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CARCASS CHARACTERISTICS OF TROPICAL BEEF CATTLE BREEDS (WEST AFRICAN SHORTHORN, SANGA AND ZEBU) IN GHANA

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ABSTRACT

In Ghana, butchering is one of the most common and lucrative jobs in villages, towns, and cities as a major source of employment and wealth creation for mostly traditional butchers. Though there is an ever changing meat processing standard internationally, butchers in Ghana on the other hand are still holding tight to their old practices and customs. Live animals are bought based on visual assessment and not by weight. Some of the butchers sell their products without weighing. There are no suitable weighing scales to determine live and carcass weights. This preliminary study was conducted using 35 animals to provide a means of a more accurate estimation of live and carcass weights of three tropical cattle beef cattle; the Zebu (Plate1), the humpless West African shorthorn (WASH) (Plate2) and the Sanga (Ghana Sanga), a crossbreed between WASH and Zebu (Plate3). Their live and carcasses weights and the weights of their major carcass components and offal were used to provide information on their carcass characteristics. The carcass components used were: empty carcass, fore-and hind-quarters and filet, internal offal (heart, liver, lungs, spleen, kidney and the rumen) and external offal (head, tail, legs and skin). In terms of live weight, the Zebu was significantly (P< 0.001) heavier (309 Kg), than the Sanga (202 Kg) and the WASH (162Kg). Consequently, the zebu had a heavier (P< 0.001) carcass weight (156kg) than the Sanga (93kg) whilst the WASH had the least carcass weight (73kg) (P< 0.001). All the major carcass components of the Zebu were significantly (P< 0.001) heavier than that in the Sanga and the WASH. Correlations on all the three breeds demonstrate high positive relationships between carcass components and the live and carcass weights. In all the three breeds, the fore-quarters constituted higher percentages (average 53.7%) of the carcass weights than the hind-quarters (average 46.3%). Those carcass components (fore- and hind-quarters, head and legs), which were positively correlated to live weight could be used to predict the live weights of these animals. The offal (heart, liver and spleen), which are positively correlated to the carcass weight could also be used to estimate or predict the carcass weights. Due to their small size, the beef performance of the WASH is generally low, although the dressing percentages are similar to those of the Sanga and the Zebu.

Key words: Carcass, offal, Sanga, Zebu hind-quarters

INTRODUCTION

The slaughtering of animals and sale of meat is one of the oldest full time occupations for many people who are normally referred to as butchers. These butchers play important roles in rural communities by acting as financiers to livestock owners who go to these butchers for money in exchange for a livestock, which could be colled any time to slaughter [1]. The livestock sub-sector is an important component of Ghana's agriculture and contributes to food security by providing animal protein to enhance the nutritional contents of diets of Ghanaians [2]. Ruminants including cattle play essential roles in the food production systems by being able to harvest and convert vegetation, which is not consumed by humans into high–quality protein food [3]. The socio-economic benefits of the meat trade include serving as a source of employment for most people, especially the youth and generating revenue for the government through taxation.

In most parts of the world, various methods such as hand feeling, visual assessment of the body conformation, weighing and sophisticated ultrasonic photographs are used to obtain information on carcass characteristics of cattle for slaughter. There are large differences in growth rate between breeds which lead to substantial differences in the weight of carcass tissues at a given age [4]. Typical beef cattle can be described as the thick-set, blocky breeds having a high percentage and a superior development of high-priced relative to low -priced cuts of meat on their carcasses [5].

The ultimate objective of the meat producer is to make profit, through the correct control of materials and processing conditions which is essential to optimize product quality and to minimize production costs [6]. In meeting consumer demands and preferences, carcasses must be graded and uniformly grouped [7] based on the quality and palatability as well as the quantity of the meat [8]. The use of suitable weighing scales to determine live and carcass weights is absent Ghana [9]. There is limited information available on the carcass traits of the local beef cattle breeds in Ghana. Information about the percentage contribution of the various components of the carcass will greatly facilitate proper pricing of the animal and its carcass. The objective of this study was, therefore, to provide information on the carcass characteristics of beef cattle in Ghana and means of estimating their carcass and live weights.

MATERIALS AND METHODS

The study was carried out at the Meat Laboratory on of the Animal Science Department of the University for Development Studies, Tamale, Ghana. Data were collected over a nine month period from September 2007 to May 2008. The data were limited to the available breeds and number of cattle slaughtered within the period. The animals were nine Zebus, (Plate1), eight West African Shorthorns (WASH) (Plate2) and eighteen Sangas (Plate3)

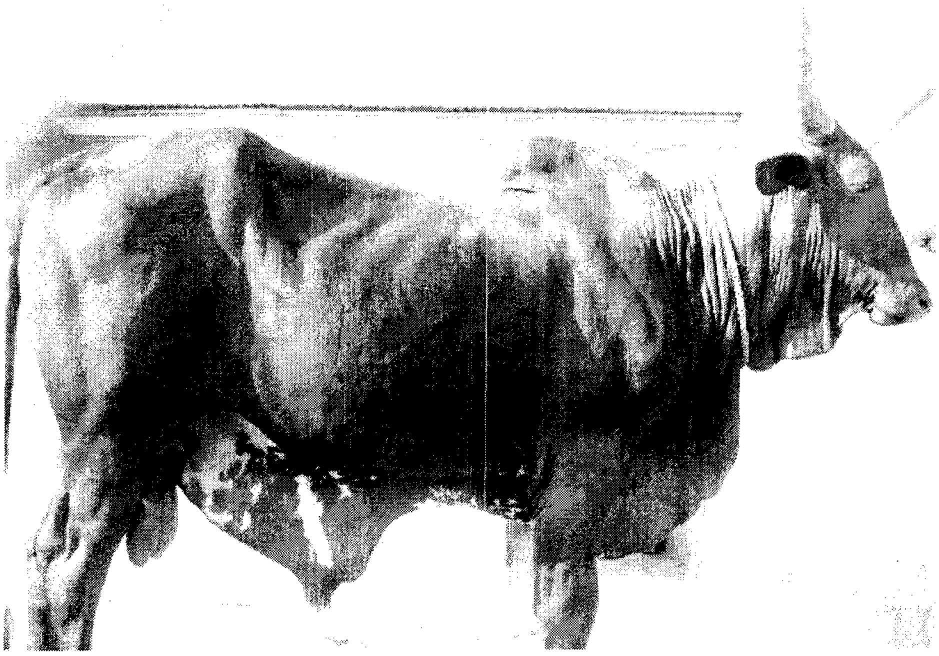

Plate1: A typical matured Zebu bull cattle in Ghana (live weight 320kg)

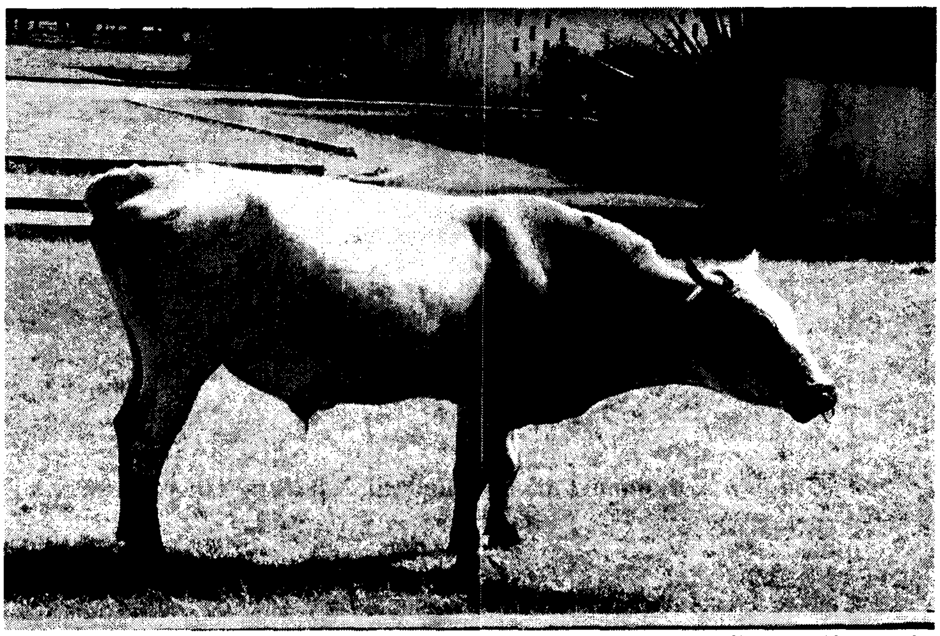

Plate 2: A matured West African Shorthorn bull cattle in Ghana (live weight 160kg)

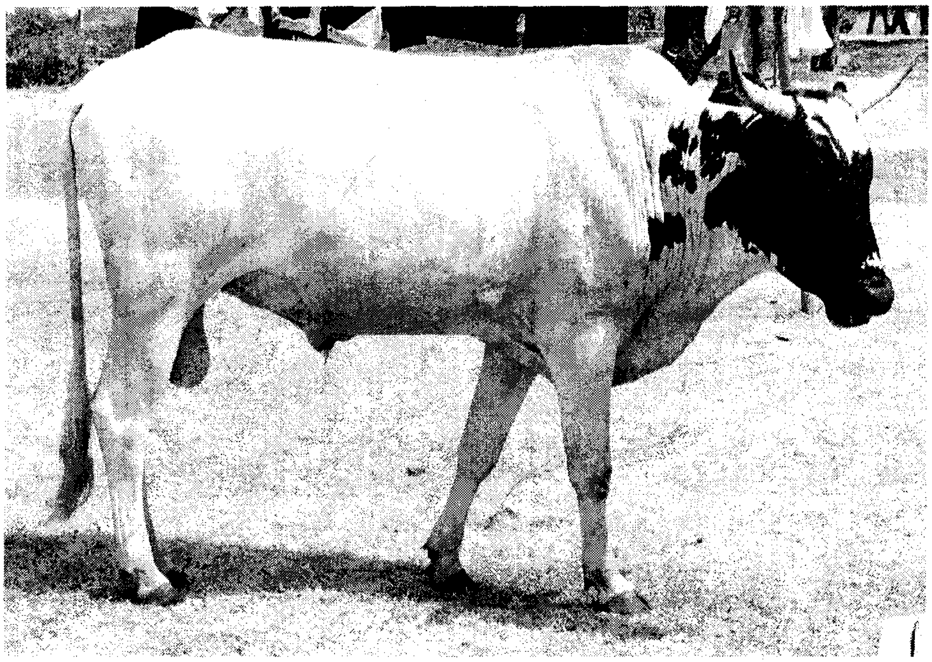

Plate 3: A typical matured Sanga bull cattle with rudimentary hump in Ghana (Live weight 210kg)

Data collection

Live weights of all the animals were taken prior to slaughter using an electronic scale. The animals were stunned with a captive bolt pistol, bled, and skinned manually. The head and feet were not skinned but chopped off and singed afterwards. After evisceration, the empty carcasses were split along the backbone into halves. The halved carcasses were divided into fore-and –hind quarters by cuing between the 6th and 7th thoracic vertebra, and extending the across the ribs. The flank was separated from the thigh and the vertebra column by cutting across the ribs at about 10cm away from the vertebral column. All components and offal were then weighed separately. In case of the Zebu cattle, the weights of the humps were added to the weights of the fore-quarters. The dressing percentages were then calculated by multiplying the ratio of the carcass weights and the live weights by hundred.

Data analysis

Analysis of variance (ANOVA) using general linear model, Pearson correlation and regression analysis were done using MINITAB version 13.0 [10].

RESULTS

Carcass characteristics of the beef cattle breeds

There were significant differences ($P< 0.001$) between the live weights with the Zebu being the heaviest, followed by the weight of the Sanga, which was not significantly different from that of the WASH (Table1). Similarly, the fore- and hind-quarter weights of the Sanga were not significantly different from those of the WASH (P > 0.05) but together they were significantly lower than those of the Zebu (P < 0.001).

Mean weight of internal offal of tropical beef cattle breeds

The weights of the internal offals tend to follow the trend of the weights of the major carcass components. The Zebu had the heaviest offal, followed by the Sanga and with the WASH being the least. The mean weights of the internal offal of the WASH and the Sanga were not different from each other but were significantly lower than those of the Zebu (P≤ 0.001). With exception of the kidney, the weights of all the internal offal of the Zebu were about twice the weights of the internal offal of the WASH.

Mean weights of external offal of beef cattle breeds in Ghana

Again, there were no significant differences between the external carcass components (head, tail, legs and skin) of the Sanga and the WASH. The Zebu, however, had significantly heavier (P< 0.001) external carcass components than the Sanga and WASH (Table 3).

Pearson correlation (r) between carcass components of the three breeds of cattle (Sanga, WASH, Zebu)

There were significant (P<0.001) and strong positive correlations(r =0.92) between the live weights and carcass weights for all the three breeds. Similarly the live and carcass weights had significant (P<0.05) and strong positive correlations(r =0.74 to 0.99) with all the carcass components including the offal when data for the three breeds were pooled (Table 4). All the carcass components correlated positively with each other.

Pearson correlation (r) between live weight, major carcass components and offal weights of the West African shorthorn (WASH) cattle

Most of the carcass components did not correlate well with the live weights of the WASH (Table 5). There was a weak positive correlation (r=0.52) between the live and carcass weights of the WASH. Surprisingly, only the liver and spleen had significant (P< 0.05) positive correlations (r = 0.77 and r = 0.72, respectively) with the live weights of the WASH. The legs and skin recorded negative correlations with live weights (Table 5).

Pearson correlation (r) between live and carcass weights and all carcass components of the Sanga Cattle

Unlike the WASH, there was a strong significant (P<0.001) positive correlations (r = 0.93) between the live and carcass weights of the Sanga (Table 6). The fore-and hind-quarters weights were positively correlated (r = 0.93) with the live weight. Similarly, almost all the other carcass components and offal were positively and significantly (P<0.01) correlated (r = 0.57 to 0.85) to the live and carcass weights. Both the internal and the external offal were positive and moderately correlated with one another.

Pearson correlation (r) between all major carcass components and offal of the Zebu cattle

There was a good significant ($P<0.01$) positive correlation ($r = 0.78$) between the live and the carcass weights of the Zebu (Table7). Very strong positive correlations (r= 0.96, 0.96, 0.72, 0.71 and 0.84, respectively) were also established between the carcass weight and the weights of'the fore- and hind- quarters, heart, head and filet.

Estimation of live weights for all the three tropical beef Cattle breeds.

The live weights for all the three breeds could be predicted or estimated by the regression equation:

$Y= -83.2- 9.6x + 10.5x_2 +11.7x_3 + 7.76x_4 +20.9x_5$

Where: Y = live weight (kg)

-83.2 = constant

X =carcass weight (Kg)

X_2= fore- quarter weight (Kg)

X_3= Hind –quarter weight (Kg)

X_4 = Weight of head (Kg)

X_5 = Weight of the legs (Kg)

Estimation of carcass weight for all the three tropical breeds of cattle

The carcass weights of the three cattle breeds could be estimated using the regression equation:

$Y = -37.8+ 61.1x + 22.2\ x_2 + 43.8x_3$

Where: Y= Carcass weight (Kg)

-37.8= constant

X = Heart weight (Kg)

X_2 = Liver weight (Kg)

X_3 = Spleen weight (Kg)

Estimating the carcass weight for the WASH

The derived regression equation for the estimation of the carcass weight of the WASH is as follows: $Y = 48.9+41.8x - 16.1x_2 +63.7x_3$

Where: Y = Carcass weight (Kg)

48.9 =constant

X = Heart weight (Kg)

X_2 = Liver weight (Kg)

X_3 = Spleen weight (Kg)

Estimating the carcass weight of the Sanga cattle

The derived regression equation for carcass weight of the Sanga is as follows:

$Y = -51.5 + 47.8x + 25.6x_2 + 70.9x_3$

Where: Y = Carcass weight of Sanga (Kg)

- 51.5 = constant

X = Heart weight of Sanga (Kg)

X_2 = Liver weight (Kg)

X_3 = Spleen weigh (Kg)

Estimation of carcass weight for Zebu cattle

The derived regression equation for estimating the carcass weight of the Zebu cattle is as follows: $Y = 4.3 + 58.3x + 18.4x_2 + 20.8x_3$

Where Y = Carcass weight (Kg)

4.3 = constant

X = Heart weight (Kg)

X_2 = Liver weight (Kg)

X_3 = Spleen weight (Kg)

DISCUSSION

The Ghana Sanga being a cross-breed between the WASH and the Zebu, yielded intermediate values for live, carcass and carcass components weights. Generally, the crosses (Sanga) are normally heavier at maturity than their humpless parental stock, but lighter than their humped parental stock [11], which was explicitly depicted in their carcass characteristics in this study. There are varying reports on the slaughter or mature and carcass weights the WASH breed in Ghana. It was reported that the slaughter and carcass weights of WASH bulls on the average can be up to 250 and 125 kg, respectively with a corresponding dressing-out percentage of 50 percent [12]. Another report [13] of an on-station study of a sample of 32 Dwarf Shorthorns in the humid forest zone produced slaughter and carcass weights of 142 and 67 kg, respectively, and a dressing-out percentage of 47.3 percent. The results of this study compare fairly well with those of other humpless Shorthorns in the region [11]. The mature weight of the Zebu bulls under an improved system of management may be up 350-665kg [14].This suggests that the lower slaughter weights obtained in this study are from animals from the traditional system or the animals were not fully matured.

The carcass weights of all the three breeds depict the features of a typical unimproved tropical beef animal having the larger proportion of the carcass weight in the fore-quarters [9, 15]. The breeds did not exhibit the typical blocky body structure peculiar of beef cattle breeds with a high percentage of the high- priced cuts of the hind-quarters relative to the low-priced cuts of the fore-quarters [5]. The economic value of all the breeds as beef animals is low since the high-priced cuts come from the hind-quarters, which constituted just 43 to 46% of their carcass weights.

The dressing percentages were not significantly different from each other though the values increased slightly from WASH through Sanga to Zebu. This is an indication that all the breeds yielded similar proportions of their live weights as carcass weight. The trend of increasing dressing percentages from the WASH to Zebu supports a previous statement that as the animal gets heavier, the dressing percentage increases [4]. Perhaps a maternal effect of the WASH might be exerting some genetic dominance over the Zebu genotype which might have caused the Sanga carcass components to be similar to those of the WASH than to the Zebu's.

Those carcass components that had strong and significant positive correlations with the live and carcass weights are good predictors that can be used to estimate the live and carcass weights where suitable weighing scales are not available for live and whole carcass weight. The carcass components of WASH in general had very weak correlations with one another. This pattern of weak or negative correlations between the carcass components of the WASH may be a reflection of the high live weights and low carcass weights with the corresponding low carcass components weights. Also, there is a problem of high gut fill which reduces the dressing percentage of the WASH. It will, therefore, be relatively easier to predict the live and carcass weights of the Sanga than for the WASH by using the carcass components.

The results suggest that predicting the live and carcass weights of the Sanga could be possible with a wide range of weights of its carcass or body components. However, the estimation of the live and carcass weights of its parents (the WASH and Zebu) have to be restricted to a few carcass or body components. Those carcass components with strong significant, positive correlations with the live and carcass weights were used to estimate or predict both the live and carcass weights of these cattle breeds. Where it is impossible to determine the carcass weight by weighing, the weights of the carcass components and the offal could be used to estimate/predict the carcass weights of the beef cattle breeds under consideration. The estimated carcass weight could then facilitate the estimation of the live weight and the pricing of the animal and meat.

CONCLUSION

The Zebu was superior to the Sanga and the WASH in body and carcass weights and in the weights of all carcass components. Though the Sanga weights were not significantly different from the WASH, they were numerically heavier depicting a positive effect of crossbreeding the WASH cows with the Zebu bulls. The differences in carcass and offal yields between breeds could be accounted for by the differences in live weights due to their genetic differences.

All the three breeds exhibited the characteristics of unimproved breeds with higher percentages at the fore- quarters (average 53.7%) than the hind- quarters (average

46.3%) for carcass weight. The correlations between the weights of carcass components were stronger in the Sanga than in the WASH and Zebu. Since the offal weights could be determined with top-loading weighing scales, in the absence of suitable scales for determining the live and carcass weights of these three breeds of tropical beef cattle, the regression equations derived from this work could be used to estimate both live and carcass weights of these. Breed specific equations will provide a more accurate prediction or estimation than a generalize one.

Table 1: Live weight and carcass components of beef cattle breeds in Ghana

Components weights(Kg)	WASH	Sanga	Zebu	Seds	ignificance
Live weight	162.0 [a]	201.9 [a]	309.4 [b]	26.3	***
Carcass weight	74.1 [a]	95.3 [a]	155.9 [b]	11.5	***
Fore-quarter	39.2 [a]	50.5 [a]	82.0 [b]	6.4	***
Hind-quarter	34.5 [a]	44.4 [a]	67.1 [b]	5.2	***
Filet (*psoas major*)	1.1 [a]	1.3 [a]	1.9 [b]	0.13	***
Dressing %	45.9	47.6	52.1	2.7	ns

[ab-] means with different superscripts in the same row are significantly different.
ns: not significant; *** P < 0.001
sed: Standard error of difference

Table 2: Mean weights of internal offal of beef cattle breeds in Ghana

Internal offal weights(g)	WASH	Sanga	Zebu	Sed.	significance
Heart	654 [a]	759 [a]	1,033 [b]	80	***
Liver	2,388 [a]	2,616 [a]	3,850 [b]	240	***
Lungs	1,625 [a]	1,660 [a]	3,483 [b]	160	***
Spleen	569 [a]	615 [a]	992 [b]	70	***
Kidney	420 [a]	486 [a]	597 [b]	60	*
Rumen	4,563 [a]	5,514 [a]	7,418 [b]	470	***

[ab-] means with different superscripts in the same row are significantly different.
* P< 0.05, *** P < 0.001,
sed: Standard error of difference

Table 3: Mean weight of external offal of beef cattle breeds in Ghana

External offal weight(Kg)	WASH	Sanga	Zebu	Sed.	significance
Head	8.740^{a}	10.2^{a}	13.05^{b}	0.78	* * *
Tail	0.798^{a}	0.978^{a}	1.256^{b}	0.14	* *
Legs	3.180^{a}	3.748^{a}	4.778^{b}	0.29	* * *
Skin	4.842^{a}	5.308^{a}	7.933^{b}	0.51	* * *

$^{ab-}$ means with different superscripts in the same row are significantly different.

** $P < 0.01$; *** $P < 0.001$

Sed: Standard error difference

Table 4: Pearson correlation (r) between live weight and weights of all carcass components of all the three breeds (n=35)

	Lv*	Cc	Fqt	Hqt	Ht	Lr	Lg	Sp	Ky	Rm	Ft	Hd	Tl	Lg
Carcass	**0.92**													
Forequarter	**0.92**	**0.99**												
Hindquarter	**0.91**	**0.99**	**0.97**											
Heart	**0.86**	**0.84**	**0.82**	**0.82**										
Liver	**0.83**	**0.87**	**0.85**	**0.83**	**0.74**									
Lungs	**0.71**	**0.71**	0.67	0.69	0.58	**0.70**								
Spleen	**0.74**	**0.79**	**0.77**	**0.74**	0.67	**0.71**	0.69							
Kidney	**0.70**	**0.70**	**0.70**	0.69	**0.70**	0.62	0.53	0.68						
Rumen	**0.73**	**0.70**	0.67	0.68	0.62	0.63	0.65	0.63	0.41					
Filet	**0.78**	**0.87**	**0.83**	**0.88**	**0.83**	**0.78**	0.64	**0.71**	0.64	0.60				
Head	**0.82**	**0.81**	**0.80**	**0.77**	**0.80**	**0.79**	0.56	**0.71**	0.66	0.69	0.66			
Tail	0.67	**0.70**	**0.71**	**0.71**	0.52	0.55	0.51	0.50	0.46	0.48	0.48	0.45		
Legs	**0.77**	**0.80**	**0.79**	**0.80**	0.61	0.68	0.59	0.67	0.60	0.61	0.64	0.68	0.70	
Skin	**0.74**	**0.76**	**0.74**	**0.75**	0.61	0.66	0.59	0.64	0.49	0.55	**0.73**	0.67	0.45	0.76

r = Linear correlation coefficient figures in bold are significant: if $r \geq 0.70$, $P < 0.05$; $r \geq 0.78$,$P <0.01$; $r \geq 0.87$, $P< 0.001$

*Lv-live; Cc-carcass; Fqt- forequarter; Hqt-hindquarter; Ht-heart; Lr-liver; Lg-lungs; Sp-spleen Ky-kidney; Ft-filet; Hd-head; Tl-tail; Lg-leg

Table 5: Pearson correlation (r) between live weight and weights of all carcass components of the WASH breeds (n=9)

	Lv*	Cc	Fqt	Hqt	Ht	Lr	Lg	Sp	Ky	Rm	Ft	Hd	Tl	Lg
Carcass	0.52													
Forequarter	0.48	**0.98**												
Hindquarter	0.05	**0.98**	**0.92**											
Heart	0.55	**0.82**	**0.79**	**0.86**										
Liver	**0.77**	0.03	0.09	-0.08	0.12									
Lungs	0.47	-0.01	-0.02	-0.05	0.16	0.64								
Spleen	**0.72**	**0.69**	**0.77**	0.59	0.65	0.62	0.49							
Kidney	0.61	0.65	**0.71**	0.57	0.62	0.48	0.54	**0.92**						
Filet	0.29	**0.71**	**0.71**	**0.75**	**0.89**	-0.03	0.24	0.64	**0.70**					
Head	0.61	**0.70**	**0.77**	0.56	0.55	0.55	0.44	**0.87**	**0.79**	0.48				
Tail	0.61	**0.80**	**0.72**	**0.80**	**0.70**	0.14	-0.08	0.47	0.24	0.41	0.48			
Legs	-0.04	0.58	0.54	0.52	0.07	-0.35	-0.20	0.13	0.30	0.07	0.39	0.33		
Skin	-0.13	0.38	0.42	0.28	-0.10	-0.21	-0.09	0.15	0.27	-0.02	0.47	0.03	**0.91**	

r = Linear correlation coefficient figures in bold are significant: if $r \geq 0.69$, $P < 0.05$; $r \geq 0.80$, $P < 0.01$; $r \geq 0.91$, $P < 0.001$

*Lv-live; Cc-carcass; Fqt- forequarter; Hqt-hindquarter; Ht-heart; Lr-liver; Lg-lungs; Sp-spleen Ky-kidney; Ft-filet; Hd-head; Tl-tail; Lg-leg

Table 6: Pearson correlation (r) between live weight and weights of all carcass components of the Sanga breeds (n=18)

	Lv*	Cc	Fqt	Hqt	Ht	Lr	Lg	Sp	Ky	Rm	Ft	Hd	Tl	Lg
Carcass	**0.93**													
Forequarter	**0.93**	**0.99**												
Hindquarter	**0.92**	**0.99**	**0.98**											
Heart	**0.65**	**0.64**	**0.63**	**0.65**										
Liver	**0.78**	**0.77**	**0.76**	**0.76**	**0.50**									
Lungs	**0.68**	**0.70**	**0.70**	**0.69**	0.35	**0.30**								
Spleen	**0.69**	**0.67**	**0.64**	**0.69**	0.43	0.42	**0.66**							
Kidney	**0.72**	**0.67**	**0.64**	**0.70**	**0.64**	**0.47**	**0.49**	**0.57**						
Rumen	**0.57**	**0.53**	**0.55**	**0.50**	0.45	0.29	**0.55**	0.37	0.31					
Filet	0.54	**0.61**	0.56	**0.66**	**0.63**	**0.47**	0.39	**0.63**	**0.57**	0.24				
Head	**0.69**	**0.61**	**0.62**	**0.58**	**0.68**	**0.58**	0.21	0.35	**0.51**	**0.50**	0.25			
Tail	**0.62**	**0.68**	**0.71**	**0.66**	0.33	0.50	0.65	**0.47**	0.34	0.34	0.21	0.13		
Legs	**0.85**	**0.85**	**0.83**	**0.85**	**0.78**	**0.76**	**0.62**	**0.61**	**0.63**	0.45	**0.58**	**0.52**	**0.69**	
Skin	**0.60**	**0.67**	**0.66**	**0.68**	**0.47**	**0.52**	0.31	0.43	0.41	0.05	**0.65**	0.44	0.25	**0.49**

r = Linear correlation coefficient figures in bold are significant: if $r \geq 0.47$, $P < 0.05$; $r \geq 0.57$, $P < 0.01$; $r \geq 0.64$, $P < 0.001$

*Lv-live; Cc-carcass; Fqt- forequarter; Hqt-hindquarter; Ht-heart; Lr-liver; Lg-lungs; Sp-spleen Ky-kidney; Ft-filet; Hd-head; Tl-tail; Lg-leg

Table 7: Pearson correlation (r) between live weight and weights of all carcass components of the Zebu breeds (n=18)

	Lv*	Cc	Fqt	Hqt	Ht	Lr	Lg	Sp	Ky	Rm	Ft	Hd	Tl	Lg
Carcass	**0.78**													
Forequarter	0.77	**0.96**												
Hindquarter	**0.73**	**0.96**	**0.91**											
Heart	**0.88**	**0.78**	**0.72**	**0.73**										
Liver	0.54	**0.73**	**0.66**	0.6	**0.65**									
Lungs	0.40	0.38	0.20	0.34	0.39	0.64								
Spleen	0.30	0.36	0.32	0.19	0.32	0.17	0.21							
Kidney	0.48	0.55	0.60	0.33	**0.66**	0.59	0.15	0.56						
Rumen	0.46	0.16	0.02	0.16	0.24	0.19	**0.75**	0.18	0.22					
Filet	0.64	**0.84**	**0.73**	**0.89**	**0.81**	**0.71**	0.41	0.03	0.35	0.14				
Head	**0.71**	0.64	0.58	0.51	**0.70**	**0.67**	0.39	0.46	0.45	0.42	0.52			
Tail	0.62	0.55	**0.70**	0.54	0.44	0.26	0.21	-0.19	0.24	-0.05	0.40	0.39		
Legs	0.28	0.12	0.22	0.07	-0.18	-0.05	0.14	0.16	-0.12	0.36	-0.32	0.08	0.25	
Skin	0.57	0.10	0.07	0.17	0.29	-0.03	0.45	0.17	0.21	**0.74**	0.10	0.08	0.25	0.44

r = Linear correlation coefficient figures in bold are significant: if $r \geq 0.65$, $P < 0.05$; $r \geq 0.75$, $P < 0.01$; $r \geq 0.84$, $P < 0.001$

*Lv-live; Cc-carcass; Fqt- forequarter; Hqt-hindquarter; Ht-heart; Lr-liver; Lg-lungs; Sp-spleen Ky-kidney; Ft-filet; Hd-head; Tl-tail; Lg-leg

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