SEASONAL AND ANNUAL VARIATIONS IN BODY WEIGHT AND CARCASS CHARACTERISTICS OF CATTLE IN THE SUDAN SAVANNA ZONE OF NIGERIA

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ABSTRACT

Records kept by the Bauchi Meat Company, on 2,264 cattle slaughtered for meat, from 1982 to 1984, were analysed to study the influence of season and year on the weight of the body, carcass, bones, wholesale and retail cuts, and dressing percentage. Both season and year showed significant ($P<0.01$) influence on traits measured. Body weight was lowest during the rains (345.39±3.00kg) increasing steadily thereafter to attain its highest peak (397.87±3.30kg) in the hot-dry season. Body weights were similar in 1982 (370.85±3.91kg) and 1984 (365.24±2.39kg) but superior ($P<0.01$) to that of 1983 (357.63±2.61kg). Warm carcass weight was highest in the hot-dry season (217.11±2.05kg) and lowest in the cold-dry season (181.64±1.96kg). The annual values were similar for 1982 and 1984 but superior ($P<0.01$) to that of 1983 (183.80±1.43kg). The wholesale and retail cuts were heaviest in the hot-dry season. The dressing percentage was highest in the rainy season (56.13±0.12%) and lowest (49.81±0.21%) in the cold-dry season ($P<0.01$). On annual basis, carcasses dressed best in 1984 (55.26±0.07%) and least (53.17±0.12%) in 1982. Studies such as this conducted through many season, years and even decades are valuable in functional planning.

Keywords: Season, bodyweight, retail cuts, dressing %, carcass, beef.

INTRODUCTION

Apparently much has been done and much exist in the literature on the liveweight, carcass weight and dressing percentage of cattle slaughtered for beef in Nigeria and other coutries of the West African sub-region (Ferguson, 1969; Clottey, 1972; Ojo, 1977; Olayiwole, 1982, Luswetti - Collins, 1984; Adebowale, Legel and Dobel, 1986; Hill, 1990). However, the use of the values obtained from many of these works in formulating any national plan on beef supply in this sub-region is bound to present some problems for various reasons. Firstly, much of the studies were conducted using very highly restricted number of animals. Secondly, only a few were carried out outside such ideal conditions as in the University Teaching and Research Farms and other Government Institutions. Then these works must have been done at one season of the year or the other.

About 80 per cent of the Nigerian National cattle herds are in the hands of the semi-normadic and transhumant Fulani and Shuwa Arab pastoralists of this sub-region. The offtake of livestock among these pastoralists for sale for meat is greatly influenced by various factors as season of the year, year of drought or of abundance of pasture and disease outbreak among others (Alaku, 1982; Alaku and Igene, 1983; FLD, 1984).

This study was, therefore, conducted to find out whether the season and year of slaughter have any influence on body weight, carcass weight and some other carcass traits of the cattle that supply much of the meat consumed in this subsahara environment. Definitely data such as from this study, derived directly from our national herds would provide better estimates for their carcass yields. There would also be a clearer picture of what to expect in running a meat industry in the environment.

MATERIALS AND METHODS

The data used in this study were collected

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from the records kept by the Bauchi Meat Company, Bauchi, Nigeria on a total of 2264 head of cattle slaughtered for meat from 1982 to 1984. Records were kept on such traits as the weights of the body, warm and cold carcasses, sirloin, rump, fillet, stew meat, topside, soft bones, inedible bones and the big bones.

For the purpose of this study the year was divided into four seasons viz. Cold-dry (December to February), Hot-dry (March to May), Rainy (June to August) and Post-rainy (September to November). Within each season, means were calculated for all the parameters under study. Also the dressing percentages for the carcasses, using the warm and cold carcasses respectively were calculated for each season of the year. Then the yearly means were calculated for each trait. All data were subjected to analysis of variance and means compared using Duncan's multiple range test (Steel and Torrie, 1960).

RESULTS

The year as well as the seasons of slaughter demostrated highly significant influence ($P<0.01$) on the weights of the body, warm and cold carcasses, sirloin, rump, fillet, stew meat, topside,soft bones, inedible bones, big bones and the dressing percentages of the carcasses. Table 1 shows the seasonal means for the traits studied. Animals slaughtered during the hot-dry season, that is by March - May, which actually is the end of the long dry season, had the heaviest body weight. This group also had the heaviest warm and cold carcass weights. Body weight of the cattle slaughtered during cold-dry season tended to be higher than that for the post-rainy group but no statistically significant differences were found between them. Body weight during the rainy season and the carcass weights were seemingly lowest during the cold-dry season (Table 1).

The sirloin rump and stew meat were heaviest during the hot-dry season ($P<0.01$). No statistically significant differences were found between means for the fillet tended to be highest during the rainy season but did not differ significantly from values recorded in the hot-dry season and post-rainy season. The weights of the topside appear similar in the cold-dry and hot-dry seasons and were higher ($P<0.01$) than the values obtained for the rainy and post-rainy seasons. The soft bones percentage, calculated either using the warm or cold carcass weight, was highest ($P<0.01$) during the rainy season and was lowest during the cold-dry season (Table 1). The overall dressing percentage of 53.7.15kg was recorded during the cold- dry seasons.

The dressing percentage, calculated either using the warm or cold carcass weight, was highest ($P<0.01$) during the rainy season and was lowest during the cold-dry season (Table 1). The overall dressing percentages were 53.75% using the warm carcass and 51.30% using the cold carcass weight. The calculated chilling losses were 2.20, 2.57, 2.77 and 2.05 for the cold-dry, hot dry, rainy and post-rainy season respectively and the overall loss was 2.45%.

Table 2 shows the data obtained for the different traits in the different years of slaughter. Both live and warm carcass weights obtained in 1982 did not differ from values calculated in 1984 but were superior ($P<0.01$) to the values calculated in 1983. The cold carcass weight obtained in 1984 was the heaviest while that obtained in 1983 was the lowest ($P<0.01$). The weights obtained for the sirlon rump fillet stew meat and topside obtained in 1982 were significantly higher ($P<0.01$) than the values obtained in the other years. The dressing percentages obtained both on warm and cold carcass were highest in 1984 and lowest in 1983. The calculated chilling losses are shown in Table 2.

The data on hind quarter did not lend themselves to appropriate statistical analysis. Only 305 carcasses were cut into fore and hind quarters. Then only one carcass was involved in the entire hot-dry season and the value obtained (49.50kg) was very small when compared with the values obtained in the other seasons. In the cold-dry season a total of nine carcasses were treated and the mean weight was 64.53% of the cold carcass weight.

TABLE 1: MEAN VALUES FOR THE BODYWEIGTH, CARCASS, CUTS, BONES (KG) AND DRESSING PERCENTAGES (%) FOR THE DIFFERENT SEASONS.

	Season of the year						Season of the year			
	Cold-dry		Hot-dry		Rainy		Post-rainy		Entire population	
Variables	n		n		n		n		n	
Live (Body) Wt.	430	364.36 ± 3.36^{b}	530	397.87 ± 3.30^{a}	679	345.39 ± 3.00^{c}	535	355.39 ± 2.80^{bc}	2264	363.63 ± 1.63
Warm carcass	430	181.64 ± 1.96^{c}	530	217.11 ± 2.05^{a}	679	193.87 ± 1.88^{b}	535	186.14 ± 1.46^{b}	2264	195.16 ± 0.99
Cold carcass	430	173.82 ± 1.89^{c}	530	207.04 ± 2.01^{a}	679	184.74 ± 1.83^{b}	535	178.93 ± 1.45^{bc}	2264	186.51 ± 0.96
Sirloin	288	9.27 ± 0.32^{b}	350	10.25 ± 0.19^{a}	440	9.02 ± 0.16^{b}	393	9.03 ± 0.15	1341	9.30 ± 0.10
Rump	313	21.77 ± 0.49^{b}	384	27.37 ± 0.70^{a}	640	22.03 ± 0.44^{b}	483	23.17 ± 0.39^{b}	1720	23.19 ± 0.25
Fillet	294	2.62 ± 0.05^{b}	276	2.88 ± 0.06^{ab}	48	2.94 ± 0.04^{a}	364	2.79 ± 0.04^{ab}	1414	2.82 ± 0.02
Stew meat	332	30.41 ± 0.63^{b}	320	32.91 ± 0.77^{a}	650	28.51 ± 0.51^{b}	486	29.69 ± 0.43^{b}	1788	29.97 ± 0.29
Topside	334	41.64 ± 0.89^{a}	322	$42.02 \pm 1.02a$	648	36.15 ± 0.78^{b}	486	37.95 ± 0.77^{b}	1790	38.72 ± 0.43
Soft Bones	404	8.78 ± 0.15^{c}	352	$9.73 \pm 0.25a$	720	9.68 ± 0.20^{ab}	491	8.82 ± 0.16^{bc}	1967	9.29 ± 0.01
Big Bones	397	7.31 ± 0.21^{c}	340	$8.22 \pm 0.29b$	687	6.90 ± 0.12^{c}	492	9.45 ± 0.23^{a}	1916	7.87 ± 0.10
Dressing	409	16.76 ± 0.35^{a}	361	$16.05 \pm 0.44a$	719	13.53 ± 0.26^{b}	493	17.27 ± 0.36^{a}	1982	15.58 ± 0.17
Percentage (%)										
(a) Using warm carcass weight		49.81 ± 0.24^{d}		54.55 ± 0.24^{b}		56.13 ± 0.12^{a}		52.69 ± 1.45^{c}		53.75 ± 0.12
(b) Using Cold carcass weight		47.61 ± 0.21^{d}		51.98 ± 0.24^{b}		53.36 ± 0.18^{a}		50.64 ± 0.26^{c}		51.30 ± 0.12

*Seasonal means ±SE within a row bearing different superscript letters are significantly different ($P < 0.01$): n = sample size.

TABLE 2: MEANS FOR THE WEIGHT OF THE BODY, CARCASS, SOME WHOLESALE AND RETAIL CUTS, BONES (KG) AND DRESSING PERCENTAGE (%) FOR THE DIFFERENT YEARS

	Year of slaughter					
	1982		1983			
Variable	n		n		n	1984
Live (Body) Wt.	328	370.85±3.91[a]	722	357.63±2.61[b]	1214	365.24±2.39[ab]
Warm carcass	328	197.62 ± 1.41[a]	722	183.80±1.43[b]	1214	201.25±1.46[a]
Cold carcass	328	189.13 ±2.34[b]	722	172.48±1.38[c]	1214	192..36±1.43[a]
Sirloin	224	11.08±0.21[a]	618	8.96±0.12[b]	479	8.85±0.20[b]
Rump	249	27.51±0.68[a]	583	21.55±0.36[b]	888	23.04±0.36[b]
Fillet	244	3.44±0.06[a]	632	2.60±0.03[b]	538	2.81±0.04[c]
Stew Meat	257	35.88±0.79[a]	643	29.93±0.44[b]	888	28.30±0.41[b]
Topside	257	49.89±0.92[a]	646	44.64±0.51[b]	887	31.17±0.65[c]
Soft bones	256	15.16±0.14	630	8.60±0.07[b]	1081	8.30±0.06[b]
Inedible bones	257	5.06±0.11[b]	640	8.06±0.19[a]	10184.	8.30±0.14[a]
Big bones	257	13.18±0.48[b]	642	19.28±0.23[a]	1083	13.96±0.24[b]
Dressing percentage (%)						
(a)Using warm carcass weight		53.17±0.12[b]		51.46±0.08[c]		55.26±0.07[a]
(b)Using cold carcass weight		50.89±0.12[b]		49.15±0.08[c]		52.70±0.07[a]

Means ± SE within a row bearing different superscript letters are significantly different ($P < 0.01$). n = Samples size.

In the rainy season a total of 169 carcasses were used and the mean weight for their hind quarter was 57.76% of the chilled carcass weight while in the post rainy season a total of 96 carcasses were involved. The mean weight for the hind quarter was 61.56% of the cold carcass weight.

There was no hind quarter measurement in 1982. In 1983 measurements were made on 36 carcasses and the mean weight recorded for the hind quarter was 85.35kg representing 48.64% of the cold carcass weight and in 1984 as much as 269 carcasses were involved. The mean hind quarter weight was 111.38kg and this was 57.90% of the chilled carcass weight.

There were no records on lean meat for the year 1982. In 1983 a total of 26 carcasses were dissected. The mean lean weight was as much as 58.85% of the cold carcass weight. In 1984 as many as 70 carcasses were involved representing 44.84% of the cold carcass weight.

DISCUSSION

It is known that livestock, particularly cattle, reared in these warm tropical environments usually gain weight during the rainy season but lose everything during the dry seasons when feed and water become scarce and they have to trek long distances, in most cases under scorching heat, in search of feed and water (Oyenuga 1974; Alaku, 1984; Saeed, Ward, Light, Durkin Wilson, 1987). However some studies on grazing time of herded Bunaji (white Fulani) cattle under settled pastoralist system of the Guinea savanna plains in Nigeria (Bayer and Otchere, 1982) have revealed that the average time spent by a herd outside the camp varied according to the season of the year, being longest (about 11hr) at the end of the dry season around April, and shorter (5hr.29min only) by August which marks the peak of the rainy season. The workers were of the view that the short grazing time during the rainy season may be having some adverse effects on the animals as they are less able to take full advantage of the good quality natural fodder in this season. It has also been observed by Rege, Von Kaufmann and Mani (1993), that grazing in some savanna areas of Nigeria is characterised by being relatively plentiful during the dry season because of the abundant crop residues, field weeds and fallow plots. In the wet season cattle are said to be confined to poor grazing on the hills, away from the cultivated fields. Larmode and Franti (1975) did survey some 1,625 herds among the pastoralists in Nigeria. Prominent among their findings were complaints by the pastoralists that their cattle starved during the rainy season beacuse of restriction of grazing areas by farm lands. A completely different but very important finding by Toure (1990) was that the younger generations of the transhumant pastoralists are no longer keen in herding of stocks. It is very probable that this reluctance could be greater during the rains when the environment is wet and cold. All the above factors could favour slaughtering heavier animals during the dry than during the rainy season.

Another very important factor is that of the presence of itinerant herds from the neighbouring countries of Cameroon, Chad, Niger and even from Mali and the Sudan. It has been observed (Khalil, 1974) that at the peak of the long dry season and also during droughts, cattle herds from these countries migrate into Nigeria. Notable among these herds are the Rahali cattle from the Republic of Niger (Jiya, 1994) which are often located as far down as the sub-humid ecological zones of Benue and Kwara States of Nigeria. These foreign herds arrive Nigeria later in the dry season to graze the areas earlier on vacted by the local herds which had migrated southwards at the onset of the dry season. Much of the devastating overgrazing effects experienced in most parts of northern Nigeria is blamed on this relay grazing that subjects the ecosystems to continous grazing all the year round.

It has been noted (Kano, 1974) however, that these foreign herds directly and indirectly supply at least 25% of Nigeria's annual slaughter cattle. At the peak of the dry season the pastoralists are compelled to reduce their stock size by salvaging particularly the sick and disabled animals that can no longer continue

the seemingly endless trek so that they do not die of starvation and dehydration (FLD, 1984). Alaku and Moruppa (1993) observed that the incidence of carcass and organs condemnations because of tuberculosis in cattle slaughterd for meat in the sub-sahel region of Nigeria was highest during the hot dry, through the rainy, season. All these could explain why heavier cattle were slaughtered during the dry season.

The significant yearly variations in body and carcass traits are familiar phenomena in these areas especially as the period from 1984 to 1985 was yet another drought time in the sub-saharan Africa (Thambyahpillay, 1988). Body and carcas weights were similar for the year 1982 and 1984 Table 2) with the value obtained in 1983 being the lowest.

The Nigerian national benchmark for cattle carcass is 181kg (FOS, 1992). This is comparable to the value 181.86kg obtained in the cold dry season, which was about 7% [illegible] and highly significa[illegible] mean value of 13[illegible] carcass resulting [illegible] widely depending [illegible] breeding (Mc[illegible] sources of differences in body [illegible] traits are some [illegible] transit, which [illegible] 15%, from the [illegible] slaughter abattoir.

Various factors such as gut-fill, degree of fattiness, muscling type and pregnancy (Joo, 1977; Cole and [illegible] influence dressing [illegible] Further, heavily [illegible] dress higher [illegible] those in adverse [illegible] relatively low. [illegible] influencing [illegible] animals is bree[illegible] (Allen, 1984). The heritability of dressing percentage is quite high, 0.6 (Brinks [illegible] and Rendel, 1968). Seasonal variation in lean or muscle as percentage of body or carcass weight cannot here be determined [illegible] the data to some [illegible] It does seem, however, that there exist some yearly variations. In 1983 muscle formed only 28.88% of body and 58.85% of carcass weights but in 1984 the proportion was 23.61% of body and 44.84% of carcass weight. The overall value for muscle in this study was 24.99% of the body weight and 48.72% of the carcass weight.

The calculated percentage of bone to carcass weight for the entire population in this study was 16.78%. This is within the range of 12 to 20 percent in cattle (Cole and Garrett, 1980). The highest values 19.09 and 18.08% recorded in the post rainy and cold dry seasons respectively were apparently at the upper limits of this range. The values 15.66% and 15.53 were recorded in the hot-dry and rainy seasons respectively.It is very apparent that larger carcasses had lower percentage of bones. According to Sonaiya (1982) the desire to satisfy consumer demands and preferences in most countries has led to the development of [illegible] animal and carcass evaluation and [illegible] years. At present, in Nigerian and [illegible] West African sub-region, [illegible] existing grading system [illegible] does not seem to exist [illegible] as regards grade or quality [illegible] immediately after slaughter on [illegible] basis.

[illegible] often, however, workers in Nigeria and the sub-region go ahead to compare the dressing percentages of our unselected and ungraded livestock using the values recorded for the improved exotic breeds. Mostly cattle [illegible] cattle brought at cattle market are compared with the imported breeds which are usually selected in their countries of origin. Such comparisons are [illegible] made when there is at present a lack of detailed information particularly for the indigenous breeds of Africa. In almost all cases the comparisons are made high - lighting the inferiority nature of the carcass traits of the indigenous breeds without regards to the various factors usually applied in the grading systems.

In fact much of the carcasses in this sub-region could rightly be expected to fall within the commercial grade or below as most

of the cattle sold for slaughter are predominantly too old, lean or sick (Baker, 1981). Pullan and Grindle (1980) studies the productivity of the Bunaji cattle in the Jos Plateau of Nigeria and noted that the mean age for slaughter of the male is 5 years and for the female 10 years. These values compare very well with the 6.2 years for male and 9,3 years for female as recorded by Rege *et al.* (1993) who also gave the mean age of cattle sold for slaughter as 8.1 years with such wide age range that some of the animals are as old as 17.4 years at slaughter. These culled animals, when subjected to particularly feeding trials, come up with varied reponses especially in the body weight because of their age differences. For example, Tuthernberg (1976) fed such culls on artificial pastures in the Southern Guinea Savanna of West Africa and recorded high rate of compensatory growth of up to 1500g/day for about 20 days after which the growth rate fell to 500 - 700g/day over the next six months among 5 to 9 years old steers. Saeed *et al.* (1987) also did observe this compensatory growth during periods of adeqate fodder availability, noting that growth rate varies with the age of the animals ranging from 450g/day for calves of 1 to 2 years of age to 650g/day for cattle aged 4.5 to 5 years.

Meaningful comparisons can only be made when all breeds, be they the local or exotic, are subjected to the same treatments from birth till slaughter. In particular, the local zebu should be subjected to appropriate selection and upgrading so that they attain utmost productivity limit. It is only then that the issue of superiority of inferiority can be established.

The results of this study are clear that significant seasonal and yearly variation exist in body, carcass, wholesale, retain cuts weight and also dressing percentage of cattle slaughtered for meat in this sub-saharan environment. Also significant monthly, seasonal and yearly variations have been oberved in volumes of cattle supply for slaughter for meat in Nigeria from 1977 to 1981. The Bauchi Meat Company from where the present study was conducted is a good example of this failure. It only functioned from 1982 to 1984 and indeed this study included all the slaughter carried out by company throughout its existence. Studies such as this should be conducted through many seasons, years and even decades and at various locations in the country concerned. The results, well analysed will help in better planning in terms of efficient labour and other resource utilization. Also a wiser decision could be made on siting canning and other meat processing and storage industries.

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