al. (1999) in crossbred dairy cattle and Abdelhadi and Babiker (2009) in Baggara zebu. The regression equation gave more accurate estimate of live weight of cattle of >12-24 months old compared to other age groups and the R^2 value (0.94) indicated that 94% of the variation in live weight was determined by heart girth around the chest. However, the regression equations for >12-24 and >24 month age group are different from those reported by other authors for zebu cattle. Goe et al. (2001) derived an equation of LBW=4.21HG–365 for working Abyssinian Short-horned zebu oxen in the Ethiopian highlands and Kashoma et al. (2011) formulated an equation of LBW=4.55HG–409 (±17.9) for Tanzania shorthorn zebu cattle (170-390 kg) in Tanzania while Abdelhadi and Babiker (2009) formulated an equation of LBW=3.89HG–260 (±0.13) for Baggara bulls in Sudan. This variation might be due to the different genetic effects, age of animals and management practices of animals involved in the studies.

CONCLUSION

Most of the morphometric measurements were linearly increased with the advances of age. Bivariate correlations between body weight and morphometric traits of Brahman X Local crossbred cattle were positive and highly significant. Heart girth as a single efficient predictor can be used to predict body weight of Brahman crossbred cattle. Heart girth and body length combined together gave the best fitted prediction equations with body weight in all age categories.

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CONFLICT OF INTEREST

There is no conflict of interest.

AUTHORS' ONTRIBUTION

All the authors contributed equally to this research paper.

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