Research article

Dynamics of changes in the breed composition of pastoral and agro-pastoral cattle herds in Benin: implications for the sustainable use of indigenous breeds

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HIGHLIGHTS

- Redistribution of cattle breeds across the country.
- Increasing presence of Zebu in the humid and sub-humid regions.
- Emergence of nondescript crossbreed along the transect north-south.
- Increasing threat to the genetic integrity of the indigenous taurine cattle.
- Urgent need for sustainable management of cattle genetic resources.

ARTICLE INFO

ABSTRACT

Data for concretely analyzing current trends regarding breed composition of cattle herds at the national scale and the logic behind it are lacking in Benin. This study aimed to investigate the factors affecting the dynamics of breed composition in traditional Beninese cattle herds. In this regard, the main reasons for acquiring new breeds by herders and management strategies for animal genetic diversity in herds were targeted. Using a semi-structured questionnaire, a total of 753 cattle herds were surveyed in six pastoral communities along a north-south transect in Benin. Data collection included original breed composition of the herds (at their installation), cattle breeds introduced in the last five years, reasons for introducing new breeds, herders' breed preferences, and perceptions concerning productive and adaptive traits of the existing breeds in the study area. Descriptive analyses of herd composition revealed breed redistribution across the country with the increasing introduction of zebu in the southern region of the country. A high percentage of nondescript crossbreeds was associated with herders' willingness to improve both milk and meat production. In this regard, the analysis of herders' perceptions using the Friedman test ranked most zebu cattle breeds as the most productive. In contrast, the taurine breeds were highly ranked by herders for their adaptive features. This study confirms that herders' breed choices fit their production objectives. In addition, strategies for effectively and efficiently managing genetic diversity within herds are expected to increase animal productivity while conserving adaptive and special traits in local breeds. The effectiveness of herders' knowledge of local cattle breeds as well as their experience may increase the success of such strategies and facilitate their adoption.

1. Introduction

To improve animal productivity, crossbreeding has been practiced worldwide for centuries (Hill, 2014). The existence of numerous highly productive crossbreeds, such as Holstein-Friesian and Girolando, is well known (Tadesse et al., 2010; Canaza-Cayo et al., 2016; Daltro et al., 2021). In Africa, several livestock production improvement programs have focused on crossing local breeds with exotic ones (Leroy et al., 2016;

Nyamushamba et al., 2017; Wilson, 2018). Unfortunately, most of these programs have scarcely achieved their main goal of increasing the productivity of local breeds (Leroy et al., 2016; König et al., 2016; Wilson, 2018). An illustrative example is the importation of Gir, Girolando and Holstein by the government of Benin since 2010 for upgrading local breeds. However, the resulting crossbred animals demonstrated a low survival rate and productive performance owing to unfavorable environmental conditions, making this project unsuccessful (Toukourou and Senou, 2010; Kassa et al., 2016).

While governmental policies attempt to create new productive breeds through crossbreeding, herders pursue the same objective by introducing new breeds in their herds. Crossbreeding practices by African farmers have increasingly been reported as a serious threat to local animal diversity (Mwai et al., 2015; Kabi et al., 2016). Such crossbreeding practices, usually considered uncontrolled or poorly planned, have rarely been addressed by scientific studies (Rege and Tawah, 1999; Zulu, 2008; Nyamushamba et al., 2017). Nevertheless, farmers are recognized as custodians of animal genetic resources (FAO 2009). Their knowledges on animal genetic resources are crucial for the sustainability of indigenous breeds (Ayantunde et al., 2007; Kugonza et al., 2012; Tamou et al., 2018). Consequently, the logic driving their crossbreeding practices could be meaningful. For instance, crossbreeding of trypano-susceptible zebu breeds with trypanotolerant taurine breeds has helped farmers move and feed their animals across regions infested with tsetse flies, which were formerly considered unsuitable for livestock production (Blench, 1999; Ayantunde et al., 2014). Herder breeding strategies need to be closely assessed in several integrative aspects. In this regard, the adequate appreciation of herders' perceptions and logic will be useful for understanding their breeding strategies and for developing appropriate improvement initiatives that integrate their expectations together with scientific requirements and government policies.

Considering previous warnings regarding poorly planned and indiscriminate crossbreeding practices among cattle herders in Benin, this study aimed to investigate, at the national level, the dynamics and main drivers of breed composition change in traditional cattle herds in light of herders' perceptions and goals.

2. Material and methods

2.1. Study areas and surveyed herds

Data for this study were collected concomitantly with those from a previous study (Houessou et al., 2019a). Individual interviews were conducted between July 2015 and May 2016 with a total of 753 resident cattle herders. Only herders with cattle breeding experience in the study area greater than or equal to five years were randomly selected. The uneven distribution of cattle herds across villages resulted in unequal sampling across the six (06) locations surveyed (Table 1). Further details

on the study area and sampling are presented in Houessou et al. (2019a). Most cattle herders belonged to the Fulani ethnic group (67%), with 33% belonging to other ethnic groups (Otammari, Bariba, Monkolé, Yoruba, and Fon/Mahi by order of importance). In general, 71% of the herders kept cattle as their main occupation and source of income, whereas the remaining (29%) reported their main occupation to be crop cultivation. The average size of cattle herds was 45 animals, with small herds (generally less than 25 heads) kept by non-Fulani farmers and larger herds (generally more than 25 heads) by Fulani pastoralists. Approximately half of the non-Fulani farmers entrusted their herds to Fulani pastoralists.

2.2. Data collection and analysis

A semi-structured questionnaire was used for collecting data. Participation in the survey was voluntary. Collected information included current breeds of cattle kept, breed composition of herds at the establishment of the herd, cattle breeds introduced in herds in the last five years, and reasons for changes in breed composition. Animal breed names were assigned by the herders. We relied on this information because previous phenotypic and genotypic characterizations in the study area (Houessou et al., 2019b; Scheper et al., 2020) corroborate the breed names assigned by herders. Respondents were also asked to provide their perceptions of the breeds (kept in their geographical area) and rank them regarding their adaptive and productive traits. For each trait, the lowest rank (1) was assigned to the most appreciated breed and the highest to the least appreciated breed.

Statistical analyses of the categorical variables were considered standard descriptive analyses, including frequency analyses for their distribution and chi-square (χ2) test for comparisons across the study locations. The Friedman test was employed for analyzing the ordinal variable, that is, for ranking the breeds. This non-parametric test was used to assess significant differences among respondents with respect to breed ranking for a given trait (McCrum-Gardner, 2008; Pereira et al., 2015; Hazra and Gogtay, 2016). The post-hoc analyses were applied using the non-parametric Wilcoxon signed-rank test with Bonferroni's adjustments.

To effectively compare and interpret results, some locations were grouped for specific analyses because the breeds were not evenly distributed in all of them. All statistical analyses were performed with the statistical software package IBM SPSS version 20.0 (IBM Corp., 2011).

3. Results

3.1. Current geographical distribution of cattle breeds

Herders named and reported nine cattle breeds (Figure 1). These cattle breeds included two taurine, five zebus, two hybrids, and one

Table 1. Current cattle types in the herds (n) across locations in the study area.

		Locations							χ^2
		Total	Kétou	Savalou	Tchaourou	Kandi	Sinendé	Boukoumbé	
		(n = 753)	(n = 120)	(n = 120)	(n = 110)	(n = 148)	(n = 135)	(n = 120)	
Cattle breed (% of herds)	Bargouji	46.6	4.2[a]	7.5[a]	76.4[b]	82.4[b]	97.0[c]	0.0	518.79
	Yakanaji	44.2	96.7[a]	96.7[a]	76.4[b]	0.7[c]	11.9[d]	0.0	579.95
	Gudali	13.7	18.3[a]	35.8[b]	32.7[b]	1.4[c]	0.0	0.0	145.34
	Dageeji	8.4	17.5[a]	22.5[a]	13.6[a]	0.0	0.0	0.0	85.10
	Bodeeji	6.5	10.8[a]	25.8[b]	0.0	2.0[c]	1.5[c]	0.0	103.85
	Boboji	7.7	6.7[a]	41.7[b]	0.0	0.0	0.0	0.0	237.71
	Djelliji	2.3	0.0	0.0	0.0	0.0	0.7[a]	13.3[b]	79.62
	Nondescript crossbreed	55.9	62.5[b]	80.0[b]	69.1[ab]	39.9[c]	77.0[b]	9.2[d]	184.38
	Somba	15.3	0.0	0.0	0.0	0.0	0.0	95.8	715.97

[abc] Within a row, values with different superscript letters are significantly different at P ≤ 0.001 level (Chi-square test).

Figure 1. Pictures of cattle breeds in the study area.

nondescript crossbreed. The taurine breeds were Somba and *Boboji* (identified as Lagune cattle in the southern region). The zebus breeds (*Bos indicus*) included *Yakanaji* (known as White Fulani), *Gudali or Bokoloji* (known as Sokoto Gudali), *Bodeeji* (known as Red Fulani or M'bororo), *Djelliji* (known as Peulh Nigérien), and *Dageeji* (Dage). The hybrids (Sanga) were *Bargouji* and *Muti or Keteeji,* generally considered Borgou. The nondescript crossbreed type (Zenga) resulted from crossing two or more cattle breeds.

Figure 2 illustrates the current geographical distribution of cattle types in the study area. As shown in Table 1, most herds in the central and southern regions of the country comprised more than two breeds, in contrast to those in the north.

Irrespective of the location, the nondescript crossbreed population was the most prevalent cattle genotype, followed by *Bargouji and Yakanaji. Bargouji* was more common in the northern (Kandi, Sinendé) and central (Tchaourou) regions, where it also represented the dominant breed in the majority of herds (66–97% of the herds) (Table 2). In contrast, *Yakanaji* and Gudali were mainly reported in the central (Savalou and Tchaourou) and southern (Kétou) regions. *Yakanaji* breed was also the dominant cattle in the majority of herds in Kétou (94.2%) and Savalou (90%). The Somba breed was only found in the Boukombé district and kept as dominant breed in 91.7% of cattle holdings in this area.

3.2. Dynamics of breed composition of cattle herds

Herders reported important changes in breed composition since the establishment of their herds (Figure 3). Indeed, most herders originally set up their herds with *Bargouji* cattle in Kandi (98.6% of herds), Sinendé (98.5% of herds), and Tchaourou (73.6% of herds). In addition to *Bargouji, Yakanaji* were originally present in some herds, especially in Tchaourou (37.3% of herds), and Sinendé (5.9% of herds). In contrast to the original breed composition, the current breed composition of cattle herds surveyed in Kandi, Sinendé, and Tchaourou presented higher proportions of *Yakanaji* in the presence of new breeds, including *Gudali* and *Dageeji*. Moreover, high rates of nondescript crossbreeds were observed in several herds.

Herds in the regions of Kétou and Savalou were mainly characterized by the original presence of the zebu *Yakanaji* (70% of herds at least) but some farmers also established their herds with the taurine breed *Boboji*. However, in addition to *Yakanaji* and *Boboji*, diverse breeds, including *Gudali* and *Dageeji,* were identified in the herds. Moreover, nondescript crossbreeds were found in more than 60% of herds located in Kétou and Savalou. More interestingly, *Boboji* cattle were observed in some herds (5

and 10 % of herds respectively surveyed in Kétou and Savalou) originally established without this breed.

Compared with other locations, fewer changes in breed composition were observed in herds located in Boukombé. New nondescript crossbred animals were found in only 10% of the herds surveyed at this location.

3.3. Newly introduced breeds and motivations of herders for introducing them in their herds

In general, *Yakanaji* (43.2%) and *Bargouji* (30.8%) were the main breeds frequently introduced in the surveyed herds. However, high variability in the choice of a new breed to be introduced was observed across locations (Table 3). Unlike other locations, *Gudali* cattle were frequently (23.3%) introduced into the herds in Tchaourou, whereas nondescript crossbreeds were introduced in Boukombé (27.8%).

According to herders, the main reasons for introducing new breeds in herds were for improving meat and milk production and reproductive performance (Figure 4). Other reasons included diversifying breed and improving animal resistance to disease and walking ability.

3.4. Herders' perceptions about productive and adaptive traits of cattle breeds in Benin

Irrespective of locations, herders ranked zebu cattle (*Yakanaji, Gudali, Bodeeji, Djelliji,* and *Dageeji*) better than indigenous cattle (Somba, *Boboji,* and *Bargouji*) for productive traits, including milk and meat yields (Table 4). *Gudali* received the highest rank for the latter traits. Zebu cattle, particularly *Bodeeji* cattle, were also considered to have a higher walking ability. Compared to other zebus, *Yakanaji* was highly appreciated by herders for both productive and adaptive traits. Nevertheless, the highest ranks with regard to adaptive traits (such as resistance to disease and feed shortage), reproductive performance, and draught ability were generally attributed to indigenous taurine cattle.

4. Discussion

4.1. Diversification of cattle breeds and admixture in Beninese cattle herds

Comparing the current herd composition with original breeds adopted by herders (at the establishment of their herds) reveals the increased introduction of *Yakanaji* (i.e., White Fulani) and *Bargouji* (i.e., Borgou), as well as further zebu breeds (*Gudali, Djelliji*) in the herds. The increasing presence of zebu cattle may explain the current widespread use of
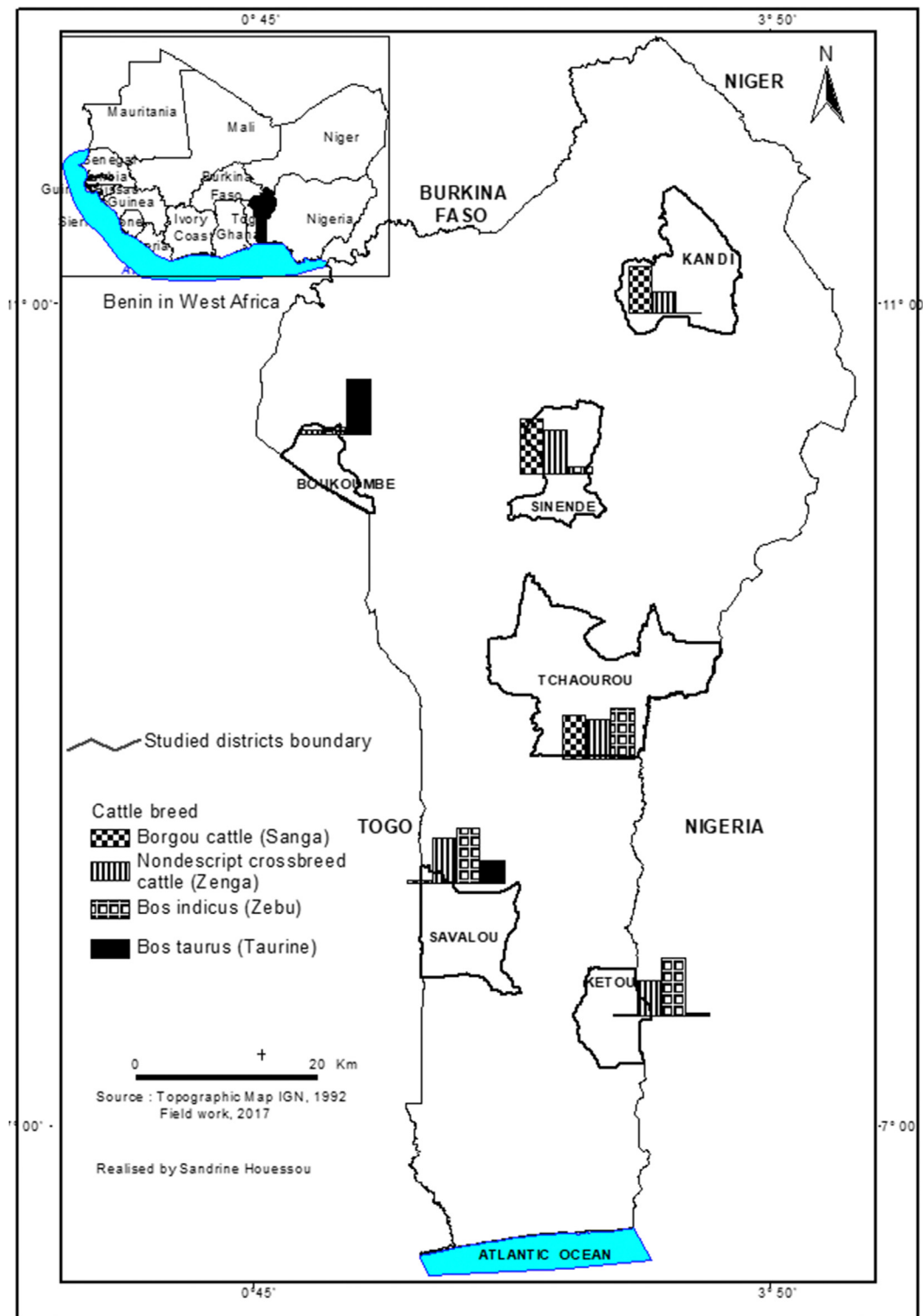
Figure 2. Map depicting the current geographical distribution of cattle type across the study area in Benin.

nondescript crossbred animals in all investigated locations across the country. These findings agree with recent phenotypic (Houessou et al., 2019b) and genetic (Scheper et al., 2020) characterizations of cattle populations in these areas, but contrast with the official cattle breed distribution in Benin, which attributed the zebu cattle to the Northern regions (DE-MAEP, 2004). As warned by several scientists, the increase in zebu and crossbreed populations in herds, resulting in a decline in

taurine populations, confirms the potential threat that represents the introgression of Sahelian zebu into the sub-humid zones of the south (Koudandé et al., 2009; Flori et al., 2014; Ahozonlin et al., 2019). The increasing introduction of new breeds in South and Northeast Benin, as observed in this study, is in line with the strong admixture reported in the Lagune (Koudandé et al., 2009; Ahozonlin et al., 2019) and Borgou populations (Flori et al., 2014).

Table 2. Dominant cattle breeds in the herds (n) across locations in the study area.

		Locations							
		Total	Kétou	Savalou	Tchaourou	Kandi	Sinendé	Boukombé	χ^2
		(n = 753)	(n = 120)	(n = 120)	(n = 110)	(n = 148)	(n = 135)	(n = 120)	
Cattle breed (% of herds)	Bargouji	43.6	4.2[a]	7.5[a]	76.4[b]	66.9[b]	97.0[c]	0.0	143.17
	Yakanaji	33.3	94.2[a]	90.0[a]	23.6[c]	0.7[d]	2.2[d]	0.0	
	Gudali	0.5	0.0	0.0	0.0	0.0	0.0	0.0	
	Dageeji	0.5	1.7[a]	1.7[a]	0.0	0.0	0.0	0.0	
	Boboji	0.1	0.0	0.8[b]	0.0	0.0	0.0	0.0	
	Djelliji	0.7	0.0	0.0	0.0	0.0	0.0	4.2	
	Nondescript crossbreed	7.2	0.0	0.0	0.0	32.4[a]	0.7[b]	4.2[b]	
	Somba	14.6	0.0	0.0	0.0	0.0	0.0	91.7	

[abc] Within a row, with different superscript letters are significantly different at P < 0.0001 level (Chi-square test).
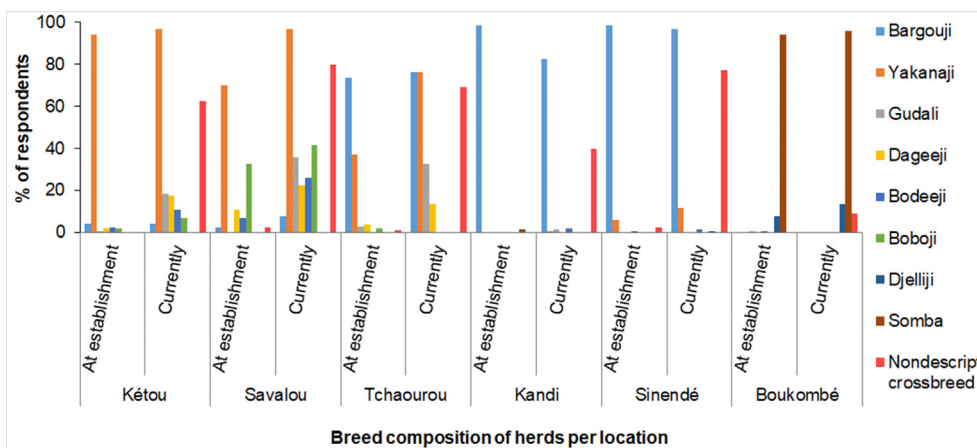

Figure 3. Dynamics of breed composition of herds across the study area in Benin.

Table 3. Cattle breeds recently introduced in the herds across locations.

Locations									
		Total	Kétou	Savalou	Tchaourou	Kandi	Sinendé	Boukombé	χ^2
		(n = 560)	(n = 44)	(n = 124)	(n = 120)	(n = 51)	(n = 149)	(n = 75)	
Cattle breeds (% of herds)	Bargouji	35.4	0	0	15.0[a]	96.1[b]	87.9[b]	0	1035.28
	Yakanaji	40.0	81.8[a]	92.7[b]	54.2[c]	0	5.4[d]	0	
	Gudali	6.8	4.5[a]	6.5[a]	23.3[b]	0	0	0	
	Dageeji	2.5	9.1[a]	0.8[b]	7.5[a]	0	0	0	
	Bodeeji	0.2	2.3[a]	0	0	3.9[a]	0	0	
	Boboji	0.2	2.3	0	0	0	0	0	
	Somba	9.3	0	0	0	0	0	72.2	
	Nondescript Crossbreed	5.4	0	0	0	0	6.7[ab]	27.8[b]	

[abc] Within a row, with different superscript letters are significantly different at P < 0.0001 level (Chi-square test).

More pronounced crossbreeding was observed in the southern and central regions, which correspond to the original habitat of Lagune cattle. In contrast, the Somba herds in the northwestern part of the country showed the lowest heterogeneity. The latter finding agrees with that of Scheper et al. (2020), who reported less genetic admixture in the Somba breed. Similarly, the current cattle herds in Northwest Benin displayed less heterogeneity regarding breed composition when compared with that in the central and southern regions. This difference in breed diversity across the country may be associated with herders' sociocultural backgrounds or their perceptions of breeds.

4.2. Sociocultural factors and motivations for introducing new breeds in herds

The important changes in breed composition observed in the surveyed areas, especially in the southern and central regions, may be related to the establishment of new sociocultural groups of herders in livestock breeding areas (Houessou et al., 2019a). Indeed, increasing settlements of both pastoralists from Northern Benin and new immigrant Fulani pastoralists from Niger, Nigeria, and Burkina Faso were recently reported in Southern and Central Benin (Ange et al., 2014). The latter
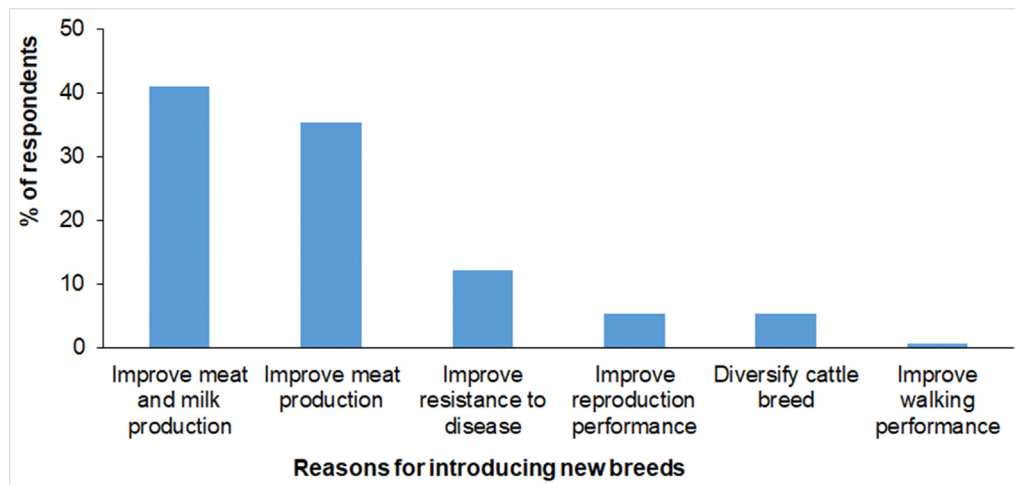
Figure 4. Reasons given by herders for introducing new breeds in their herds.

Table 4. Herders' ranking of cattle traits/attributes for locally available breeds in southern, central, and northern Benin (n = 753).

Location	Genotype/Breed	Milk Yield		Meat yield		Reproductive performances		Calves' viability		Resistance to disease		Resistance to feed shortage		Marketing easiness		Ability to walk long distances		Draught ability	
Kétou and Savalou	Yakanaji	1.6[a]	(2)	2.2[a]	(2)	2.4[a]	(1)	2.8[a]	(2)	2.4[a]	(2)	2.4[a]	(2)	2.3[a]	(2)	1.9[a]	(2)	1.9[a]	(1)
	Gudali	1.5[a]	(1)	1.2[b]	(1)	3.4[bc]	(4)	3.4[ab]	(4)	4.1[b]	(5)	4.5[b]	(5)	1.1b	(1)	3.5[b]	(4)	2.7[b]	(3)
	Bodeeji	3.5[b]	(3)	3.0[d]	(3)	3.7[c]	(5)	3.5[b]	(5)	3.8[c]	(4)	3.7[c]	(4)	3.3c	(3)	1.7[a]	(1)	4.3[c]	(5)
	Dageeji	3.7[b]	(4)	3.7[c]	(4)	2.7[a]	(2)	2.8[a]	(3)	2.8[a]	(3)	2.8[a]	(3)	3.4[c]	(4)	3.2[b]	(3)	2.3[ba]	(2)
	Boboji	4.7[c]	(5)	4.9[e]	(5)	2.8[ab]	(3)	2.5[a]	(1)	1.8[d]	(1)	1.7[d]	(1)	4.9[d]	(5)	4.7[c]	(5)	3.9[c]	(4)
	χ2	271.18		292.32		70.35		54.01		148.27		187.08		303.73		231.18		147.33	
	P≤	0.001		0.001		0.001		0.001		0.001		0.001		0.001		0.001		0.001	
Tchaourou, Kandi and Sinendé	Yakanaji	2.3[bc]	(2)	2.4[ab]	(2)	1.8[a]	(1)	1.7[a]	(1)	2.1[ab]	(2)	1.6[a]	(1)	2.3[ab]	(2)	1.4[b]	(1)	2.0[ac]	(2)
	Gudali	1.0[c]	(1)	1.0[b]	(1)	2.3[a]	(2)	3.3[ab]	(4)	4.5[c]	(5)	4.7[b]	(5)	4.2[c]	(4)	4.4[a]	(5)	4.0[b]	(4)
	Bodeeji	2.8[ab]	(3)	3.0[a]	(3)	3.2[ab]	(4)	2.5[a]	(2)	3.0[bc]	(3)	2.7[ace]	(3)	3.0[bc]	(3)	2.9[ab]	(3)	3.2[bc]	(3)
	Djelliji	4.8[d]	(5)	4.8[c]	(5)	4.9[b]	(5)	4.8[b]	(5)	4.4[c]	(4)	3.6[be]	(4)	4.3[c]	(5)	3.5[a]	(4)	4.4[b]	(5)
	Bargouji	4.2[ad]	(4)	3.9[ac]	(4)	2.9[a]	(3)	2.7[a]	(3)	1.0[a]	(1)	2.5[ac]	(2)	1.2[a]	(1)	2.8[ab]	(2)	1.5[a]	(1)
	χ2	48.85		45.14		33.98		31.95		44.57		30.20		39.57		25.30		37.31	
	P≤	0.001		0.001		0.001		0.001		0.001		0.001		0.001		0.001		0.001	
Boukombé	Djelliji	1.0[a]	(1)	1.0[a]	(1)	1.6[a]	(2)	2.0[a]	(2)	1.9[a]	(2)	2.0[a]	(2)	1.4	(1)	1.1[a]	(1)	2.0[a]	(2)
	Somba	1.9[b]	(2)	2.0[b]	(2)	1.4[b]	(1)	1.1[b]	(1)	1.1[b]	(1)	1.0[b]	(1)	1.5	(2)	2.0[b]	(2)	1.0[b]	(1)
	χ2	116.03		100.83		6.64		96.21		85.95		120.00		0.74		97.20		120.00	
	P≤	0.001		0.001		0.01		0.001		0.001		0.001		0.389		0.001		0.001	

The values with a,b,c are the means rank; the lower the value, the higher is the rank of the breed for the given attribute.
[a,b,c]Means in the same row are significantly different ($P < 0.05$), Friedman test.

groups of cattle herders are well known for their cultural preference for zebu cattle. In addition, direct exchanges of animals between local farmers and transhumant herders have been reported (De Haan, 1997; Quarles Van Ufford, 1999; Houessou et al., 2020). Compared with other regions, previous studies have reported low transhumance pressures in Boukombé (Houessou et al., 2019a). In addition, the low presence of zebu and crossbreeds in cattle herds located in Boukombé may be related to the strong link between the Somba breed and the social and cultural lives of the Otammari people (Vanvanhossou et al., 2021). Similarly, herds surveyed in Northeastern Benin were also found to be less heterogeneous than those located in the central and southern regions. These findings are consistent with previous observations by Tamou et al. (2018), who reported the preference of herders in Northern Benin to maintain a single breed in their herds. These authors explained this finding by the fact that herders did not perceive breed diversity in a herd as an asset of resilience to a changing environment. In contrast, herders surveyed in the southern region tended to promote breed diversity as a

strategy of resilience to both changing environmental conditions and market requirements. Indeed, the majority of respondents in these regions reported breed diversification as the main reason for modifying the initial breed composition of their herds. Therefore, the current results show high diversity in herders' motivations regarding the choice of a breed and the management of genetic diversity. Blench (1999) similarly observed that some pastoralists adopt crossbreeding to face new environmental challenges, whereas others (under the same environmental pressures) prefer keeping purebred breeds, even if they continuously need to use veterinary drugs. Furthermore, herders sometimes have other personal considerations with respect to animal behavior or aesthetics. For instance, while justifying the absence of taurine cattle in their herds, some herders have reported difficulty in controlling taurine animals in pastures owing to their low docility. Likewise, some herders avoid introducing *Gudali* cattle into their *Yakanaji* herds to preserve their physical attractiveness. These herders consider cattle herds with different horn sizes less impressive. Overall, for most of the interviewed herders,

improving animal productive performances, especially meat and milk production was the main reason for introducing new breeds. Similarly, market opportunities have been reported as an important driver of farmers' preferences for zebus (Tano et al., 2003; Kinkpe et al., 2019).

4.3. Perceptions of herders on cattle breeds

The introduction of zebu and crossbreeds into Beninese cattle herds suggests a decreasing interest in indigenous taurine cattle.

The ranking of breeds by herders confirms their preferences for zebus and crossbreeds for productive traits, that is, milk and meat performances. The observed herders' perceptions are in line with observations by Drucker (2003) that indigenous taurine cattle are often disfavored, mainly because of their low market value. According to Rollefson (2005), the widespread evaluation of farm animal breeds based on individual performance or a single trait (generally meat or milk production) often leads to an underestimation of their value, with negative effects on their conservation. Indeed, such considerations limit the promotion and sustainable use of important traits in taurine breeds, including adaptability to marginal environments and trypanotolerance (Belemsaga et al., 2005). Adaptive traits are not common to all African cattle but are crucial for the sustainability of both low-input smallholder livestock and crop-livestock production systems in Africa (Belew et al., 2016). The loss of locally adapted indigenous taurine breeds exclusively distributed in West Africa can be considered an irreversible loss of unique genetic resources (Mwai et al., 2015). Current herders' appreciation and motivation for higher productivity has raised the real need to improve these local taurine breeds with the challenge of conserving their adaptive traits.

Although management strategies of herders contributed to the decline of animal genetic diversity, especially in the Beninese indigenous breeds, their knowledge regarding the local cattle breeds' attributes and their experience should be considered to improve the effectiveness of breeding programs.

Indeed, perceptions of many herders regarding different breeds were consistent with scientific literature. For instance, compared with indigenous taurine cattle, zebu cattle are commonly known for their high productivity (Rege et al., 1994; Mwai et al., 2015). *Gudali* is particularly well known for its high beef performance (Felius, 1995), whereas indigenous taurine cattle and *Bargouji* are well recognized for their tolerance to trypanosomiasis (Aboagye et al., 1994; Blench, 1999) and endurance under harsh environmental conditions (Aboagye et al., 1994; Belemsaga et al., 2005; Soro et al., 2015) including feed shortage. Somba cattle are well appreciated for their draught ability (Dehoux and Hounsou-Ve, 1993; Moazami-Goudarzi et al., 2001; Dossa and Vanvanhossou et al., 2016; Chabi Toko et al., 2016). As described in previous studies, herder perceptions also agreed with the adequate production performance and adaptive capacity of *Yakanaji* cattle (Blench, 1999; Alphonsus et al., 2012; Pelican, 2012).

The aforementioned findings reflect the accuracy of herders' knowledge. This knowledge can be efficiently exploited through the creation of breeder associations or community-based breeding programs.

In addition, the integration of this indigenous knowledge into a scientifically based conservation strategy could improve readiness of herders to sustainably use their farm animal genetic resources (Wollny, 2003).

5. Conclusion

Ongoing changes in the livestock production environment of Benin have greatly influenced the distribution and management of cattle breeds throughout the country. The major consequence of increasing zebu in new breeding areas, which have been the traditional habitats of taurine cattle populations, is the emergence of nondescript crossbred animals, which represent a potential threat to the genetic integrity of indigenous taurine cattle. The creation of new crossbreeds is associated with the motivation of herders to increase the productivity and meet the high market demand for large-sized animals. Therefore, effective strategies are required for increasing animal productivity while conserving adaptive and special traits in local breeds. The expectations and perceptions of herders regarding cattle breeds indicate the importance of associating them in the design of animal improvement policies. Furthermore, the effectiveness of their knowledge regarding local cattle breeds may increase the success of such strategies and facilitate their adoption. Community-based breeding program initiatives are expected to ensure the sustainable use of animal genetic resources.

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