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Characteristics of cattle carcasses from slaughter areas in the Subprefecture of Napie

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Abstract

With the aim of helping to improve the quality of meat in Côte d'Ivoire, a study was carried out on the carcasses of cattle from the slaughter areas of the Sub-prefecture of Napié. Thus, on all cattle admitted to these slaughter areas, the breed and age were determined by observation; carcass weight was determined using a scale while live weight, carcass conformation, fatness and meat were determined using a grid. With Statistica 7.1 software, the Student t test was used to compare means at the 5% threshold. The results showed Taurine cattle, whose age was between 4 and 8 years, were the most slaughtered (86.06% of the population). Among the bulls killed, females were more numerous (80.56%) than males (19.44%). The average carcass weight (170.86±58.63 kg) of Zebu cattle was significantly higher (P < 0.05) than that of Taurine cattle (100.1±29.67 kg). The carcass yield of Zebus cattle (63.40%) was approximately the same as that of Taurines (63.70%). Carcasses with E conformation were more represented in Taurines (45.24%) while those with S conformation were more represented in Zebus (4.76%). U, R and O conformation carcasses were only represented in taurines with 13.04%, 0.68% and 0.27% respectively. The covered fattening state was the most represented with a proportion of 49.80% among taurines and 4.39% among zebus. The red coloring of the carcasses was the most dominant in Taurines (65.74%) and Zebus (7.97%). Despite the little improved breeding conditions, the quality of beef from the Napie slaughter areas remains satisfactory.

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Introduction

The decade of socio-political crises that the country went through, from 1999 to 2011, significantly affected the agricultural sector in general and the animal resources sector in particular. This resulted in a decline in performance in terms of covering national animal protein needs. In response to this situation which has marked the animal resources sector, the government put in place the Strategic Development Plan for Livestock, Fishing and Aquaculture (PSDEPA 2014-2020). This plan aimed to make the animal resources sector a source of sustainable growth and job creation, in order to contribute to the reduction of extreme poverty and hunger in Côte d'Ivoire. This plan allowed the ruminant sector to experience a slight increase in terms of performance, in the period from 2014 to 2019, where the number of cattle increased from 1,585,585 to 1,694,873 head, an increase of 9%. Cattle production also saw a slight increase of around 7%, from 31,358 tonnes of carcass equivalent in 2014 to 33,558 tonnes of carcass equivalent (TEC) in 2019 (MIRAH, 2022). Despite this progress, Ivory Coast continues to import a large part of its beef consumption and no particular attention is paid to the quality of carcasses in slaughterhouses. Only health checks are carried out regularly (Soro *et al.*, 2024a). Also, no sorting of carcasses is done during slaughter. All carcasses are therefore mixed and sold under the same conditions. However, it is proven that several factors can influence the quality of the carcass.

These factors include the selection of breeding stock, breeding conditions and animal welfare (Couvreur, 2018). According to some authors, age, weight, composition of the ration and finishing time can have an effect on the quality of the carcass (Gagaoua *et al.*, 2018; Nogalski *et al.*, 2018). Soulat *et al.* (2022) even indicate that age is the factor that would have a greater influence on carcass quality.

These works highlight the importance of awareness if we obtain quality meat. According to Interbev (2017) and JORF (2018), if the beef industry is to develop, new strategies must be put in place to meet consumer expectations. It therefore appears imperative to determine the quality of the carcasses of cattle slaughtered on slaughter areas. An evaluation of this will make it possible, on the one hand, to make categorized meats available to populations where everyone can make their choice according to their expectations and, on the other hand, to fill the data gap in this area.

Material and methods

Material

Biological material

The biological material consisted of cattle transported to the Napié slaughter areas. These cattle all come from sedentary livestock farms in the sub-prefecture of said city.

Technical equipment

The technical equipment used consisted of, on the one hand, sheets containing the rating criteria for different parameters and, on the other hand, measuring and restraint equipment.

As for the measuring equipment, it consisted of Livestock Weight Measuring Tape (Kamer brand zoometric tape in kg, length: 2.5 m) and a 200 kg capacity scale from Hanging Scale. It was also composed of stamps and ink to stamp the inspected carcasses; latex gangs, a white coat and a pair of boots to protect against dirt.

Methods

Sampling

The assessment of the condition of the carcasses was carried out on all cattle admitted to the Napie slaughter area. This study, which was carried out over 4 months, from January 2 to April 30, 2023, made it possible to record 251 heads of slaughtered cattle.

Determination of breed, sex and age

Information relating to these parameters was collected using the sheets developed for this purpose. Thus, the sex and breed were determined just before the slaughter of the animals, as soon as they arrived at the slaughter area.

The age of the cattle was determined by observing the dentition (incisors) according to (Ibrahim, 1990). To observe this, the animal's mouth was kept open after slaughter and the teeth were observed.

Estimated live weight
To estimate live weight, the cattle were held at the withers and a tape was used to measure the chest circumference. Then, the Crevat formula (cited by Touré *et al.*, 2017), below, was used. The coefficient (a) used in this formula is shown in Table 1.

$P = a \times Pth3$, with: P = weight in kg; Pth = thoracic perimeter in meters; a = coefficient depending on the animal.

Collection of data relating to carcass quality
Determination of carcass weight and carcass yield
The ante-mortem inspection was carried out directly on the slaughter area. The slaughters were carried out between 6 a.m. and 4 p.m. The dressing was carried out on site thanks to the various operations carried out on the cattle (skinning, evisceration).

After the inspection, the hot carcasses were weighed using a scale. As for the carcass yield, it was obtained by making the ratio between the weight of the carcass and the weight before slaughter.

Determination of conformation, fattening state and coloring of the carcass
The conformation of the carcass was determined according to Regulation (EC) No. 1249/2008 of the European Commission. It was expressed according to the SEUROP grid.

Fat gain was determined according to a 5-level grid from the European Commission (EC, 2008). The criterion corresponds to the quantity of fat visible outside and inside the carcass. Each level was represented by a number ranging from 1 to 5. The color criterion is classified according to a 4-level grid. Each level is represented by a number. The color of each carcass was therefore determined according to this grid.

Statistical analyzes
After collection, the data collected was processed with the Excel spreadsheet version 2016 which was used for data entry and plotting the histograms. The data relating to carcass weight were analyzed with Statistica 7.1 software and the Student's t test was used to make comparisons of means at the threshold of 0.05.

Results
Characteristics of cattle in Napie
Breeds and sex of cattle
Table 2 presents the breeds and sexes of cattle (Taurin and Zebu) which were slaughtered on the Napie slaughter areas. Bull cattle were the most slaughtered, with 86.06% of the population compared to 13.94% of Zebus cattle. Among the bulls killed, females were more numerous (80.56%) than males (19.44%). However, among Zebus cattle, males were more slaughtered (65.71%) than females (34.29%).

Table 1. Values of the coefficient a for the zebu and the bullfighter.

	Type of animal	Value of coefficient a
Zebu	Bulls	73 < a < 83
	Oxen	70 < a < 76
	Cows	72 < a < 82
Taurine	Pth < 1,4 m	a = 80
	1,4 m < Pth < 1,6 m	a = 75
	Pth > 1,6 m	a = 70

Age of cattle
Table 3 shows the age classes of cattle slaughtered in the Napie slaughter areas. Taurine cattle aged between 4 and 8 years were the most slaughtered, with 60.05% for females and 12.03% for males. However, among Zebus, males of age class]8; 10+] were more dejected (42.85%).

Characteristics of cattle carcasses
Average carcass weight
Table 4 shows the different average carcass weights of cattle slaughtered in the Napie slaughter areas. The average carcass weight (170.86 ± 58.63 kg) of Zebu cattle was significantly higher (P < 0.05) than that of Taurine cattle (100.1 ± 29.67 kg). Within the Zebu breed, males had a significantly higher mean carcass weight (190 ± 58.62 kg) (P < 0.05) than that of females (164, ± 38.95). The same observation was made among Taurines, with respectively 123.8 ± 42.99 kg for males and 94.36 ± 22.05 kg for females.

Table 2. Breeds and sexes of cattle.

Breeds	Sexes	Workforce	Pourcentage (%)	Workforce	Pourcentage (%)
Taurine	Male	42	19,44 %	216	86,06 %
	Female	174	80,56 %		
Zebu	Male	23	65,7 %	35	13,94 %
	Female	12	34,3 %		

Table 3. Age class of cattle.

Breeds	Sexes	Age classes	Workforce	Pourcentage selon la race
Taurine	Male	]0 ; 3]	4	1,85 %
		[4 ; 8]	26	12,03 %
		]8 ; 10+]	12	5,55%
	Female	]0 ; 3]	16	7,4 %
		[4 ; 8]	147	60,05 %
		]8 ; 10+]	11	5,09 %
Zebu	Male	[4 ; 8]	8	22,85 %
		]8 ; 10+]	15	42,85 %
	Female	[4 ; 8]	10	28,57 %
		]8 ; 10+]	2	5,71 %

Carcass yield
Fig. 1 shows the carcass yield of cattle slaughtered in the Napie slaughter areas. The carcass yield of Zebus cattle (63.40%) was approximately the same as that of Taurines (63.70%). Zebus males had a higher carcass yield (73.38%) than that of Taurines (56.87%). The opposite observation was observed among taurines where females recorded a higher yield (70.53%) than males (53.41%).

Carcass conformation
Table 5 shows the distribution of carcass conformations of slaughtered cattle. Carcasses with E conformation was more represented in Taurines (45.24%) while those with S conformation were more represented in Zebus (4.76%).

Among taurine females, E conformation carcasses were more numerous (24.59%) than those from males (20.65%). As for Zebus, the carcasses of males with E conformation represented 1.49% of the carcasses compared to 0.68% for those of females. U, R and O conformation carcasses were only represented in taurines with 13.04%, 0.68% and 0.27% respectively.

Table 4. Average carcass weights of cattle.

Breeds	Sexes	Average carcass weights	
Taurin	Male	123,8 ± 42,99a	100.09 ± 29,67c
	Female	94,36 ± 22,05a	
Zebu	Male	190 ± 58,62b	170.85 ± 58.63c
	Female	164, ± 38,95b	

NB: Values in the same column with the same letter are significantly different (P < 0.05).

Fattening state of the carcass

Table 6 shows the distribution of fattening states of cattle carcasses in the slaughter areas of Napie. The covered and fatty fattening states were the most represented. Indeed, the carcasses of taurine cattle which presented a covered fattening state had a higher proportion (49.80%) followed by the fatty fattening state (13.95%). The same was true for Zebus carcasses, with 4.39% and 3.58% respectively. Considering the sex, the carcasses of female taurines presented in these same fattening states the highest rates with 41.83% for the covered fattening state and 10.36% for the fat fattening state. However, among Zebus, it was the carcasses of males which recorded the highest rates with 3.59% for the covered fattening state and 1.99% for the fat fattening state.

Table 5. Conformation of the carcasses of the cattle studied.

Conformations		Taurine		Zebu	
S	Male	17,93%	33,29%	3,40%	4,76%
	Female	15,36%		1,36%	
E	Male	20,65%	45,24%	1,49%	2,17%
	Female	24,59%		0,68%	
U	Male	3,26%	13,04%	0,13%	0,54%
	Female	9,78%		0,41%	
R	Male	0,14%	0,68%	0	0
	Female	0,54%		0	
O	Male	0	0,27%	0	0
	Female	0,27%		0	
P	Male	0	0,00%	0	0

Carcass coloring

Table 7 presents the different colorings of cattle carcasses in the slaughter areas of Napie. The red coloring of the carcasses is the most dominant. Among the Taurines, 65.74% of the carcasses and 7.97% of the Zebus carcasses had red coloring. Within the bullfighting breed, it was the carcasses of females (51%) which had more red coloring than those of males (14.74%). However, within the Zebus breed, red coloring dominated the carcasses of males (5.58%) than those of females (2.39%).

Discussion

Characteristics of cattle

The average carcass weight (170.86 ± 58.63 kg) of Zebu cattle was significantly higher ($P < 0.05$) than that of Taurine cattle (100.1 ± 29.67 kg).

Table 6. State of fattening of cattle carcasses.

Fattening state		Taurine		Zebu	
Skinny	Male	0,00%	8,37%	0,80%	2,00%
	Female	8,37%		1,20%	
Little coverage	Male	0,00%	7,57%	1,20%	1,60%
	Female	7,57%		0,40%	
Covered	Male	7,97%	49,80%	3,59%	4,39%
	Female	41,83%		0,80%	
Fat	Male	3,59%	13,95%	1,99%	3,58%
	Female	10,36%		1,59%	
Very fatty	Male	5,18%	6,38%	1,59%	2,36%
	Female	1,20%		0,80%	

These results are lower than those of (Sossa, 2020) who report an average carcass weight of 194.30 ± 29.01 kg in zebu cattle. This difference can be explained by factors such as genetic characteristics, feeding and rearing practices, and specific study conditions, highlighting the importance of variations

between study populations and methodologies. used. Males had mean carcass weights (190 ± 58.62 kg for Zebus and 123.8 ± 42.99 kg for bulls) significantly higher (P < 0.05) than those of females (164, ± 38. 95 for Zebus and 94.36 ± 22.05 kg for bulls). This difference could be explained by the genetic potential available to males. Indeed, due to their physiology,

males have a propensity to build muscle. According to Blagna *et al.*, (2022), growth between the sexes is justified by a pronounced sexual dimorphism observed in favor of the male. This same observation was made by Koussou *et al.* (2017) which reports superior growth and size of males over females.

Table 7. State of coloring of cattle carcasses.

Coloration	Sexe	Taurine			Zebu		
		Workforce	Pourcentage (%)		Workforce	Pourcentage (%)	
White	Male	0	0,00	1,99	2	0,80	2
	Female	5	1,99		3	1,20	
Light pink	Male	0	0,00	5,98	5	1,99	2,39
	Female	15	5,98		1	0,40	
Pink	Male	5	1,99	12,35	2	0,80	1,6
	Female	26	10,36		2	0,80	
Red	Male	37	14,74	65,74	14	5,58	7,97
	Female	128	51,00		6	2,39	

Characteristics of cattle carcasses

The carcass yield of taurine cattle (63.70%) was substantially identical to that of zebu cattle (63.40%). However, it should be noted that male taurines had a lower carcass yield (56.87%) than zebu males (73.38%). As for the taurine females, they had a carcass yield of (70.53%) and (53.41%) for the zebu females. The difference in carcass yields could be explained by breeding conditions, measurement

methods and environmental contexts (rainy season, dry season). This result is consistent with the observations of Sanfo *et al.* (2010) who studied cattle carcass yields noted the influence of age, sex and body condition on these yields.

Carcasses of conformation E were more frequent in taurines (45.24%), while carcasses of conformation S were more represented in zebu (4.76%).
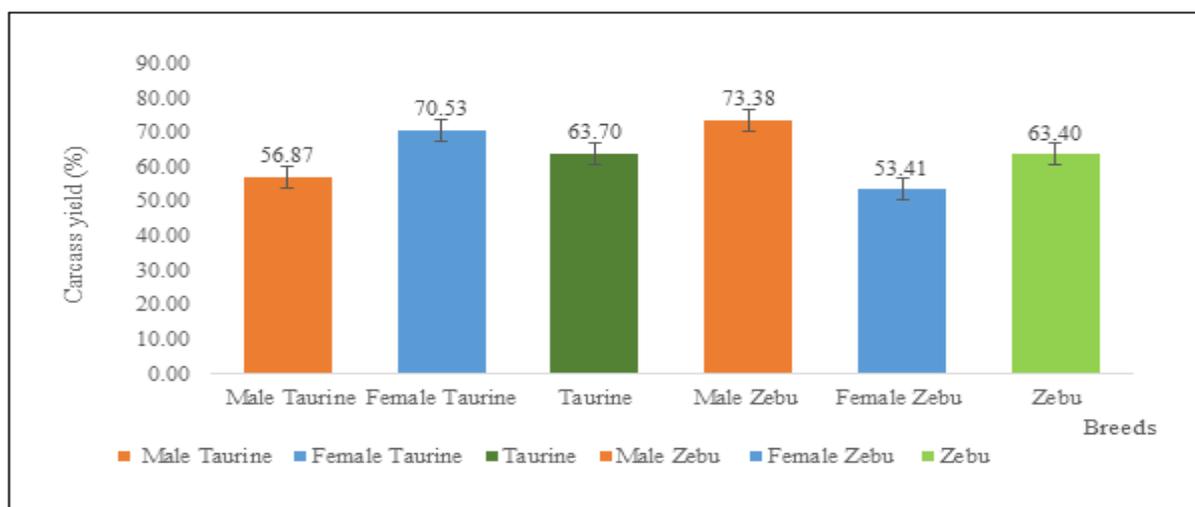

Fig. 1. Cattle carcass yields.

This indicates that taurines have genetic characteristics and breeding practices favoring better carcass conformation. These differences have

important implications for meat quality and farm profitability. The covered and fatty fattening states were the most represented. The carcasses of

bullfighting cattle had a covered fattening state of 49.80% and a fatty fattening state of 13.95%. Zebus carcasses recorded, for the same fattening states, 4.39% and 3.58% respectively. These fattening conditions would be due to the breeding system and the remarkable capacity of our taurine breeds and Zebus has adapted to difficult breeding conditions. Indeed, breeding on natural pasture, very often without supplementation, is the herd management method par excellence in the study area (Soro *et al.* 2023; 2024). However, this method of breeding does not allow a significant deposition of tissues, especially adipose, because of the long walks that the herds make in search of pastures and the poverty of said pastures.

According to Nicolazo de Barmon *et al.* (2022), supplementation and breeding practices such as energy intake, duration of finishing and the protein level of the ration are factors that allow a significant deposition of fat in the carcass. Most carcasses had red coloring, with respectively 51.00% for females and 14.74% for males. Carcass color can be influenced by several factors. The zebu and bullocks were mainly grass-fed which could be the cause of the darker meat color. According to Sanogo *et al.* (2014), diet and production methods significantly influence the color and organoleptic qualities of beef.

Conclusion

This study carried out on the Napie slaughter areas on the condition of cattle carcasses highlighted the quality of the carcasses. Bull carcasses had a lower average carcass weight (100.09 ± 29.66 kg) than that of zebu (170.86 ± 58.63 kg). Carcasses of conformation E were more frequent in taurines (45.24%) while those of conformation S were more represented in zebus (4.76%). In terms of fattening state, carcasses with a covered fattening state were the most common in taurines (49.80%) and in zebus (The same was true for Zebus carcasses, with respectively (4.39%) The red color predominated among the carcasses of taurines (88.10%) and zebu (60.87%). Regarding carcass yield, zebu had a carcass yield of 63.40. %) substantially identical to that of

Taurines (63.70%). In view of these results, a study could be carried out on all the slaughterhouses in the main towns of Côte d'Ivoire to determine the quality of the carcasses which reach consumers.

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