



# The Status of Cattle Genetic Resources in West Africa: A Review

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**Abstract** | The current review focuses on phenotypic characterization of West African cattle breeds for the development of breeding programmes for indigenous beef cattle genetic resources. Indigenous cattle breeds found in West Africa were identified and characterized using information from refereed journals, conference papers and research reports. A data mining exercise was carried out at the start of the review. Different literature search systems were used. The choice of a search system to be utilised was based on the database involved. Approximately 400 academic journal papers, refereed conference papers and peer reviewed research reports on livestock characterisation in Africa in general were found. A process of selecting the most relevant ones to the current review was carried out through scanning through each publication abstract. Results of this review indicates that smallholder cattle production in West Africa is extensive and dominated by indigenous cattle breeds with ability to adapt to the local environment. The breeds include Somba, Lagune, Muturu, N'Dama, Kuri, Maure, Azawak, Gudali, Shuwa, White Fulani, Djelli, Gobra, Ketekou, Ghana Sanga and Borgou. The contributions of these breeds to West African country's economy ranges from provision of food, cultural and ecological roles as well as a source of income. They also have adaptive traits including but not limited to tolerance to ticks and tick-borne diseases, heat and diseases such as trypanosomiasis. Although smallholder cattle farming systems contributes substantially to household food security and income, their productivity is hindered by several constraints including high prevalence of diseases and parasites, limited food availability and poor marketing.

**Keywords** | Indigenous cattle breeds, Phenotypic characterization, West African regions

**Editor** | Kuldeep Dhama, Indian Veterinary Research Institute, Uttar Pradesh, India.

**Received** | September 16, 2018; **Accepted** | November 01, 2018; **Published** | December 07, 2018

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**Citation** | Santoze A, Gicheha M (2019). The status of cattle genetic resources in west africa: a review. *Adv. Anim. Vet. Sci.* 7(2): 112-121.

**DOI** | <http://dx.doi.org/10.17582/journal.aavs/2019/7.2.112.121>

**ISSN (Online)** | 2307-8316; **ISSN (Print)** | 2309-3331

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## INTRODUCTION

Animal Genetic resources (AnGR) refer to all animal species, breeds and strains that have any economic, scientific and cultural interest (Rege, 1999) play a critical role in livestock production and are essential to a sustainable agriculture and food security. They constitute part of the biological diversity of the planet. More than 40 species of domesticated animals have been documented over the world and contribute directly to the production of food and fibre and indirectly through functions such as draft power, manure, transport, store of wealth (M. Herrero et al., 2013). The most commonly reared species include cattle, sheep, goats, camels, donkeys, pigs, chicken, rabbits, horses (M. Herrero et al., 2013) with their importance and distribution differing among cultures and regions of the

world.

Most of West African countries economy is mainly based on the rural sector accounting for more than 70% of the available labour force (Tidjani et al., 2006). The livestock sector contributes up to 25% of agricultural gross domestic product (GDP) providing food and nutritional security to rural households while at the same time acting as a tool for poverty alleviation. Despite the contribution, the livestock sector in most West African countries is still characterized by the traditional production practices. In many countries in the region there are no formal breeding programmes. This leads to sub-optimal utilisation and conservation of the available cattle AnGR. The first step in design of effi-

cient breeding programme is the definition of the breeding objective. This involves the specification of breeding, production and marketing system, identification of sources of revenues and costs, determination of biological characteristics affecting the revenues and costs, and the derivation of the economic values of the goal traits (Erb et al., 2012) so as to comprehensively describe the needs and economic interests of the producers, consumers and the production environment. This review is thus important in bringing together the breed, production and marketing information systems of indigenous cattle breeds in West Africa.

### RELEVANCE OF CATTLE PRODUCTION TO HUMAN SOCIETIES

Cattle farming and production is a key industry within the West African context according to several authors. The geospatial coverage and economic investment, as well as envisioned returns from investment underscore the importance of cattle farming as a major production system within the West African region. The cattle production industry contributes both directly and indirectly to the viability, success, and continuity of other production systems within the region (Thornton, 2010). Socioeconomic benefits of cattle farming offer the best example on the industry's direct contribution towards development in West Africa. According to the FAOSTAT (2016), cattle production contributes approximately 43% of the total Gross Domestic Product (GDP) in West African territories. The suggested value can also be linked to the intrinsic activities adopted around cattle farming in the region. Cattle breeds in West Africa are valued for their beef and dairy products, which are a direct source of income within the suggested industry (Mapiye et al., 2009). While articulating the numerical size (of 10.52 million heads) of dairy cattle within the West African region, the FAOSTAT (2016) notes that the suggested dairy breeds in the region fuel the vibrancy of the food production industry. Similarly, the approximately 73.68 million heads of cattle cited in the FAOSTAT (2016) report are also channelled towards different economic generating activities such as leather production, draught power, and manure manufacturing (Mapiye et al., 2009).

Manure production activities are of particular importance to the scope of agricultural growth in West Africa, especially with regard to its direct influence on crop farming practices within the region. Cattle as well as other animals provide organic manure which improves soil fertility. Farm manure which consists of animal faecal materials is used to fertilize farm lands. Adding manure from cattle offers a less corrosive and efficient source of nutrients for plant growth in addition to improving soil structure and water retention capacity. An earlier research report by the FAO (1996) looked at the holistic roles played by cattle in offering draught power to fuel crop production in direct and

indirect contexts. Nigeria's peasant farmers provide a good example of the conclusions reached in that report by exhibiting a heavy dependence on cattle as a source of power relevant to activities that include cultivation and transport (Payne and Wilson, 1970). Similarly, the draught power provided by cattle is also used for correlated functions that include water lifting and powering food processing equipment. Cattle also assist in the economic utilization of non-marketable crop resources and land, creating value through limiting wastage or offering convenient alternatives for utility. For instance, cattle are able to survive on fallow lands or domains that are not suitable for arable crop farming. Such activities aid in maximizing the use of the available land resource (Kosgey et al., 2013). The FAO (1996) also looks at the grazing habits of cattle in coconut oil plantations within Malaysia. Within that context, the cattle function as natural weed control agents by grazing on weeds in the suggested plantations. The role of such agents contributes to approximately 40% of weed control objectives; an aspect which is equally evident in other regions around the world, including West Africa (FAO, 1996). As such, cattle are central to the enhancement of crop farming in the global context that includes the West African region.

While milk and beef production as well as the aforementioned crop farming activities feature as the key benefits of cattle within the West African social domain, the suggested animals also offer products not directly linked to the livestock production system, but of significant relevance to the production value chain in human society. First, the FAO (1996) discuss the use of cow dung for energy production objectives. Use of cow dung is initially evidenced in biogas production, with the energy produced from the suggested biogas being channelled towards functions such as light and heat production as well as motive power. Second, the cattle business is also linked to vibrancy within the international trade context for West African countries. Commodities such as beef, milk, and hide derived from cattle are traded for foreign exchange that is later channelled towards economic development of the countries (Naves et al., 2015). The socioeconomic values of cattle production are evident in the livelihoods supported by the suggested industry, especially for entities that undertake farming at subsistence level (Kubkomawa, 2017). Nomadic communities provide a second scenario to the economic values of cattle keeping (pastoralism). The nomads' migration with cattle means that they convey wealth to different regions they visit, which makes their cattle 'mobile banks'. This socio-economic values are also reflected in the holistic increase in financial acuity of West African countries engaging in cattle farming and production.

The sociocultural values of cattle production are often displayed as the personal and communal growth attributes

the suggested practices offered in society. For this, some studies have focused on the poverty eradication or affluence growth values provided by cattle farming within the West African context. For instance, the study by [Adebambo \(2001\)](#) identified cattle farming as being a predominant activity among Nigeria's peasant or small-scale farmers. Those farmers rely on the cattle as a source of income, hence a buffer to poverty. Similarly, cattle production plays a role in improving food security standards for those farmers by ensuring continued availability of both money and food to mitigate negatives such as crop failure ([Kubkoma-wa, 2017](#)). A different study by [Payne and Wilson \(1970\)](#) identified the wealth linked to cattle farming and correlated this to the prestige and status individuals achieve in the societal context ([Shackleton et al., 2005](#); [Rischkowsky and Pilling, 2007](#)). A second set of sociocultural benefits is presented through the cultural significance of cattle to societies. For instance, many West African communities and larger African inhabitants understand the significant cultural importance of cattle. As such, cattle are utilized as gift items in customary ceremonies such as weddings and traditional rites occasions ([Rischkowsky and Pilling, 2007](#); [Flint and Woolliams, 2008](#); [Hoffmann, 2010](#)). Cattle are also used in various rituals or worship ceremonies as gifts or sacrificial items. In general, cattle farming offers a holistic range of benefits that help spur sociocultural growth in West Africa and other domains around the world.

Cattle breeds have undergone decades of selection for specific role in human communities which have resulted in cattle breeds that differ phenotypically as well as genetically. In Africa, most of indigenous cattle production occurs in low-input/low-output systems mainly characterised by open field grazing with overreliance on tradition knowledge and practices in management of the livestock. Where improvement involves use of crop by-products in agro-pastoral systems ([Kamuanga et al., 1999](#)). According to [Hoffmann \(2010\)](#), approximately 80% of cattle production in West Africa is practiced in extensive and semi-intensive production systems. In the pastoral or extensive systems, animals are raised almost exclusively on free grazing ([Olafadehan and Adewumi, 2010](#), [Amadou et al., 2012](#)) without integration with cropping activities ([Robinson et al., 2011](#)). It is considered as the major production system in terms of area it covers as well as in terms of food production. Pure pastoral system of livestock is mostly present and practiced in very dry areas (arid zone) even though some wetter areas for cropping have gained a tradition of pastoralism through migration ([Hoffmann, 2010](#)). Due to climatic variability and the need to balance fluctuating animal nutritional demands (due to population dynamics) and the fluctuating nutrients supply the animals do not meet the minimum requirement in terms of quality (nutrients) and quantity; in most times of the year implying corresponding low productivity as well as products of poor

quality ([Mario Herrero et al., 2010](#)). Diseases and parasites are a major constraint limiting productivity and profitability in pastoral systems with minimal veterinary care intervention ([Kosgey et al., 2013](#)).

### CATTLE POPULATION, BREEDS AND GEOGRAPHICAL DISTRIBUTIONS IN WEST AFRICA

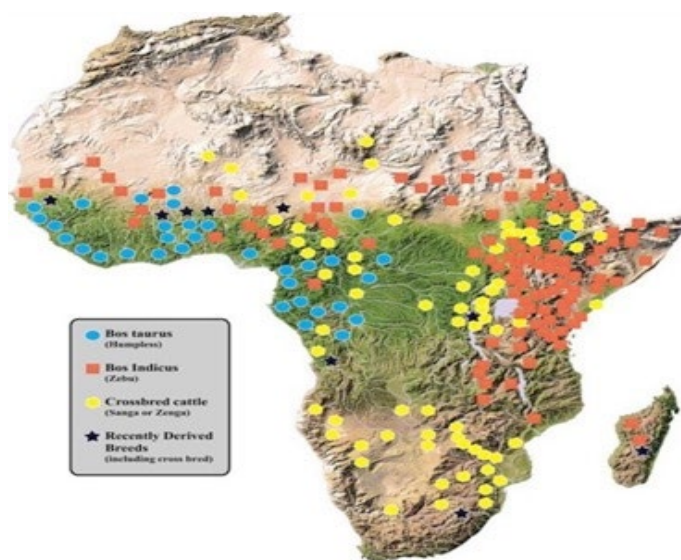
Characterization of livestock species falls within the context of Animal Genetic Resources (AnGR). The International Livestock Research Institute (ILRI) defines AnGR as animal species, breeds, and strains that accord value within the economic, scientific, and cultural contexts of normative society. The fact that cattle species are core elements in economic growth and food security for West African countries, Africa and globally means that they are essential AnGR. [Rege \(1999\)](#) noted that more than 40 species of domesticated animals have been documented over the world. The emphasis on such documentation is linked to the contribution towards provision of products used for food and fibre and indirectly through functions such as draft power, manure, transport, and store of wealth ([Flint and Woolliams, 2008](#)).

Characterization of cattle species involves the documentation of physical and genetic characteristics. The characterization has been effective at the global level, but at a lower degree within the African context ([Gibson et al., 2007](#)). Studies such as that by ([Rege, 1999](#)) have documented about 180 breeds of cattle. Approximately 150 breeds are indigenous populations which largely remains uncharacterized ([Mwai et al., 2015](#)). This has been attributed to logistical and technical limitations which have generally hindered the important characterization of the indigenous cattle resources.

Currently there are increased efforts towards the characterisation of these indigenous cattle resources by various African governments in light of increased demand for animal protein, expanding agro-manufacturing sector, the threat of climate change and subsequent climatic variability among other factors ([Goitom et al., 2016](#)). For instance, [Belemsaga et al. \(2005\)](#) conducted a cattle population survey and inventory that identified 13 indigenous cattle breeds in West African regions. The suggested breeds were cited as Ndama, Kouri, the group Baoule-Somba, the group Lagoon cattle, zebu Azawak, zebu Maure, zebu Touareg, zebu Goudali, zebu Bororo, zebu White Fulani, zebu Djelli, zebu peuhlsoudanien, zebu Gobra, and their crossbreeds (Zebu x N'Dama and Zebu x West African Shorthorns). However, the study was confined to countries within the Centre international de recherche-développement sur l'élevage en zone subhumide (CIRDES), which included Benin, Togo, Ghana, Ivory Coast, Mali, Burkina-Faso and Niger. An earlier study by ([Deshler, 1963](#))

featured a review of cattle species within the larger African continent and noted that *Bos Taurus* and *Bos Indicus* were the main species, with other breeds that are documented being identified as subgroups to or cross breeds of the aforementioned species. A study by Rege et al. (2001) affirmed the findings of Deshler, (1963) who noted that “humpless” breeds (*Bos Taurus*) and “humped” (*Bos Indicus*) species were predominant in West Africa. Mwai et al. (2015) included the categories identified as humped and humpless by Rege and Tawah, (1999), but added the Sanga breed which described the crosses to the *Bos Taurus* plus *Bos indicus* groups and the Zenga that emerged from backcrossing the Sanga with the Zebu backcross (Hanotte et al., 2009). Studies by Bradley et al. (1994), Belamsaga et al. (2005) and Mwai et al. (2015) noted that the Zenga and Zebu breeds were predominantly found in the eastern Africa region but influenced majority of the humped cattle breeds found in the West African region as further confirmed by (Koudandé et al., 2009).

Koudandé et al. (2009) noted that recent breeds derived from the crossbreeding of Zebu and Taurine cattle have emerged and include the Borgou of Benin, the Ghana Sanga from Ghana, and Keteku that is domiciled in Nigeria. Mwai et al. (2015) classified these as the Sanga type cattle. Figure 1 below features a pictorial outlook of different cattle breed within the sub-Saharan region, with particular emphasis on the distribution of indigenous and cross breed cattle within the sub-Saharan region.



**Figure 1:** Distribution of indigenous and cross breed cattle in sub-Saharan Africa; Source: (Mwai et al., 2015).

### CHARACTERISTICS OF WEST AFRICAN CATTLE BREEDS

Genetic factors are central to the diversity in physiological characteristics exhibited cattle species within the West African region (Anderson and Georges, 2004). The breeds exhibit a wide variety of body sizes, conformation characteristics, coats colour and other correlated aspects relevant

to their phenotypic characteristics. Studies such as that by FernándezToro (2006) introduce genetic predisposition as an outcome of environment-borne growth and adaptability aspects displayed by the suggested species. While genetic background of ancestral populations feature as a key reason for phenotypic diversities of cattle breeds, factors such as the influence of the agro-ecological environment hosting the species as well as rearing preferences and practices adopted by cattle keepers also plays a critical role (Andersson & Georges, 2004; Gibson et al., 2007; Naves et al., 2015). As such, both nature and nurture factors influence the genetic and phenotypic characteristics of West African cattle breeds. Table 1 presents an overview of documented characteristics of common cattle breeds within the West African Region

Cattle breeds domiciled in the West African region have their physiological characteristics themed on tolerance to heat (Renaudeau et al., 2012) and specific diseases as well as varying degrees of humidity and food availability (Hoffmann, 2010). These breeds equally exhibit a high degree of hardiness across a wide range of temperatures besides diseases tolerance and resilience. Many characterisations studies associate the traits alterations as outcomes of the nature of the environments where the cattle breeds are reared. For instance, Zebu cattle type are more adapted to a harsh climate (Hansen, 2004) but susceptible to trypanosomiasis. Further, the differences include a lower threshold of tolerance to food insufficiency for cattle breeds from the eastern Africa region. Those condition explain the adaptation of the cattle population in West Africa to heat and poor feeding conditions (Kim et al., 2017). Knowledge on those characteristics is important in guiding breeding and rearing practices as well as the greater goals of effective production within the cattle industry.

Predominant breeds within the West African region include Somba, Lagune, Muturu, N'Dama, Kuri, Maure, Azawak, Gudali, Shuwa, White Fulani, Djelli, Gobra, Ketekou, Ghana Sanga, and Borgou (Belemsaga et al., 2005). In this study, the Somba breed was documented as being predominant in Benin, Burkina Faso, Ghana, Cote d'Ivoire, and Togo. The hot and humid conditions within the region ensure efficient food availability in both natural and domesticated contexts, which explains the stocky nature of the breed. Findings by (Ratmanov et al., 2013) further indicate that the equatorial environment within the region predisposes a high risk of vector-borne diseases, but the Somba breed exhibits a high degree of tolerance to the resultant vector caused diseases more so in regard to its trypano-tolerant nature (Belemsaga et al., 2005). Studies by Rege and Tawah, (1999) and (Mattioli et al., 2000) and (Smetko et al., 2015) noted similar disease resistance characteristics in the N'Dama breed of the *Bos Taurus* group that is domiciled in the same countries as the Somba breed,

with the inclusion of Nigeria, Mali and Senegal. (Mattioli et al., 2000; S. A. Traoré et al., 2017) noted that N'Dama displays an effective adaptability to humid climate conditions, which Hoste (1992) observed increase the propensity for fungal and bacterial diseases that affect cattle. The N'Dama breed has a large and stocky body structure with an average weight of 275 kg at adulthood which is relatively high compared to many other indigenous breeds in Africa (Kubkomawa, 2017; Rege and Tawah, 1999).

Disease tolerance characteristics were also identified in the Lagune breed that is common in Benin, Ghana, Cote d'Ivoire, and Togo. According to Adebambo (2001) the Lagune breed also displays good adaptation to tropical humid and sub-humid climates that prevail within the West Africa regions. However, Lagune differs from other cattle breeds by having a less bulky body structure, with an average weight of 180kg at adulthood. In general, Lagune displays good adaptability characteristics, although its low mature body weight when compared to Somba and N'Dama breeds makes it less preferred alternative in cattle in meat producing farming systems.

The Mutura breed of Ghana and Nigeria features a similar low weight and body size stature as the Lagune. Adebambo, (2001) described it as the smallest cattle breed domiciled in the West African region (and globally). The breed resides and thrives in the high humid and forested regions of equatorial belt of West Africa. While the breed displays strong adaptability tolerance capacities (especially with regard to diseases), its survival and longevity within the region that records a high human population may be attributed to its position as sacred entity rather than its meat and milk production. Moreover, its milk is said to have medicinal value to humans and high butter fat content making it preferred choice in butter production (Adebambo, 2001). The Kuri breed is a longhorn type *Bos taurus* mainly found in Nigeria and Niger. The breed is one of the largest cattle types in the West African region, with an average weight of 400 kg at maturity. The breed is credited with swimming prowess, which is an evolutionary adaptation developed from residing in a swampy environment while in the natural (non-domesticated) context (Hoste, 1992; Tawah et al., 1997; Meghen et al., 2000; Kubkomawa, 2017). The breed is also known for its high milk yield, which makes it a preferred breed within the dairy farming communities in the region (Kubkomawa, 2017).

The shorthorn variety of the *Bos indicus* cattle breeds are known for their physical endurance capabilities, which makes them effective survivors in semi-arid and arid conditions. For instance, the Maure shorthorn cattle breed is documented to have strong muscular frame, which makes them suitable for provision of draught power (Penda et al., 2014). Similarly, the breed exhibits a high tolerance for

high temperature, low-humidity conditions, which would explain its preference among livestock farmers in regions such as the arid sections of Mali. The breed's adaptability to diverse temperature conditions also explains why it can also survive in high humid domains of Cote d'Ivoire and Senegal. The breed's large and stocky body size also makes it a suitable candidate for beef farming practices within the West African region. The Azawak breed has similar tolerance and endurance characteristics as the Maure breed. Studies indicate that such characteristics as well as its ability to walk for long distances underscore its suitability for cattle rearing among pastoralists (A. Traoré et al., 2015). The breed's average mature body weight of 345 kg as well as high meat content makes it more suitable in meat production. Besides, the breed has a low milk yield of approximately 1.5kg per day making it inefficient for dairy farming (A. Traoré et al., 2015).

Another indigenous cattle breed found in the West Africa region is the Gudali. It is a heavy and stocky breed common in Benin, Burkina Faso, Ghana, Mali and Nigeria (Yakubu et al., 2010). The breed exhibits effective adaptability characteristics both in humid and wet to dry and arid conditions. Besides being used for meat production, Gudali is used for draught power provision though its mainly preferred more in beef production systems. The Shuwa breed equally has similar endurance and high weight characteristics to other members of the *Bos Indicus* group (Rege and Tawah, 1999). The breed is mainly reared in dairy systems owing to its high lactation yield.

Other breeds of the West Africa region identified are the White Fulani, Djelli, and Gobra of the *Bos Indicus* longhorn cattle type group who have shown to be highly tolerant to diseases as well as exhibiting cross-environment adaptability. The White Fulani is renowned for its dual purpose characteristics and is mainly kept by the beef and dairy producers (Rege and Tawah, 1999; Mwai et al., 2015). The Djelli breed is predominant in Niger and is mainly reared in pastoralist systems (Rege and Tawah, 1999). Another common indigenous cattle breed in the West Africa region is the Gobra which is mainly kept for meat production due to its high mature body weight (Missohou et al., 2011). It is also preferred in pastoral production systems due to its endurance to the arid and semi-arid conditions encountered in the systems explaining its predominance in the Sahelian regions of Mali and Senegal.

Other identifiable breeds from the region are the Sanga group breeds of Ketekou, Ghana Sanga, and Borgou which are generally cross breeds of native West African species and/ or other tropical African breeds such as the Zebu. As such, the breeds exhibit a greater degree of tolerance and productivity as compared to the pure breed counterparts. For instance, the Ketekou breed that is a crossbreed of

**Table 1:** provides a brief overview of documented characteristics of common cattle species within the West African Region.

Breed	Majors characteristics	Location	Sources
Somba ( <i>Bos Taurus</i> , Shorthorn cattle type)	Stocky animals, straight chamfer and compact body, long and narrow head, short and thin limbs and long tail, coat colour mostly black, either uniformly black, black-and-white or red-and-white. This breed is reported to be trypanotolerant. wither height 110 cm male and 85cm female. Weight 200 kg for mature bull and 180kg for a mature cow. The lactation length for a Somba cow is about 200 days and the age at first parturition estimated at 36 months with a parturition interval of 360 days.	Benin, Burkina-Faso, Ghana, Cote d'Ivoire, Togo	(Trail et al., 1979), (Dossa and Vanvanhosou, 2016), (Goudarzi et al., 2001), (Rege et al., 2007)
Lagune ( <i>Bos Taurus</i> , Shorthorn cattle type)	Cattle of small format, rectilinear, with very small or absent horn. It has a long bare head, a straight profile, a flat or slightly concave forehead. The chamfer is rectilinear. It presents a black coat, sometimes black pie. They are trypanotolerant with a good adaptation to the tropical humid and sub humid climate. Weight of a mature Lagune cattle is 200kg for a bull and 160kg for a cow. Average length of lactation is 180 days. Age at first parturition 24-36 months and the parturition interval an average of 559 days	Benin, Ghana, Cote d'Ivoire, Togo	(Trail et al., 1979), (Rege et al., 1994), (Rege et al., 2007)
Muturu ( <i>Bos taurus</i> , Shorthorn cattle type)	smallest cattle breed known, wither height of 95cm for a male and 88cm for the female. Generally black coat colour. The survival of the cattle in the humid and forest zones of Nigeria stems from the fact that the animal is still sacred in so many communities and its milk is widely used for medicinal purposes. The birth weight is 11kg. a cow has a lactation length of 216 days and the age at first parturition is between 28-42 months.	Ghana, Nigeria	(Trail et al., 1979), (Adebambo, 2001), (Kubkomawa, 2017), (Rege et al., 1994), (Rege et al., 2007)
N'Dama ( <i>Bos taurus</i> , Longhorn cattle type)	Tolerant to trypanosomosis and well adapted to humid climate conditions. A mature bull is about 300 kg against 250 kg for a cow. The lactation length for a cow is in average 351 days with a daily milk yield of 0.6kg. the age at first parturition is between 23-60 months.	Benin, Burkina-Faso, Ghana, Cote d'Ivoire, Mali, Senegal, Togo, Nigeria	(Trail et al., 1979), (Rege & Tawah, 1999b), (Ndiaye et al. 2015), (Rege et al., 2007)
Kuri ( <i>Bos taurus</i> , Longhorn cattle type)	Excellent swimmers with a gigantic bulbous horns. A mature bull is 499kg as weight against 363kg for a cow. The coat is uni coloured: light or white, occasionally with spots. Milk yield of 1260 kg for a lactation length 280 days with a parturition interval of 450 days. The Wither height for a bull is about 152cm and 139cm for a female.	Niger, Nigeria	(Tawah et al., 1997), (Meghen et al., 2000), (Rege et al., 2007)
Maure ( <i>Bos indicus</i> , Shorthorn cattle type)	Coat colour is fawn, red or black in plain or patchy pattern. Excellent carrier and well adapted to arid zone. 400 kg and 300 kg respectively for the weight of a mature male and female. The wither height is an average of 140cm and 130cm respectively for the male and the female. Milk yield per lactation is 471 kg with a maximum lactation length of 270 days. Milk yield per day is about 8 kg.	Cote d'Ivoire, Mali, Senegal	(Rege et al., 2007), (Rege & Lipner, 1992)
Azawak ( <i>Bos indicus</i> , Shorthorn cattle type)	Good walker, well adapted to drought; coat colour usually a mixture of red and white. Suitable for beef and draught. Weight of an average of 393 Kg (Male) and 292 kg (Female). The milk yield per day is 1.5kg and a lactation length of 290 days. The age at first parturition is between 35-40 months.	Burkina-Faso, Mali, Niger, Nigeria	(Rege et al., 2007), (Rege & Tawah, 1999b)

Gudali ( <i>Bos indicus</i> , Shorthorn cattle type)	Rather long and broad ears, well-developed hump and pronounced sheath in the bull; horns are short and tend to be longer in the cow than in the bull; coat colour varies between grey and white, or light dun, with dark shading over head, neck and shoulders. the tail switch is black. The weight of a mature male and female are respectively 525kg and 325kg. The lactation length for the cows is about 228 days and the milk yield per day 7.5kg.	Benin, Burkina, Ghana, Mali, Niger, Nigeria	(Kubkomawa, 2017)), (Rege & Lipner, 1992), (Belemsaga et al., 2005), (Rege et al., 2007)
Shuwa ( <i>Bos indicus</i> , Shorthorn cattle type)	Typical shorthorned zebu cattle; considered to be good dairy animals; used by women for riding and as pack animals; coat colour is usually plain red, and sometimes black and patchy. 323 kg and 277kg represents respectively the weight of a mature male and female. The lactation yield for a cow is 1212 kg for a lactation length of 259 days.	Nigeria	(Kubkomawa, 2017)), (Rege & Tawah, 1999b), (Belemsaga et al., 2005)
White Fulani ( <i>Bos indicus</i> , Longhorn cattle type)	Characterised by long (80-105cm) and lyre-shaped horns; coat colour is white with patches of black, sometimes with red marks on the ears, feet and sides. It is known to have excellent potential as dual-purpose (milk/beef) cattle. 500kg and 323 kg respectively for the weight of a mature bull and a mature cow.	Benin, Burkina, Ghana, Mali, Nigeria	(Deshler, 1963; Kubkomawa, 2017); Rege & Tawah, 1999b), (Rege et al., 2007)
Djelli ( <i>Bos indicus</i> , Longhorncattle type)	Medium size and lyre-shaped horns; coat colour is white and black in speckled or patchy pattern; some Djelli populations have been influenced by the neighbouring SokotoGudali breed in relation to the seasonal migrations of the Fulani pastoralists. An average weight of a mature Djelli cattle is 300 kg.	Niger	(Rege et al., 2007), (Rege & Lipner, 1992)
Gobra( <i>Bos Indicus</i> , Longhorn cattle type)	Long (70-80 cm), lyre-shaped horns, which can occasionally be loose; well-developed dewlap; coat colour is generally white, with some coloured spots and stripes; the hump is prominent particularly in the bull; the skin is thick and loose; it is considered to be a good beef breed to exploit the Sahelian pasture of West Africa. A mature bull weight in average 450 kg against 550kg for a cow.	Mali, Senegal	(Deshler, 1963; Kubkomawa, 2017); Rege & Tawah, 1999b), (Rege et al., 2007)
Ketekou (Sanga)	Stabilized cross of Savannah Shorthorn (Muturu) of the south and White Fulani of the north of Nigeria, with some input from N'Dama Longhorn. White coat colour with black ears and nose and sometimes black speckled; body is long and muscled, but with poorly developed hindquarters; dished head profile. Trypanotolerant and adapted to harsh climatic conditions. Average weight of a mature is 203 kg. The cows have a lactation length of 200 days.	Nigeria	(Kubkomawa, 2017), (Rege et al., 2007)
Ghana Sanga	Stabilized cross of the Ghana Shorthorn (sometimes also the N'Dama) with zebu (commonly White Fulani, and sometimes SokotoGudali. Small animals with variable coat colour; the head is generally long, straight or convex in profile; coat colour is mostly plain black, but black pied and brown pied coats are also common.	Ghana	(Mwai et al., 2015; Rege and Tawah, 1999)
Borgou (Sanga)	Crossbreed between West African Zebu (main White Fulani Zebu) and West African Shorthorn, the coat is usually white or grey, or sometimes black-and-white. It shows little sexual dimorphism and much more docile than the Lagune or Somba. A mature borgou bull has an average weight of 260kg and 226kg for cow. It has a carcass weight of 137 kg and a dressing percentage of 48 percent. The lactation length is about 250 days with a daily milk yield of 2.5 kg in average. A parturition interval of 540 days. 42 months in average is equivalent to the age at first parturition.	Benin	(Trail et al., 1979), (Belemsaga et al., 2005), (Rege et al., 1994), (Rege et al., 2007)

Muturu and White Fulani is trypano tolerant and is well adapted to the harsh climatic conditions in which it is kept

In general, knowledge on phenotypic and general physiological capacities as well as diversities that exist among (Buchanan & Lenstra, 2015). The Ghana Sanga breed is a cross of the N'Dama and Zebu varieties can survive both in arid and semi-arid conditions, while equally displaying tolerance for humid and wet environments. The Borgou breed is a crossbreed of the West African Zebu and West African Shorthorn and have good adaptability characteristics (Rege and Tawah, 1999; Belemsaga et al. 2005).

West African cattle breeds plays an essential role in guiding rearing and production practices within the cattle industry. Characteristics of significance importance revolve around the adaptability to produce and reproduce in specific production systems and then potential of use of the breed in the face of the changing climate. It is important to identify and document the unique qualities exhibited by each of the indigenous cattle populations in West Africa and Africa in general to enable relevant stakeholders within the cattle industry to stock or develop unique breeds in response to changing conditions within the climate and larger environment context, human nutritional requirements, and market conditions as well as greater societal needs (Hoffmann, 2010; Naves et al., 2015). Further, the knowledge on the characteristics of the cattle breeds also enables actions ensuring they meet the subsequent goals of value generation within the cattle production industry as well as sustaining human-based aspects such as food security and economic development.

The FAO (2016) data indicates that all West African countries had approximately 73,685,002 head of cattle in different production systems providing different products and services. (Buchanan & Lenstra, 2015) noted that, most producers in African countries use cattle genetic resources sub-optimally as there are no formal breed improvement plans. Research shows that due to uncontrolled cross-breeding and breed replacements with exotic breeds, many indigenous breeds are endangered (Nyamushamba et al., 2017). The purity status of those indigenous cattle breeds is therefore seriously affected. This situation is aggravated by poor strategies of records keeping, lack of frequent genetic evaluation, and uncontrolled mating systems practiced in the smallholder areas (Mwai et al., 2015) leading to in-breeding and to a highly disorganised genetic structure of indigenous cattle with uncontrolled gene flow between populations (Ndiaye et al., 2015). Furthermore, transhumance practices of livestock in most West African countries due to the porosity of the borders is an additional way leading to genetic mixtures among the different cattle populations (Ndiaye et al., 2015). For instance, the numbers of "Somba" cattle breed found in Benin sharply decreased from 58,000 in 1986 to about 17,000 head in 2000 (Belemsaga et al., 2005) and currently, there is no data about

its effective population size, explaining its unknown risk status (FAO, 2016). Similarly, it has been reported that the Pabli breed previously found in Benin is extinct and the lagune cattle type are under risk of extinction due to gene introgression from Borgou and Zebu breed (Belemsaga et al. 2005). If this trend is not addressed, the gene pool of indigenous cattle could be lost in the near future (Reist-Marti et al. 2003; Rischkowsky and Pilling 2007; Mwai et al. 2015). This threat has been identified by FAO (1999) which implied that animal genetic resources in developing countries in general, are being eroded through the rapid transformation of the agricultural system, in which the main cause of the loss of indigenous AnGR is the indiscriminate introduction of exotic genetic resources, before proper characterization, utilization and conservation of indigenous genetic resources (Hanotte et al., 2010). There is need to take remedial steps to improve knowledge of production environments, describe the cultural aspects of animal production and utilization, carry out phenotypic and genetic characterization of the available animal genetic resources in order to increase the livestock production in developing areas through well implemented breeding programs. In the similar way, a designing of a long term conservation plan. This review provides an overview on the indigenous cattle species in West African regions which has implications on survival and productivity of livestock species.

## ACKNOWLEDGEMENTS

The authors recognise the financial support provided by the African Union Commission through the Pan African University Institute of Basic Science, Technology and Innovation.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest insofar as this manuscript is concerned.

## AUTHORS CONTRIBUTION

Authors contributed equally all stages of the development of this manuscript.

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