



Racial Composition and Structure of the Cattle Herds of the Massa Agro-Breeders in the Moulkou and Djarwaye Zone of Mayo-Boneye, Chad

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ABSTRACT

Objective: The objective of this study was to determine the racial composition and structure of the cattle herds of Massa agro-breeders in the Department of Mayo-Boneye.

Methodology and Results: across-sectional and retrospective survey was carried out among 319 agro-breeders in three (3) cantons and nine (9) villages. The vast majority of agro-breeders (86.52%) claimed that the local Massa breed has existed since the origin of the ethnic group. The breed is present in the Mayo Boneye in Chad and in the Department of Mayo Danay in Cameroon. In Chad, the Massa and Toupouri of Mayo-Kebbi East Province breed it. Herds consist in only of local breed are the majority (67.40%, n=215), against mixed and composed of several cattle breeds (32.60%, n = 104). The average herd size was 16.63 ± 0.74 heads and about 3/4 of the numbers were females.

Conclusion and Application of Results: The breeding of Massa breed remains an activity of choice for agro-breeders. Females accounted for the largest proportion of herds. This activity remains the basis for the development of agro-breeders. Phenotypic and genotypic characterization of this breed would make it possible to estimate the degree of miscegenation to undertake improvement and conservation programs. This would allow the perpetuation of this genetic resource well adapted to its environment.

Keywords: Cattle breeding, Racial composition, herd structure, Mayo-Boneye, Chad.

RESUME

Objectif : L'objectif de cette étude a été de déterminer la composition raciale et la structure des troupeaux bovins des agro-éleveurs Massa dans le Département du Mayo-Boneye.

Méthodologie et Résultats : une enquête transversale et rétrospective a été réalisée auprès de 319 agro-éleveurs répartis dans trois (3) cantons et neuf (9) villages. La grande majorité des agro-éleveurs (86,52%) a affirmé que la race locale Massa existe depuis l'origine de l'ethnie. La race est présente dans le Mayo Boneye au Tchad et dans le département du Mayo Danay au Cameroun. Au Tchad, elle est élevée par les Massa et les Toupouri de la Province du Mayo-Kebbi Est. Les troupeaux constitués uniquement de la race bovine locale sont majoritaires (67,40%, n = 215), contre ceux mixtes et composés de plusieurs races bovines (32,60%, n = 104). La taille moyenne des troupeaux a été de $16,63 \pm 0,74$ têtes et environ $\frac{3}{4}$ des effectifs étaient des femelles.

Conclusion et Application des Résultats : L'élevage de bovins de race Massa reste une activité de choix des agro-éleveurs. Les femelles ont représenté la plus grande proportion dans les troupeaux. Cette activité reste la base du développement des agro-éleveurs. Une caractérisation phénotypique et génotypique de cette race bovine permettrait d'estimer le degré de métissage en vue d'entreprendre des programmes d'amélioration et de conservation. Ce qui permettrait la pérennisation de cette ressource génétique bien adaptée à son environnement.

Mots clés : Élevage bovin, Composition raciale, structure troupeau, Mayo-Boneye, Tchad.

INTRODUCTION

Cattle farming is one of the main components of agricultural production (agriculture and livestock) in Africa (Diawara *et al.*, 2017; Mopaté *et al.*, 2019; Assadi *et al.*, 2022). It is a source of income diversification for rural and peri-urban households (FAO, 2012), despite the very poor zootechnical performance of animals (Tellah *et al.*, 2015; Houndjo *et al.*, 2018; Tellah *et al.*, 2019). In Chad, the herd consists of cattle, camels, small ruminants, pigs, and poultry (MERA 2017; Mopaté *et al.*, 2020). This polyculture creates social, economic, and environmental dynamics (Guérin *et al.*, 2014). In Mayo-Boneye, the cattle herd is estimated at 1,103,523 head out of the 24,892,098 head in Chad (MERA, 2015). Livestock generates more than 1000 billion CFA francs from the public treasury. It contributes 18% to the national GDP (MERA, 2017). Cattle farming thus contribute to ensuring the food security of populations (Tellah, 2016; Koussou *et al.*, 2017). However, this breeding is still practiced in a traditional system characterized by the irregularity of fodder availability, difficulties of access to veterinary inputs (veterinary care), and a weak

technical framework negatively impacting the productivity of the herds. However, cattle raised in Chad perform poorly due to poor breeding behavior and difficult rearing conditions (Tellah, 2016). Bred bovine species are particularly attached to a region corresponding to agroecological zones or pastoralist communities (ME, 2003). The dominance of the local breed in a breeding area is due to the better adaptability of the local cattle to the conditions of breeding (Bousbia *et al.*, 2010). The Massa or Toupouri breed (Beef of Logone) has an important commercial and social role (dowry) with breeders, and seems to be on the verge of extinction as: the consequence of uncontrolled crosses (Martin *et al.*, 1996). Thus, the socio-economic reasons for this breed would suggest that it have existed since the origin of these natives (Massa and Toupouri). The mixing of cattle breeds in herds due to their extensive nature is a factor promoting genetic erosion. The assessment of the level of this phenomenon, by a study of the racial composition in the herds, is amply justified. Thus, this study would make it possible to establish the racial composition of

sedentary cattle herds in the Department of Mayo Boneye to estimate the degree of absorption of the local cattle breed (pout Masada). The objective of this study was to

MATERIALS AND METHODS

Description of the study area: The study was conducted in the sub-prefectures of Samga (Djarwaye) and Moulkou in Mayo Boneye, one of the four departments of Mayo-Kebbi East Province and having as its capital the city of Bongor. Distanced by 235 km from the capital of Chad, it is located between 10° 17' north and 15° 22' east on the banks of the Logone River and opposite (16 Km) Yagoua (Cameroonian city). This Province covers an area of 18,186 km² with a population estimated in 2009 at 769,198 habitants with a density of 42 habitants / km² (INSEED, 2009). It is located in the Sudanese zone with two seasons including a dry season (late October – April) and a rainy season (May-early October) with an annual rainfall of between 800 and 1200 millimeters of rain per year. Assadi *et al.* (2022) previously described this area.

Sampling and data collection: A cross-sectional and retrospective survey was conducted among 319 agro-pastoralists in three (3) cantons and nine (9) villages in the study area. GPS (Global Positioning System) surveys of the various sites were carried out.

RESULTS

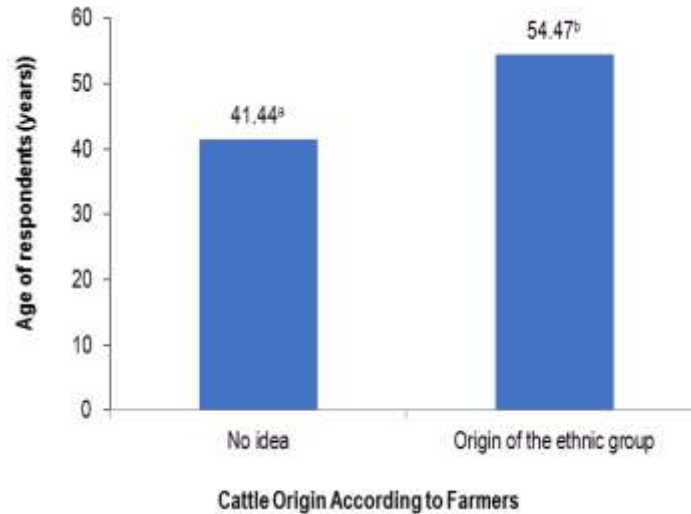
Origin and geographical area of the Massa breed: A large majority of agro-breeders (86.52%, n = 276) claimed that the local Massa breed has existed since the origin of the ethnic group, while a minority (13.48%, n = 43) has

determine the racial composition, origin, and structure of cattle herds in Mayo-Boneye, Chad;

Only elderly people engaged in dwarf cattle breeding were surveyed on a voluntary basis. The survey was conducted by direct interview using a survey sheet from September to October 2021. The information sought focused on the socio-professional profile of the agro-breeders surveyed, the racial composition, the origin, the geographical range, and the structure of the herds in the households of the Massa dwarf cattle.

Statistical method: Data were analyzed using XL-STAT software (6.1.9). Descriptive statistics provided dispersion parameters (mean, standard deviation, extremes, and frequency) and an analysis of variance (ANOVA) was performed to compare the means. The parameters measured covered the age of the respondents, the origin, and geographical area of the cattle breed, the racial composition, and the structure of the cattle herds of the Massa agro-breeders. The comparison of means (multi-factor ANOVA) was made with the Newman Keuls test at the 5% threshold.

no idea of the origin of this cattle breed. Those who reported the existence of this cattle since the origin of the Massa ethnic group were significantly ($p < 0.05$) older than the second (**Figure 1**).



Different letters on the bars indicate a significant difference at the 5% threshold.

Figure 1: Origin of Massa Breed by Age of Agro-breeders

The large proportion of agro-breeders surveyed (81.19%, n = 259) recognize the existence of this breed both (cite the corresponding Province) in Northern Cameroon and in the Province of Mayo-Kebbi East in Chad. This space corresponds to the geographical area of distribution of the Massa and Toupouri ethnic groups that raises it. In addition, those who claimed its presence only in Chad were in the minority (18.81%, n= 60).

This breed known as the "Pout Masada" in the Massa language is bred in Chad by the Massa (57.23%, n= 182) and the Toupouri (42.77%, n= 136%).

Racial composition of the cattle herds of Massa agro-breeders : Mixed herds, composed of several cattle breeds, constituted 32.60% or 104 farms and those consisting only of the local cattle breed are in the majority (67.40%) or 215 owners (**Figure 2**).



Figure 2: Mixed herd composed of several breeds (Photo 1) and a herd composed mainly of the local Massa breed (Photo 2)

The average number of Massa breed in the herds surveyed was significantly higher ($p < 0.05$) than those of other breeds (Table 1).

Table 1: Average Racial Composition of Bovine Herds in the Study Area

Breed	Minimum	Means ± Standard Deviation	Maximum
Arab Zebu	1.00	2.80 ± 0.17a	10.00
M'Bororo Zebu	1.00	2.25 ± 0.17a	15.00
White Fulani Zebu	1.00	2.48 ± 0.19a	1 15.00
Massa breed (Local Breed)	1.00	13.93 ± 0.63b	69.00

The average herd size of Massa agro-breeder's cattle was 16.63 ± 0.74 head (mini. = 1; max = 75). It varied according to the Sub-prefectures (Table2). It was significantly higher ($p < 0.05$) among agro-breeders in Moulkou Sub-prefecture and low in Samga ($p < 0.05$).

Table 2: Change in average herd size and proportion of local breed (%) in the households surveyed

Sub-prefecture	Average number (N)	Local breed number (n)	Local Breed (%)
Samga	12.26 ^a	10.64 ^a	86.79 ^a
Moulkou	20.58 ^b	16.91 ^b	82.17 ^a

In the two (02) sub-prefectures, the proportion of the local breed dominated that of the other breeds with a slight superiority in Samga, with no significant difference ($p > 0.05$).

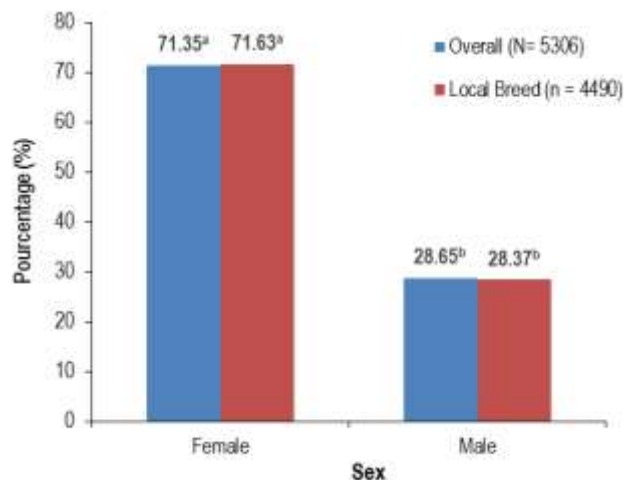
Structure of bovine herds: The structure of cattle (n) in a household's herd is shown in Table 3.

Table 3: Structure of cattle in a herd of Massa breed in a household's herd in Mayo Boneye

	Cows	Heifers	Female Calves	Bulls	Males Calves
Minimum	1.00	1.00	1.00	1.00	1.00
Mean. ± SD	6.69 ± 0.33 ^a	3.68 ± 0.16 ^b	2.61 ± 0.14 ^c	2.75 ± 0.20 ^c	2.72 ± 0.13 ^c
Maximum	35.00	17.00	13.00	12.00	16.00

The number of females (cows, heifers and calves) was significantly higher ($p < 0.05$) than that of males (bulls and calves). Of the total cattle surveyed (N = 5306), the local breed represents 84.62% (n = 4490) of cattle. This makes it the most preferred breed of breeders in the locality.

The composition of the herds according to the sex of the cattle (**Figure 3**) shows a similarity for all the animals and for the local breed taken apart. Females made up about 3/4 of the population.



Different letters on the bars indicate a significant difference at the 5% threshold.

Figure 3: Sex Distribution of Cattle in Mayo Boneye; Chad

DISCUSSION

Origin and geographical area of the Massa breed: The knowledge of the origin of this breed by the vast majority of agro-breeders who have been significantly older, confirms our initial hypothesis that these cattle are raised by Massa agro-breeders in Mayo Boneye since the foundation of their company. Some authors have claimed that this breed would come from crosses between the N'Dama cattle introduced in 1952 in Chad on the Fianga breeding farm and the Arab Zebu (Planchenault, 1985; Seignobos, 2000). For other researchers, the Massa cattle are a distant avatar of a bull who, after miscegenation, has taken on the appearance of a small zebu while keeping different behaviors at calving and fattening. According to Martin *et al.* (1996) and Seignobos (2000), this breed remains very hardy. In general, African cattle have been introduced through the Horn of Africa from domestication centers for about 10,000 years and have been disseminated following the complex migrations accompanying the movements of pastoralist populations (Flori and Gautier, 2013). On the other hand, according to Lesur (2009), the spread of livestock in general in the Horn of Africa has been more through acculturation than migration. Baccouche *et al.* (2014) report that local cattle populations have undergone anarchic crosses that have affected their genetic structures over centuries and to the present day. The Massa breed is present in the Mayo Boneye in Chad and the Department of Mayo Danay in Cameroon, following the geographical range of the Massa community (ethnic group). The same observations are made in Chad and Cameroon by numerous studies (Siran and Dumas-Champion, 1983; Martin *et al.*, 1996; Baroin and Boutrais, 2008).

Racial composition of herds of Massa Bovine: A large majority of herds (67%) were composed only of Massa cattle against mixed ones (about 33%). This high proportion of

herds consisting of the local breed is justified by the importance and preference that agro-breeders give to this livestock. Even in mixed herds, local breeds have always been in the majority. The preference of this local breed by the community that breeds it is related to its many sociocultural and economic functions well appreciated in the locality (Assadi *et al.*, 2022). Other large breeds are introduced into the herd to have mestizo oxen for harness cultivation. However, the use of bulls of other breeds including the Fulani Zebu as breeders leads to genetic erosion leading to absorption of the local breed. Many researchers (Sokouri *et al.*, 2009; Mopaté *et al.*, 2014; Boukar *et al.*, 2015; Chabi Toko *et al.*, 2016) also make the same observations. The average number of local breed cattle was significantly higher in our area is in agreement with the observations of Bousbia *et al.* (2010) in Algeria where the herds consist mainly of native cattle (86%). In Benin, Gounou and Yabi (2020) made the same observations on the local Borgou breed among five different genetic types of identified breeds. This dominance of local breeds justifies the better adaptability of local breed to rearing conditions (ME, 2003; Flori and Gautier, 2013). The presence of several cattle breeds observed in different herds of cattle is reported by many authors (Belhadia *et al.*, 2009; Chabi Toko *et al.*, 2016; Tellah, 2016; Gounou and Yabi, 2020; Sambe, 2020). The average number of cattle (16.63 ± 0.74) in our zone is less than: 50.2 heads reported in Benin Gounou and Yabi (2020), 21 head in Senegal (Diouf *et al.*, 2022), 48 head in Mali (Diawara *et al.*, 2017), 66 head in North Benin by Chabi Toko *et al.* (2016). On the other hand, it remains greater than eight (8) cattle observed in Algeria (Si-Tayeb *et al.*, 2015). The different sizes of herds reported are related to the different farming systems practiced and the objectives pursued by the breeders. In our area, we are in the presence of small agro-breeders who practice traditional sedentary cattle

breeding for the satisfaction of socio-cultural and economic objectives in line with the uses of the Massa community (Assadi *et al.*, 2022). Moreover, according to the same authors, this breeding is practiced in spaces whose management is relatively discussed between agricultural and pastoral use. In general, in trans-human or nomadic livestock systems, the numbers are most often large because the animals ensure the survival of the breeders who depend on them.

Structure of bovine herds: Herd structure is considered an indicator of the trend and purpose of livestock (Bousbia *et al.*, 2010, Corniaux *et al.*, 2012). The average number of females was higher (about 13 heads) than that of males (about 6). The composition of the herds of about 3/4 of the females (cows and heifers combined) testifies to the productive potential of the herd and indicates that the

breeders are in logic of reproducibility of the breeding system in place. The high proportion of females in herds is observed by several authors: 76% in Northern Benin (Chabi Toko *et al.*, 2016), 70% in Southern Benin (Azalou *et al.*, 2017), 68% in Algeria (Bousbia *et al.*, 2010) and 67.46% in southern Senegal (Diouf *et al.*, 2022). In contrast, in herds stationed in Benin, Youssao *et al.* (2000) reported female numbers of 44.9% and 36.3%. The high number of females is justified by their importance in ensuring reproduction, milk production, and the low exit rate of herds, and that of the few males by the fact that they are sold to meet the needs of the family and then face major problems (Alary *et al.*, 2011; Assadi *et al.*, 2022). Females dominate this structure. This indicates that the herd is very productive.

CONCLUSION AND APPLICATION OF RESULTS

This study made it possible to determine the origin of the local breed, the racial composition, and the structure of the Massa breed in the study area. According to these agro-breeders, these local cattle have existed since the origin of the Massa community. Herds are composed of several breeds with a dominance of the local breed. There are more females (cows and heifers) in the herds than males. The breeding of the Massa breed

remains an activity of choice for breeders. This breeding remains an important link of development in the department of Mayo-Boneye. As a result, phenotypic and genotypic characterization of this cattle breed would make it possible to estimate the degree of interbreeding in order to undertake programs to improve its zootechnical performance and conservation.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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