

Original Research Article

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Evaluation of the Morphological Characteristics of Cattle on Slaughter Areas in the North of Ivory Coast

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ABSTRACT

This study was carried out in the slaughter areas of the city of Napiéin order to evaluate the morphological characteristics and condition of cattle carcasses. To achieve this, different parameters were determined on the cattle admitted to slaughter. Thus, the sex and breed was determined by visual observation, the body condition score and the condition of the carcasses (state of fattening, conformation, coloring, carcass weight and yield) were assessed according to rating grids. Concerning live weight and carcass weight, they were estimated respectively using a Livestock Weight Measuring Tape and scale. The results showed that the cattle most slaughtered in the slaughter areas of Napie were taurines with 86.06% of the numbers slaughtered, the majority of which (68.92%) had an age between [4; 8 years]. The average body condition score of Zebu cattle (4.07 ± 0.47), the average live weight (255.08 ± 87.94 kg) was significantly higher ($P < 0.005$) than those of Taurine cattle ($3, 24 \pm 1.56$ for body condition score and 175.76 ± 44.50 kg for live weight). Taurine males also had an average live weight (217.68 ± 40.11 kg) significantly smaller than that of Zebus (133.84 ± 26.55). In view of these values, it appears that the animals slaughtered in the slaughter areas of the city of Napié have high quality carcasses. However, a study carried out throughout the year will confirm these results.

Keywords

Cattle, breeds, slaughterhouse, Napie, modern breeders

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Introduction

Unlike other West African nations, Ivory Coast does not have a pastoral vocation, although ruminant breeding is increasingly integrated into the economic diversification strategies of certain populations. Rather than being a country with a pastoral vocation, Ivory Coast welcomes

more seasonal transhumant border animals. The production of ruminants, such as cattle, saw a significant increase of 33% between 2011 (local meat production increased from 47,000 to 63,000 tonnes) and 2019 (16,000 tonnes carcass equivalent). Over this period, the number of cattle increased from 1,145,000 to 1,611,494 head, recording an increase of 71.05% (MIRAH, 2022).

Although ruminant breeding is spread across the entire territory, the north of the country has a significant share, representing 40% of the population (MIPARH, 2014). Livestock practices include extensive, sedentary or transhumant modes (Soro, 2021), involving both traditional sedentary and modern breeders, including Ivorian and Sahelian producer's resident in Côte d'Ivoire (FAO, 2017).

Despite production efforts in the cattle sector, the Ivorian market's self-sufficiency in large ruminant meat is around 40 to 50%, and the country remains an importer of animals.

The animals sold come from both national production and imports from Mali, Burkina Faso and Niger. Pastoralists decide to sell part of their herd to meet household needs (food, health, children's education, clothing, celebrations, etc.) (FAO, 2017).

The animals least useful to herds are often sold in these conditions and this leads to heterogeneity in terms of age and physiological stages. Also, the diversity of breeding practices and breeds leads to heterogeneity of batches, thus impacting the quality of slaughter products.

Given that quality constitutes a major challenge for producers and processors, subject to local and international requirements (Dognon *et al.*, 2018), taking this categorization into account could encourage breeders to aim for quality and offer population with healthy meat adapted to their financial means. It is in this context that the present study was initiated in the sub-prefecture of Napié. Its general objective is to contribute to improving the quality of beef in Ivory Coast.

Materials and Methods

Biological material

The biological material consisted of the different breeds of cattle transported to the Napié slaughter areas. These are taurine and zebu breeds.

Technical equipment

The technical equipment used consisted of sheets containing the rating criteria for different parameters and measurement and restraint equipment. The sheets used as part of this study related to the collection of data on the

slaughter areas. As for the measuring equipment, it consisted of a Livestock Weight Measuring Tape (Kamer brand zoometric tape in Kg, length: 2.5 m) and a 200 kg capacity scale from Hanging Scale with a precision of 0.1 kg.

As for the rest of the equipment, it consisted of a knife with a wide, sharp blade, stamps and ink for the stamp to certify that the meat inspected was fit for human consumption; of latex gang, a white coat and a pair of boots to protect against dirt and display good propriety at work.

Sampling

The evaluation of the morphological characteristics and the condition of the carcasses was carried out on all the cattle admitted to the Napié slaughter area, for 4 months (from January 2, 2023 to April 30, 2023. During this sampling 254 Heads of slaughtered cattle were recorded.

Collection of data relating to morphological characteristics

To collect data on the morphological characteristics and condition of the carcasses, sheets designed for this purpose were used. These individual sheets essentially included information on the age, breed and sex of the animals and the various body condition scores.

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 to determine the weight of the animal was used (Lecomte *et al.*, 2002). It is a method of estimating live weight from measurements taken on the living animal.

$P = a \times Pth^3$, with: P = weight in kg; Pth = thoracic perimeter in meters; a = coefficient depending on the animal.

According to this method the coefficient (a) is obtained in table I below.

Cattle body condition score

Body condition assessment was carried out just before slaughter using the method described by Vall (2020). The

body condition of the animal was assessed on a score of 0 for a cachectic animal to 5 for a very fatty animal.

Determination of breed, sex and physiological stage of cattle

Information relating to these parameters was collected using the sheets developed for this purpose. Thus, the sex, breed and physiological stage were determined just after the slaughter of the animals, as soon as they arrived at the slaughter area. Due to crossbreeding due to varying degrees of crossing, only two breeds were considered (bull breed and zebu breed).

Age determination

The age of the cattle was determined by observing the dentition (incisors) according to [Ibrahim \(1990\)](#). To observe this, the animal's mouth was held open after slaughter and the teeth were observed. For better categorization of animals, three age classes have been defined as follows:] 0; 3 years] ; [4; 8 years] and]8; 10 years and over].

Results and Discussion

Characteristics of cattle

Breeds and sex of cattle

Table II presents the breeds and sexes of cattle slaughtered on the Napié slaughter areas. Taurine cattle were the most slaughtered with 86.06% of the population compared to 13.94% of Zebus cattle.

Among the bulls killed, females represented 80.56% and males 19.44%. However, among Zebus cattle 65.71% were males and 34.29% females.

Age of cattle

Table III shows the age classes of cattle slaughtered in the Napié slaughter areas. Taurine cattle aged between 4 and 8 years were the most slaughtered (68.92%) compared to Zebus (7.2%). Within each race, females were the most represented.

However, taurine females of this class had a higher proportion (58.6%) than that of Zebus females (4.0%). The same observation was made among males, with respectively 10.4% for Taurines and 3.2% for Zebus.

Average live weight of cattle

Table IV shows the different average live weights of cattle slaughtered in the different slaughter areas of Napié. The average live weight (175.76 ± 44.50 kg) of Taurines was significantly smaller ($p < 0.05$) than that of Zebus (255.08 ± 87.94 kg). Taurine males also had an average live weight (217.68 ± 40.11 kg) significantly smaller than that of Zebus (133.84 ± 26.55). On the other hand, the comparison did not reveal a significant difference ($p > 0.05$) between females, with respectively 133.84 ± 26.55 kg for Taurines and 251.25 ± 89.11 kg for Zebus.

Bull Body Condition Score

Table V shows the different body condition scores of Taurines slaughtered in the Napié slaughter areas. Taurines had a significantly lower mean body condition score (3.24 ± 1.56) ($p < 0.05$) than Zebus (4.07 ± 0.47). Zebus males recorded a mean body condition score (4.15 ± 0.41) significantly higher ($p < 0.05$) than that of females of the same breed which was 3.39 ± 0.53 . The same observation was made among females, with respectively 3.2 ± 1.72 for Taurines and 3.92 ± 0.55 for Zebus.

The breed of cattle most slaughtered in the Napié slaughter areas was the taurine breed. The taurine breed represented 86.06% of slaughters while Zebu cattle only accounted for 13.94%. This predominance of the taurine breed is explained by its adaptation to local conditions, its economic prevalence and by cultural preferences. On the other hand, the number of Zebus slaughtered is lower due to adaptation difficulties and the very high purchase price. However, certain studies ([Soro et al., 2023](#)) carried out in the north of the country showed that livestock in this area were mainly made up of zebus (94.11%).

According to these authors, the presence of zebus on livestock farms could be explained by their good butchery potential and their large sizes. The presence of other breeds, although in the minority, would indicate a desire by breeders geared towards dairy production. Within the bullfighting breed, females (80.6%) were more slaughtered than males (19.4%). This situation could be explained by the fact that males are castrated at a young age and used for harness farming. Indeed, the sub-prefecture of Napiéis located in an area with high agricultural production and harness cultivation is the means par excellence used for plowing ([Yéo, 2022](#)).

Table.1 Values of the coefficient a for the Sudanese Fulani zebu and the N'Dama bullfighter

	Type of animal	Coefficient value a
Sudanese Fulani Zebu	Bulls	73 < a < 83
	Oxen	70 < a < 76
	Cows	72 < a < 82
Taurin N'Dama	Pth < 1,4 m	a = 80
	1,4 m < Pth < 1,6 m	a = 75
	Pth > 1,6 m	a = 70

Source : Lecomte *et al.*, (2002)

Table.2 Breeds and sexes of cattle

Breeds	Sexes	Workforce	Percentage	Total	Percentage
Taurin	Male	42	19,4 %	216	86,06 %
	Female	174	80,6 %		
Zebu	Male	23	65,7 %	35	13,94 %
	Female	12	34,3 %		

Table.3 Age class of cattle

Breeds	Sexes	Workforce	Age classes	Workforce	Pourcentage (%)
Taurin	Male	42	]0 ; 3]	4	1,59
			[4 ; 8]	26	10,4
			]8 ; 10+]	12	4,8
	Female	174	]0 ; 3]	16	6,4
			[4 ; 8]	147	58,6
			]8 ; 10+]	11	4,4
Zébu	Male	23	]0 ; 3]	0	0,0
			[4 ; 8]	8	3,2
			]8 ; 10+]	15	5,98
	Female	12	]0 ; 3]	0	0,0
			[4 ; 8]	10	4,0
			]8 ; 10+]	2	0,8

Table.4 Average live weight of cattle

Breeds	Sexes	Average live weight	
Taurin	Male	217.68±40.11a	175.76±44.50b
	Female	133.84±26.55a	
Zebu	Male	258.91±89.22	255.08±87.94b
	Female	251.25±89.11	

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

Table.5 Cattle body condition score

	Sex	Body Condition Score	Average
Zebu	Female	3.91 ± 0.55	4.07± 0.47a
	Male	4.15 ± 0.41	
Taurin	Female	3.19 ± 1.72	3.23 ± 1.56a
	Male	3.39 ± 0.53	

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

The average live weight of zebu cattle (255.08 ± 87.94 kg) was significantly higher (p < 0.05) than that of taurine cattle (175.76 ± 44.50 kg). Zebus have a significantly higher average live weight than bulls due to several factors. Genetically, zebu are larger and accumulate more body mass.

Their adaptability to harsh environments and their ability to make use of nutrient-poor pastures allow them to maintain a high weight even in unfavorable conditions. In addition, zebus, well adapted to hot and arid climates, maintain better physical condition compared to taurines, more sensitive to climatic and environmental variations.

Our results differ from those of [Sossa \(2020\)](#), who reported an average weight of 354 ± 52.85 kg for zebus, and those of [Akouango \(2014\)](#), who found a weight of 255.1 ± 2 kg for male taurine cattle and 249.7 ± 26 kg for females in Congo.

The average body condition score of zebu cattle (4.07 ± 0.47) was significantly higher than that of taurine cattle (3.24 ± 1.56). Our results differ from those reported by [Djikeng et al., \(2021\)](#) who found a body condition score of 3.54 in Gobra zebus and 3.40 in N'dama bulls.

This divergence may be due to three main reasons: more favorable management and feeding practices for zebu, their better adaptability to harsh environments and their resilience to seasonal variations which allows them to maintain good physical condition all year round.

At the end of this study on the morphological characteristics and condition of cattle carcasses in the slaughter areas of Napié, bulls were the most slaughtered, with a total of 216 individuals (86.06%), compared to 35 zebus (13.96%).

Among the bullfighters, those aged 4 to 8 years represented the majority (80.09%). The average live

weight (175.76 ± 44.50 kg) of Tauins was significantly smaller (p < 0.05) than that of Zebus (255.08 ± 87.94 kg). Taurine males also had an average live weight (217.68 ± 40.11 kg) significantly smaller than that of Zebus (133.84 ± 26.55).

The carcass yield of Zebus cattle (63.40%) was higher than that of Taurines (63.70%). Carcasses of excellent conformation (E) were more represented in Taurines (45.24%) than in Zebus (2.17%).

Additional studies should be carried out throughout the region and assess the organoleptic and biochemical quality of beef.

Author Contributions

Soro Soronikpoho: Investigation, formal analysis, writing—original draft. Kouadio Kouakou Parfait: Validation, methodology, writing—reviewing. Aboly Bosson Nicolas:—Formal analysis, writing—review and editing. Brou Messoum N'guettia Ghislain: Investigation, writing—reviewing. Brou Konan Gboko Gatién: Resources, investigation writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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