Evaluation of Live Weight and Carcass Characteristics of Local Cattle in Zanzibar

***Khamis, K.M.[1], H.S. Baalawy[2], F.A. Kesi[1] and A.H. Hamad[2]**

[1]Department of Livestock Development Zanzibar,
[2]Zanzibar Livestock Research Institute, P.O.Box 104, Kizimbani, Zanzibar

*Corresponding author e-mail: khamismohd5@gmail.com

Abstract

A study was conducted to evaluate live weight and carcass characteristics of cattle in Zanzibar. Forty eight indigenous bulls aged 2–2.5 years with live body weight of 106.75 ± 10.23 to 186.17 ±10.23 kg were purchased from four Districts of Micheweni, Chake- Chake, of Pemba region and Central and North "A", Unguja region for slaughter. The body condition score and initial body weight of animals were recorded before slaughtering process. All appendages were removed, weighed and recorded separately. Carcass was incised through median plan and the abdominal cavity contents were weighed individually and recorded separately. The dressing-out percentage was estimated as the hot carcass weight divided by the final body weight in percentage. Killing out parameters of cattle from North "A" were significantly higher ($p<0.05$) than those from Central, Micheweni and Chake-Chake. Weight of carcass joints of the cattle from Chake-Chake and Micheweni were significantly lower ($p<0.05$) than North "A" and Central. Animals from North "A" and Central were significantly ($p<0.05$) high in total weight of tissues than Micheweni and Chake-Chake. The lean: fat ratio of 43.31:1 was significant higher ($p<0.05$) for Chake Chake district, while Central district had significant higher ($p<0.05$) lean: bone ratio of 1.77:1. Generally; the study showed differences in live weight of cattle reared within the four Districts in Zanzibar. However the average dressing percentage of 48% obtained from this study is within range of 47 – 53 % reported on other studies conducted in Tanzania Mainland.

Keywords: indigenous cattle, live weight and dressing percentage

Introduction

In Zanzibar livestock production systems are virtually traditional and of a smallholder in nature. Three systems are recognized namely, extensive, semi-intensive and intensive. Under the extensive system of production, cattle usually grazed communally on marginal lands distant from dwellings with no supplementary feeding. The semi-intensive system is normally practiced with cross-bred cattle and high producing local stock. Intensive system or zero-grazing is commonly practiced with improved dairy breeds. (Study on Zanzibar Existing Livestock Production Systems; 2011,)
The production levels of meat from indigenous zebu cattle are generally low under traditional management systems, the main determinant of their contribution being the sheer number of animals. Poor breeding strategies, such as uncontrolled breeding and lack of records, worsen this situation further. According to National Sample Census of Agriculture, (2007/08) total number of cattle raised by the smallholders was 155,624 heads out of which, the indigenous type represented 95.5% of the total cattle population. Local breed is mainly comprised of East African Short Horn Zebu (EASHZ). Beef production system as a mechanism to increase beef volumes is not well practiced as there is no typical beef breeds reared in Zanzibar. The main breed of cattle kept as a source of meat is EASHZ and few crossbred bulls and steers.

Carcass composition largely determines carcass value. A high proportion of muscle with an optimum level of fat detected by local consumer preference represents a superior carcass. Difference between individual beef

breeds in growth performance and carcass traits have been extensively evaluated in many studies in the world (Purchas and Morris, 2007). Only 25% of beef consumed is produced in Zanzibar, the remaining is imported from Mainland Tanzania (DLD, 2018). It is important to evaluate carcass available from slaughtered cattle in Zanzibar so as to determine the actual dressing percentage and quality of meat produced. Moreover, this will be great opportunity to develop further researches on beef fattening using the local breed as well as culled dairy cattle. This study will also provide information on status of Zanzibar indigenous beef production.

Materials and Methods

Study area

This study was conducted in four districts of Zanzibar that included Central and North "A" districts for Unguja and Micheweni and Chake districts for Pemba. The districts were purposively selected based on cattle population (OCGS, 2012). The designated districts characterized by high number of local cattle compared to other districts.

Sampling Procedures

A total of 48 intact male cattle aged between 2-2.5 years old were bought from samples farmers in each district. Twelve (12) uncastrated local male cattle were purchased from farmers from each selected district. The cattle were selected based on the following criteria; they were aged between two and two and half years (2-2.5 years), they were in good health condition without any physical abnormality. All 48 selected cattle were born and raised in the respectively districts. The cattle were transported to the nearby slaughter house where all data and collection procedures were conducted.

Data collection

The Body Condition Score (BCS) of the cattle were measured and recorded during ante-mortem inspection. A five point scales (Lowman *et al,* 1973; Pulan, 1979) were used during the scoring process to qualify the status of slaughtered cattle for beef in Zanzibar. Assessments were carried out by three different observances in all 48 cattle throughout the study period.

The initial body weight was measured and recorded directly using weigh band before slaughtered. The animals were slaughtered at authorized slaughter house using halal- method considering all slaughtering protocol.

All appendages were removed, weighed and recorded separately. The abdominal cavities were opened to remove internal offal which were weighed and recorded separately. Moreover; the hot carcasses were weighed, recorded and then dissected through median plan to obtain weight of each half.

The dressing-out percentage was calculated as the hot carcass weight divided by the live body weight recorded and expressed as a percentage. Length of each carcass side was measured from the distal end of the tarsal bones to the mid-point of the cranial edge of the first rib. Circumference of muscle was measured from thigh of the hind quarter of the carcass. Right side of the carcass was used for evaluation of different parameters under the study. Each standard meat cut was evaluated for lean, fat and bone components.

Statistical analysis

The data were analyzed by using Statistical Analysis System software and were subjected to analysis of Variance (ANOVA) procedure where statistical means of the animals' under the study were compared using General Linear Model (GLM) procedures.

Results

Killing out characteristics

Means for the live weight, body condition score (BCS), empty body weight, hot carcass weight, dressing percentage, body circumference of animal were determined and presented (Table 1). The results showed that there were differences among the animals from different locations in terms of live weight, carcass weight, BCS, empty body weight, dressing percentage and circumference. The cattle from North "A" and Central districts were heaviest ($P<.0001$). Significant differences ($P<0.001$) were found in dressing percentage among the animals from all districts. Dressing percentage in North "A" had

Table 1: Means of killing out characteristics for different districts

Parameter	Chake	Central	Micheweni	North A	P- Value
LW	106.75±10.23^{c}	177.50±10.23^{b}	116.58±10.23^{c}	186.17±10.23^{a}	<.0001
BCS	2.08±0.17^{c}	2.51±0.17^{a}	2.25±0.17^{b}	2.72±0.17^{a}	<.0001
EBW	74.75±9.43^{c}	132.04±9.43^{b}	79.67±9.43^{c}	137.50±9.43^{a}	<.0001
HC	49.33±5.54^{c}	86.38±5.54^{b}	54.08±5.54^{c}	99.46±5.54^{a}	<.0001
DR%	46.08±2.04	46.87±2.04	46.41±2.04	53.18±2.04	0.0539
CIRM (cm)	47.83±3.28^{c}	65.58±3.28^{b}	55.75±3.28^{c}	71.17±3.28^{a}	<.0001

abc = Means within the same row with different superscript are significantly different at p<0.05. LW = Live weight, BCS = Body Condition Score, EBW = Empty Body Weight, HC = Hot Carcass, DR% = Dressing Percentage, CIRM (cm) = Circumference in centimeter.

Table 2: Means of weight of carcass joints for different districts (1/2 carcass weight)

Parameter	Chake	Central	Micheweni	North A	P-Value
Thigh (kg)	6.27±0.68^{c}	11.62±0.68^{b}	6.98±0.68^{c}	12.28±0.68^{a}	<.0001
Shoulder (kg)	4.72±0.61^{c}	9.35±0.61^{b}	5.83±0.61^{c}	9.69±0.61^{a}	<.0001
Chump (kg)	2.42±0.38^{c}	4.77±0.38^{b}	2.90±0.38^{c}	6.03±0.38^{a}	<.0001
Chest (kg)	4.42±0.67^{c}	8.21±0.67^{b}	4.02±0.67^{c}	10.28±0.67^{a}	<.0001
Brisket (kg)	1.26±0.14^{b}	2.02±0.14^{a}	1.25±0.14^{b}	2.00±0.14^{a}	<.0001
Loin (kg)	1.23±0.15^{b}	2.35±0.15^{a}	1.45±0.15^{b}	2.50±0.15^{a}	<.0001

abc = Means within the same row with different superscript are significantly different at p<0.05.

Table 3: Total weight and percentage of lean, bone and fat tissues in half carcass

Parameter	Chake	Central	Micheweni	North A	P-Value
Total lean (kg)	12.65±1.68^{c}	26.78±1.68^{a}	15.30±1.68b	28.37±1.68a	<.0001
Total bone (kg)	9.88±0.93^{c}	15.18±0.93^{b}	9.91±0.93c	17.08±0.93a	<.0001
Total fat (kg)	0.36±0.16^{c}	1.07±0.16^{b}	0.56±0.16c	1.88±0.16a	<.0001
Percentage as a ½ carcass					
Lean	51.18±1.51^{c}	61.58±1.51^{a}	56.57±1.51^{b}	56.78±1.51^{b}	<.0001
Bone	40.80±0.31^{a}	35.39±0.31^{c}	37.24±0.31^{b}	34.56±0.31^{c}	<.0001
Fat	1.37±0.31^{c}	2.40±0.31^{b}	2.04±0.31^{b}	3.73±0.31^{a}	<.0001
Ratio					
Lean: Fat	43.31: 1^{a}	29.98 : 1^{c}	33.57 : 1^{b}	17.92 : 1^{c}	0.0018
Lean: Bone	1.27 : 1^{c}	1.77 : 1^{a}	1.55 : 1^{b}	1.69 : 1^{b}	0.0003
Tenderness	71.3±12.19^{b}	63.6±12.19^{b}	49.4±12.19^{c}	100.9±12.19^{a}	0.0425

abc = Means within the same row with different superscript are significantly different at p<0.05.

higher significance differences (P<0.05) than Central, Wete and Micheweni districts.

Weight of carcass joints

Mean value of weight of carcass joints shown in Table 2. There was significance difference (P<0.0001) of all carcass joints of animals. However, North "A" showed higher significance difference (P<0.0001) in all carcass joints than Central, Wete and Micheweni.

Tissues Weights of Half Carcass

There were highly significant differences of lean, bone and fat from animals in the study. Table 3 shows the total and relative weights of lean, fat and bones tissues of animals. Bulls from North 'A' and Central Districts showed significantly higher (P>0.001) weight of lean, bone and fat tissues in the half carcass. Carcasses from North "A" and Central districts had about 14.13–15.72 kg more lean tissues than those from Chake-Chake and Micheweni Districts. There were significantly higher (p>0.001) weight of bone and fat on animal from North "A" and Central. Similar observations were noted for lean: fat ration in all carcasses.

Discussion

Growth performance and weight gain of the animal are the major factors to determine quality and quantity of meat. In East Africa indigenous breed of cattle for beef production at the age of 2 to 3 years range between 146 to 390kg live weights. Abdelhadi *et al.,* (2009) reported a live weight of Sudanese indigenous Baggara bulls ranging between 170–390 kg while Kashoma *et al.,* (2011) found a live weight of TSHZ aged 2-3 years to be 146 – 247 kg. Moreover; Shirima *et al.,* (2016) reported live weight of 202 to 266kg and carcass weight ranging from 101 to 129kg. According to this study results, Zanzibar indigenous cattle have the live weight ranging from 106 – 186 kg is comparatively lower than the reviewed studies.

These differences could be contributed by nutritional factors and presence of high rate of inbreeding among the herds. Those factors are also related to Body Condition Scores as observed by Swai *et al.,* (2007) for majority of the bulls ranging from 2-3 years.

The dressing percentage of this study showed the range of 46.08–53.18% giving carcasses weight of 101 – 129kg. The values are lower by 4% of dressing percentage than those reported by Asimwe, (2016) while Shirima *et al.,* (2016) reported a close range of 50 - 52 % for cattle of 2-3 years slaughtered in different abattoirs within the country. These differences could be probably due to pre-slaughtering management, different diet and feeding system used.

The findings revealed that there are significantly differences of the distributions of carcass joints between the studied bulls. This also applies to lean: bone ratios. However, the fat content in the carcasses were extremely lower than those commonly reported for local cattle Socha *et al.* (2009) and Asimwe *et al* (2016) on steers fed HFMO. This may be due lack of supplementary diet to the studied bulls as they are fed to the low quality of forage. Likewise, the extensive tethering production system used leading the cattle walk for long distance can be additional factor. Growth rate and fat deposition are directly related with the level of energy and protein intake as they increase muscle and fat mass (Safari, 2010).

Conclusions

There is great variation in live weight, carcass characteristics between districts, the animals from North A and Central had a higher performance than those from three districts. These variations influenced by several factors including type of production system practiced. The estimated live weight could then facilitate the estimation of the carcass characteristics and the pricing of the animal and meat. It is recommended that different results obtained from this study can be used to provide more information on relationship between hot carcass weights and carcass measurements of all carcasses, hence it is suggested that further studies maybe needed to obtain more information on beef production in Isles.

Acknowledgements

We wish to thank the research committee of the Zanzibar Livestock Research Institute, for comments, constructive criticisms and

encouragement which enabled to accomplish this work. We would like to express our gratitude to Director General of ZALIRI for his guidance, advice and comments from beginning of the study to the end of this work. Our thanks and appreciation also goes to the Revolutionary Government of Zanzibar for the financial support of this study.

Last but not least, our thanks go to all staff members of ZALIRI, for their moral support.

References

Abdelhadi O.M.A and S.A. Babiker (2009). Prediction of zebu cattle live weight using live animal measurements Livestock Research for Rural Development 21(8)

Annual Report, (2018). Department of Livestock Development Zanzibar, Tanzania.

Annual Report, (2012). Office of Chief Government Statistician Zanzibar.

Asimwe L, Kimambo A, Laswai G, Mtenga L, Weisbjergb M, Madsenc J, Safari J. (2016). Meat yield and quality of Tanzania Shorthorn Zebu cattle finished on molasses/ maize grain with agro-processing by-products in 90 days feedlot period. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 117(1):125–135.

Asimwe, l. (2016). Studies on performance and meat quality of indigenous cattle finished on agro processing by products. Dissertation for award PhD. Degree at Sokoine University of Agriculture, Morogoro, Tanzania. 24pp.

Eligy, J.M. Shirima, Longin M.P. Nsiima, Anjello J. Mwilawa, Jeremiah Temu1, Steven Michael and Da D. Silva Mlau. (2016). Evaluation of Slaughter and Carcass Characteristics from Indigenous Beef Cattle in Six Abattoirs of Tanzania. *Journal of Scientific Research and Reports*, 10: 1-8

Kashoma, I.P.B Luziga, C, Werema, C.W, Shirima, G.A and Ndossi, D. (2011). Predicting body weight of Tanzania shorthorn zebu cattle using heart girth measurements Livestock Research for Rural Development 23(4).

Lowman, B.G, Scott, N.A and Somerville, S.H (1973). Condition scoring of cattle.East of Scotland College of Agriculture , Bulletin No. 6.

National Sample Census of Agriculture 2007/2008, (2012). Zanzibar Livestock Report, Volume VI.

Pulan, N.B (1979). Condition Scoring of Fulani Cattle. Tropical Animal Health and Production 10: 118-120.

Purchas, R.W. and Morris, S.T. (2007). A comparison of carcass characteristics and meat quality for Angus, Hereford x Friesian, and Jersey x Friesian steers. Proceedings of the New Zealand Society of Animal Production 67:18-22

Safari, J.G. (2010). Strategies for improving productivity of small ruminants in Tanzania. Ph.D. thesis, University of Life Sciences, Norway

Socha, M.T., Tomlinson, D.J., and DeFrain, J.M., (2009). Variability of water composition and potential impact on animal performance. In Proceeding California Animal Nutrition Conference Fresno, CA. CANC 2009 Steering Committee, (pp. 58–70).

Study on Zanzibar Existing Livestock Production Systems Report, (2011). Zanzibar Livestock Welfare Development Association (ZALWEDA), Unpublished.

Swai, E.S., Kyakaisho, P. and Ole-Kawanara, M.S. (2007). Methods of Body Condition Scoring System: An important management decision support tools for resource poor small holder dairy farmers in Tanzania. *Tanzania Veterinary Journal,* 24(2): 112–122.