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State of understanding on Vogan Sheep

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Abstract
The Vogan Sheep is numerically the second sheep breed in Togo, but less known compared to the Djallonke Sheep. Historically, the breed is obtained by crossing the Djallonke ewe and the Sahelian Bali-Bali ram around the 1970s in south-east Togo. Despite its tremendous morphobiometric and zootechnical performances compared to the Djallonke Sheep and its similarity with the Sahelian Sheep, the breed remains vulnerable in its traditional breeding system. Without development program, the breed is at risk of genetic erosion and loss of value in the context of climate change and breeding systems evolution in Togo.

Key words: Vogan Sheep, knowledge state, breeding, Togo.

Introduction

Livestock plays a crucial role in West African socio-economic and cultural landscape. In Togo, 93.4% of farmers practice livestock farming as their second activity (DSID, 2012). This breeding is characterized by anarchic crossings with real difficulties in determining the phenotypic characteristics and morphological standards of the animals raised. However, according to the FAO, knowledge of the characteristics of national genetic resources is very crucial in the design of conservation strategies and improvement of their productive potential

(FAO, 2013). In Togo, small ruminants, including sheep and goats, hold a significant place in livestock farming industry. Sheep are raised in almost all areas of the country and are highly valued during Muslim festivals like Ramadan and Tabaski, and traditional rituals (Sangaré, 2005). The two main breeds of sheep in Togo are Djallonke Sheep (DS) and Vogan Sheep (VS). VS is less well-known in Togo. This bibliographic synthesis presents the current state of knowledge on the Vogan Sheep breed.

I-State of knowledge on the Vogan Sheep

1.1. **History of the Vogan Sheep**

Vogan Sheep (VS) (Figure 1b) is the second most common breed of sheep in Togo. It is the result of crossbreeding between Djallonke ewe (Figure 1a) and Sahelian Bali-Bali ram (Figure 1c) (Dayo et al., 2015a; Amegee, 1983). The breed is primarily found in the southeast of Togo, specifically in the prefectures of Vô, Lacs, Yoto, and Bas-Mono in the Maritime region. The name "Vogan Sheep" is derived from the Vogan market, which is well known as livestock sales market (Amegee, 1983). According to estimates, VS were 130,000 heads of livestock in 1981 and 190,000 in 1993 (Hadzi, 1996). These numbers may have changed due to local development actions and changes in breeding systems.

Historically, cross-breedings between Djallonke Sheep (DS) and Sahelian Sheep (SS) occurred as result of the importation of SS by Hausa traders and transhumant Fulani (Amegee, 1983). In the 1970s (Dayo et al., 2015b), meetings between DS and SS traders were held that led to cross-breedings and the establishment of the Crusaders in the southeastern region of Togo, specifically in the prefecture of Vô and nearby zones, including the prefectures of Lacs, Bas-Mono and Yoto. The goal of the crossbreeding was to improve Djallonke breed morphological and production traits.

1.2 Description of the parental sheep populations of the Vogan Sheep

1.2.1 Djallonke Sheep

Djallonke Sheep is the most important sheep breed in Togo, accounting for over 95% of sheep farms. DS is a small sheep breed with short, straight feet and a rectilinear body type. The length and width of the body at the chest level are well balanced, making it a middle-line animal. In traditional breeding, the height at the withers of the DS varies from 40 cm to 60 cm, with an

average weight of 20-30 kg for ewes and 25-40 kg for rams (Sangaré, 2005; Hadzi, 1996). The morphobiometric data of this breed, shown in Table 1, are high when animals were bred in a controlled environment compared to traditional breeding methods (Djagba et al., 2019).

1.2.2 Sahelian Sheep

Sahelian Sheep (SS) found in the Sahelian regions is known under different names or synonymous terms depending on the country where it is bred. In Senegal, it is called Peul-Peul sheep, in Niger it is known as Bali-Bali sheep, in Nigeria it is called Barami sheep and in Tchad it is known as Foulbé sheep (Sangaré, 2005).

SS is a large animal, measuring 65-90 cm at withers and weighing 30-50 kg in traditional breeding and 45-65 kg in improved breeding (Sangaré, 2005). The morphobiometric data of this specimen are comparable to those described by Dayo et al. (2015a), in Burkina Faso (Figure 1c) and Yayé et al. (2023), in Niger, with regards to most quantitative characteristics (Table 2).

Table 1: Morphobiometric characteristics of Djallonke Sheep

Characters (cm)	Parameters	Djallonke Sheep in traditional breeding (Dayo et al., 2015a)	Djallonke Sheep in Station breeding (Djagba et al., 2019)
Height at withers (HW)	Mean ± Et	54,63 ± 8,23	63,8 ± 3,11
Chest circumference (CC)	Mean ± Et	74,72 ± 8,28	75,31± 3,03
Ear length (EL)	Mean ± Et	11,61 ± 2,61	10,62±0,15
Tail length (TL)	Mean ± Et	27,47 ± 8,05	27,14 ± 1,32
Thoracic depth (TD)	Mean ± Et	25,24 ʿ±3,25	37,94 ± 3,63

Table 2 : **Morphobiometric parameters of Sahelian Sheep**

Characters (cm)	Sahelian Sheep (Mean ± Et) (Dayo et al., 2015a)	Sahelian Sheep (Mean ± Et) (Yayé et al., 2021)
Height at withers (HW)	75,43 ± 5,43	79,9±4,6
Chest circumference (CC)	94,57 ± 8,82	87,6±6,0
Horn length (HL)	26 ± 11,84	29,3±14,5
Distance between horn bases (DBH)	5,67 ± 1,61	7,5±2,0
Ear length (EL)	21,63 ± 2,48	21,1±1,7
Tail length (TL)	48,20 ± 5,37	51,0±6,1
Thoracic depth (TD)	33,17 ± 2,74	35,0±3,5
Body length (LC)	74,83 ± 5,55	74,4±4,8

II Synthesis of knowledge on Vogan Sheep

2.1 Breeding system

VS breeding system is an improved traditional type (Amegee, 1983; Dayo et al., 2015a). According to Dayo et al. (2015a), VS breeders in Vô prefecture are located in the cantons of Koutime, Sevagan, Togoville, Vogan and Wogba-Vogan. The sheep rearers are mainly men (74.19%), but there are also few women (25.81%). The majority of breeders are farmers with livestock breeding as a sideline business. The size of VS flocks consists of 7-8 ewes (Amegee, 1983) with an average of 11.58 ± 11.36 ewes per breeder (Alfa, 2013). Flocks of VS are fed on the pasture by a shepherd for at least 6 hours per day, divided between the mornings from 8 to 11 am and the afternoons from 3 to 6 pm (Amegee, 1983). Animals are grazed on the fields after crop harvesting periods and freely on some fallow lands which provide them proper grazing. According to Dayo and al.(2015c), the food given to the animals is essentially: cassava peels, cassava stalks, oil palm branches, hyssop (*Vernonia sp.)* and other grasses found in the pasture. Fodder is distributed either in baskets or on the ground. Animals are usually watered at home and at will. The types of drinking troughs are domestic basins, earthen vases (clay) or troughs dug into the ground and cemented. The types of housing are either masonry shelters specifically for animals, either straw-covered sheds or abandoned huts (Alfa, 2013; Dayo et al., 2015c). The majority of farms use crossbreeding as a method of herd renewal. Some breeders use both crossbreeding between animals in the herd and the purchase of new animals, and few others use only crossbreeding as a method of herd renewal.

2.2 Qualitative characteristics

According to the description of Amegee (1983), the Vogan Sheep is a large animal, convexilinear, elongated, eumetric. The head is long with bulging eyes. The neck is long and the chest high. The forehead is flat, the muzzle slightly curved. Sock stars and frosting are present in the VS as in the SS and DS (Dayo et al., 2015a). On the other hand, the long and drooping ears bring them closer to SS. Sexual dimorphism was observed with horns present in males and not usual or thin in females. VS generally have “prismatic outward-facing” horns (Figure 3b). The hair is short like in DS and smooth like SS. The most common coats are demarcated at the front of the two-tone type (Figure 3a).

2.3 Quantitative characteristics

The height at the withers of the VS reaches 73 cm for rams and 69 cm for ewes (Amegee, 1983). The depth of the thorax is 32 cm and 36 cm, and thorax circumference is 84 cm and 85 cm for ewes and rams respectively. The average adult weight is 40 kg for ewes (30 - 45 kg, n = 120) and 45 kg for rams (40 - 55 kg, n = 29). Some individuals reach a weight of 60-80 kg. They already look like pure Sahelian breed. The pelvis measures 25 x 18 cm in rams and 23 x 16 cm in ewes. The ears, long, broad and drooping, reach an average length of 14 cm according to Amegee (Amegee, 1983) and 18.45 ± 2.08 cm according to Dayo et al. (2015a). This feature brings VS closer to SS. The tail is long (30 - 40 cm (Amegee, 1983) and 45.24 ± 6.23 cm (Dayo et al., 2015a)), often reaching the hock and lacking fat reserves. This another characteristic brings VS closer to SS.

The quantitative data of the VS (Table 3, Figure 2) (Dayo et al., 2015a) confirm the results reported by Amegee (1983) with a few differences. The type of sampling can explain the few differences on hand and on the other hand by global changes, in particular climate changes, the market preferences and the variability of the breeding system, which could affect some parameters. In addition, Dayo and al. (2015a), showed that VS breed is an intermediate breed with quantitative characteristics higher than those of the DS and relatively lower than those of the SS (Table 3).

Table 3: Morphobiometric data comparing Vogan Sheep, Djallonke Sheep and Sahelian Sheep

Characteristics (cm)	Parameters	Djallonke Sheep	Vogan Sheep	Sahelian Sheep
Height at withers (HW)	Extremes values	38 - 78	57 - 83	61 - 87
	Mean ± sd	54,63 ^{c} ± 8,23	71,65 ^{b} ± 5,79	75,43 ^{a} ± 5,43
Thoracic circumference (TC)	Extremes values	59 - 102	72 - 109	77 - 111
	Mean ± sd	74,72 ^{c} ± 8,28	89,30 ^{b} ± 9,25	94,57 ^{a} ± 8,82
Horn length (HL)	Extremes values	8 - 30	8 – 31	3 - 43
	Mean ± sd	17,00 ^{a} ± 7,44	19,29 ^{a} ± 6,04	26 ^{a} ± 11,84
Distance between horn bases (DBH)	Extremes values	2 - 7	2 – 7	3 - 8
	Mean ± sd	3,94 ^{b} ± 1,48	4,50 ^{b} ± 1,39	5,67 ^{a} ± 1,61
Ear length (EL)	Extremes values	8 - 20	12 - 22	17 - 26
	Mean ± sd	11,61 ^{c} ± 2,61	18,45 ^{b} ± 2,08	21,63 ^{a} ± 2,48
Tail length (TL)	Extremes values	15 - 52	26 - 55	37 - 57
	Mean ± sd	27,47 ^{c} ± 8,05	45,24 ^{b} ± 6,23	48,20 ^{a} ± 5,37
Arc chamfer (AC)	Extremes values	11 - 19	15 - 22	15 - 20
	Mean ± sd	14,67 ^{b} ± 1,57	17,44 ^{a} ± 1,55	17,56 ^{a} ± 1,22
Chamfer bead (CB)	Extremes values	13 - 23	17 - 25	19 - 27
	Mean ± sd	16,44 ^{c}±1,87	20,74 ^{b}± 1,87	22,90 ^{a}± 2,07
Thoracic depth (TD)	Extremes values	20-35	24-39	28-38
	Mean ± sd	25,24 ^{c}±3,25	31,50 ^{b}± 3,09	33,17 ^{a}± 2,74
Body length (BL)	Extremes values	47-80	57-84	63-88
	Mean ± sd	58,47 ^{c} ± 6,30	71,02 ^{b} ± 6,03	74,83 ^{a} ± 5,55

^{a,b,c} **Order in the Student test for p-value < 0,05;** sd**=Standard deviation**

Source : (Dayo et al., 2015a)

2.4 Zootechnical skills

2.4.1 Reproduction characteristics

Prolificacy has been evaluated in Vogan Sheep under traditional breeding conditions with an average of 1.40 (308 observations): 140 lambs per percent parturition with 62.66% of singles, 34.42% doubles and 2.92% triples (Amegee, 1983). This prolificacy is quite worthwhile and can be improved by suitable breeding methods.

2.4.2 Production parameters

2.4.2.1 Milk production and lamb growth

The milk production of 26 Vogan ewes aged 13 months to 3 years and weighing 32 kg to 41 kg, is averagely estimated to 122 kg in 124 days for ewes with one lamb and 184 kg in 139 days for ewes with two lambs. The average milk fat content is 6.11% and 5.94% for nitrogen (Amegee, 1984a). The addition of powdered leaves of *Spondias mombin* and *Vitellaria paradoxa* improved milk production in Djallonke Sheep and weight gain in lambs in southern Benin (Akouedegni et al., 2013). Thus, improving the feeding conditions of VS could improve the milk production of ewes and the growth of lambs.

2.4.2.2 Butchery value of lambs

Amegee (1984c) showed that the carcasses of 35 unfattened uncastrated Vogan lambs aged 7.5 months weighed averagely 30 kg with 65.72%, 3.73%, 25% and 5.55% of muscle, fat, bone and waste respectively. The benefits of supplementation based on leguminous plants like *Moringa oleifera* (Dimon et al., 2020), *Gliricidia sepium* and *Leucaena leucocephala* (Idrissou et al., 2017) have been successfully tested in Djallonke sheep. It is therefore necessary to carry out in-depth researches in order to master the conditions, the optimal parameters and the type of feed well adapted for VS farming in all zones in Togo.

2.5- Vogan Sheep diseases

The national prevalence of African animal trypanosomiasis (AAT) is approximately 10% (all trypanosome species combined), and *Trypanosoma vivax* is currently the most dominant species throughout the country (Dao et al., 2008). Dayo et al., (2020) reported the severity of AAT (24.51% in DS and 20.19% in VS) with a clear predominance of *Trypanosoma vivax* infection in Vô prefecture. These results showed the serious impact of animal trypanosomosis in Togo in general and in the Vô prefecture. The persistence of the trypanosomosis in this zone

could be explained by the lack of effective preventive measures and adequate treatment, but also by chemoresistance (Talaki, 2008) of the parasite to the existing trypanocidal drugs since farmers treat the animals themselves. Therefore, programs to promote Vogan Sheep require solutions to this disease in the regions where breeding of VS will be promoted.

a-Djallonke Ewe with lambs | **b-Herd of Vogan Sheep** | **c-Herd of Sahelians Sheep**

Figure 1 : Different breeds of the study (Dayo et al., 2015a)

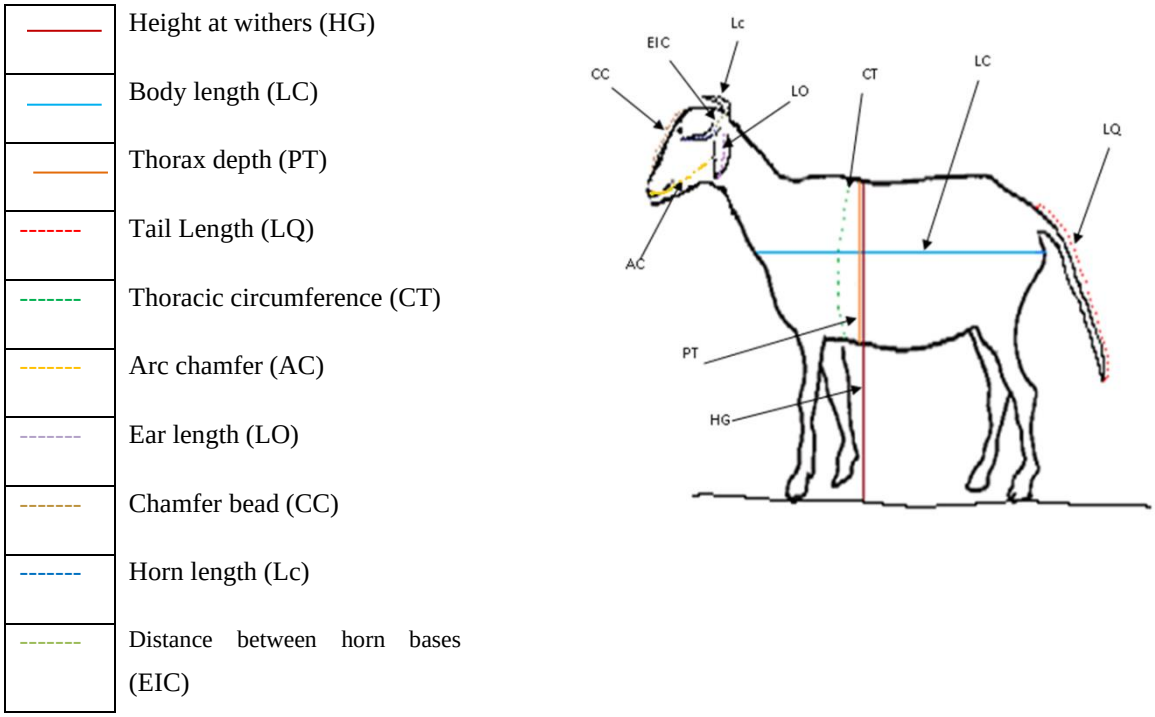

Figure 2 : Types of morphobiometric measurements (Dayo et al., 2015a)

a-Bicolor coat of Vogan Sheep | **b-Prismatic horns oriented outwards of the Vogan Sheep**

Figure 3 : Some qualitative characteristics of Vogan sheep (Dayo et al., 2015a)

III- Analysis of the current knowledge on the Vogan Sheep

3.1-Importance of Vogan Sheep in Togo

Amegee (1983) reported that, VS is highly valued by in its cradle. This large sheep compared to cattle, hence its local name "Sabalo" (Dayo et al., 2015b), is recognized as a breed by the FAO. VS is usually used for sale at the livestock market of Vogan. Selling prices are around one hundred thousands (XOF 100,000), much higher than those of DS (XOF: 40,000). Due to its morphobiometric and reproductive performances, VS presents itself as a breed of great value (Amegee, 1984a), which needs much more attention and valorisation actions.

3.2-Challenges of Vogan Sheep farming in Togo

3.2.1- Progressive genetic erosion

The morphobiometric data collected by Dayo et al. (2015a) showed the presence of small formats of VS in some locations while in the previous studies conducted by Amegee, this information was not mentioned. Two hypothesis could be explained that: the lack of studies on this aspect or the climate and farming systems change impacted the structure of VS population in the region by generating the morphological clusters. However, given the appreciation of breeders and populations utilizing the breed, it is possible that crosses between VS and DS have been made by Djallonke breeders to improve this herd. In addition, the small sizes could also come from the results of trials in the various herds of the Vô prefecture and neighboring prefectures.

Amegee (1983) mentioned the presence of tassels or pendants in VS population. However, Dayo et al. (2015a), showed the absence of these characteristics in VS populations. The absence of these appendages could also confirm the theory of genetic erosion in the VS. All actors must therefore take measures to preserve the pure breed in research centers.

3.2.2- Low zootechnical performance updated

The VS zootechnical data on lamb growth, sire reproductive characteristics, young stock butchery value, etc., date back to the 1980s (Amegee, 1984a; Amegee, 1984b; Amegee, 1983; Amegee, 1978). Recent studies on this breed have been limited to the analysis of the breeding system (Alfa, 2013), genetic and phenotypic characterization (Dayo et al., 2015a; Dayo et al., 2015b; Dayo et al., 2015c) and assessment of the prevalence and impact of animal

trypanosomoses in the VS breeding cantons (Dayo et al., 2020). Given the breed's potential interest for breeders, its size in relation to the Djallonke Sheep, and with a view to proposing dissemination strategies, it is necessary to evaluate and update the data on its zootechnical performance.

3.2.3- An established breed in the southeast of Togo

The VS is facing an expansion problem in Togo. Attempts to raise VS outside its "cradle" have always been unsuccessful. Despite its morpho-biometric and genetic performance being superior to that of the DS and similar to those of the SS (Dayo et al., 2015a), this breed is only reared in its place of origin, Vô (Dayo et al., 2015b). This is a major challenge that the scientific world must take up in order to better promote the breed.

IV- Some ideas for research on the Vogan Sheep

Analysis of the current knowledge of the VS suggests the following ideas of research

- Updated data on the current VS demography in Togo;
- Updated data on lamb growth, the breed's meat value and reproductive performance;
- Analysis of the VS adaptability at national level;
- Analysis of the impact of climate change and adaptation measures for VS animals and breeders;
- Analysis of the conservation status and the risk of loss of VS in Togo
- Diagnosis of VS diseases in Togo.

Conclusion

The Vogan Sheep, Togo's second-largest breed, has some interesting morphobiometric characteristics. Its scientific importance is no longer in doubt, given the large number of publications citing authors who have carried out research on this breed. However, the lack of an in-depth research and development program for VS is a major handicap to the development of Togo's animal gene pool.

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