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Exploitation and Reproductive Characteristics of Sheep in the Sudano-Sahelian Zone of Cameroon

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Abstract

The study was carried out with the objective of contributing to a better knowledge of the exploitation and reproductive characteristics of sheep in the Sudano-Sahelian zone of Cameroon. For this purpose, a sample of 324 ewes and their lambs were observed at birth on 124 farms. Exploitation characteristics data mainly focused on herd management, housing, feeding, health, and reproduction. Reproductive characteristics focused on litter size and lamb birth weight for each female. The main results show that the majority of the breeders surveyed (79.03%) inherited the sheep from their parents. Pastoralism is the most practiced management method (83.87%) and the most common type of housing is huts (50.00%). Animals find their food mainly in natural rangelands (96.77%). 21.77% of animals receive food supplements and 29.03% mineral supplements. 91.94% of animals receive vaccines and veterinary care. Mating takes place naturally (100%) in enclosures or on pasture. Single births are the most frequent (72.73%) and ewes receiving food and mineral supplements have higher litter sizes (1.52 ± 0.15 and 1.53 ± 0.12). The highest litter sizes ($p < 0.05$) are observed in Mayo-Danay (1.79 ± 0.08) while other localities are comparable for the character. Kirdi ewes had the highest litter sizes ($p < 0.05$) (1.71 ± 0.05). Lambs with the highest birth weights ($p < 0.05$) are obtained in Balami ewes (3.09 ± 0.09 kg) and the lowest in Kirdi (2.30 ± 0.07 kg). The highest litter sizes are obtained at the fifth parity (1.65 ± 0.08) and the lowest at the first parity (1.21 ± 0.07). An on-station study to evaluate the reproductive characteristics of these animals will make it possible to obtain more concrete results for better valorization of these animals.

Keywords

Exploitation Characteristics, Litter Size, Birth Weight, Sheep, Cameroon

1. Introduction

The sheep are an important animal species in the socio-economic life of populations around the world in view of their major production and reproduction characteristics [1] [2]. Indigenous African sheep genetic resources currently contribute to about 30% of agricultural gross domestic products (GDP) of African countries [3]. In Sub-Saharan Africa, it remains an important source of farm animal genetic resources, harboring most of the traits associated with resistance to stress, diseases and the ability to thrive on low quality feedstuffs. Genetic diversity, in animal breeds, allows for the existence of livestock in all but a few environments, globally, providing a range of products and functions [4]. For these reasons, sheep are particularly interested in helping to achieve the fundamental objective of food security in animal proteins for the majority of rural populations, particularly in developing countries [5] [6]. However, variations in prolificacy between and within breeds are controlled by both genetic and non-genetic factors [7]. Controlling environmental factors coupled with good management of feeding, health and reproduction can help increase the ovulation rate and induce twin births in ewes [8] [9]. In Cameroon, sheep farming is practiced throughout the national territory with undeniable socio-economic importance [10] with a herd of 3,931,917 heads in 2021 [11]. However, the Sudano-Sahelian zone alone represents 60% of the national livestock and constitutes the breeding of cattle and goats, one of the most practiced activities in the area [11]. Despite the socio-economic importance of sheep in this region, there is little available and reliable data on its breeding strategies. In the current alarming and changing context, sheep farming faces challenges such as climate change effects, the growing demand for sheep and multiple crossbreeding under random mating with genetic admixture [12]. Yet, it is clear that like any quantitative trait, increasing the prolificacy of ewes can be obtained by improving breeding conditions and by genetic means. The objective of this work is to contribute to the better knowledge of characteristics of exploitation and reproduction of sheep in the Sudano-Sahelian zone of Cameroon.

2. Material and Methods

2.1. Zone of Study

The study was carried out in the Sudano-Sahelian zone of Cameroon (**Figure 1**). The importance of sheep farming in this area justifies this choice. In fact, nearly 60% of the national sheep herd is found there [11]. This zone is between 8˚36" and 12˚54" North latitude, and 12˚30" and 15˚42" East longitude. It approximately covers the North and Far North regions, an area of 100,353 km^2. The climate is tropical Sahelo-Sudanian in the South and Sahelian in the North, with

two very short seasons [13]. Annual rainfall varies from 500 to 900 mm per year with averages between 750 and 800 mm. The Mandara Mountains have more water with an annual rainfall of 900 mm. The plain areas are less watered Diamaré (750 mm) and Logone and Chari (450 mm). The average annual temperature is around 28˚C, reaching maxima of 45˚C during the month of April and minima of 18˚C in December. Annual insolation varies from 2500 to 3300 hours. In the area, the landscape is dominated by shrub and tree savannahs and steppes. Two large groups whose boundaries interpenetrate are distinguished [13]; periodically flooded plains, whose flora is composed of *Pennisetum camosum*, *Hyparrhenia sp*, *Oryza longistanianata* and *Echiochhloa pyramidis*; the thorny steppes, whose pasture is made up of *Faidherbia albida* and mimosas (*Acacia seyal*, *Acacia senegal*, *Acacia sieberiana*…). Sorghum, millet, corn are the main food crops widely cultivated; peanuts, cowpeas and rice are the crops in which producers in the area are investing heavily. Market gardening has been practiced by certain local populations for a long time, but its recent development has benefited from the opening of urban markets in Southern Cameroon [14]. Furthermore, it constitutes a significant supplement to food and a source of income which makes it possible to supplement revenues from the sale of cotton. The market garden crops are: onions, tomatoes and vegetables. Livestock breeding constitutes one of the major activities in the area. It is one of the most profitable traditional activities. However, it suffers from a lack of pastures, health problems and a low commercialization rate. As for agropastoral industries, a few processing units (cotton ginning, oil mills, tanneries, yogurt makers) are installed there. Figure 1 shows the location of the study area.

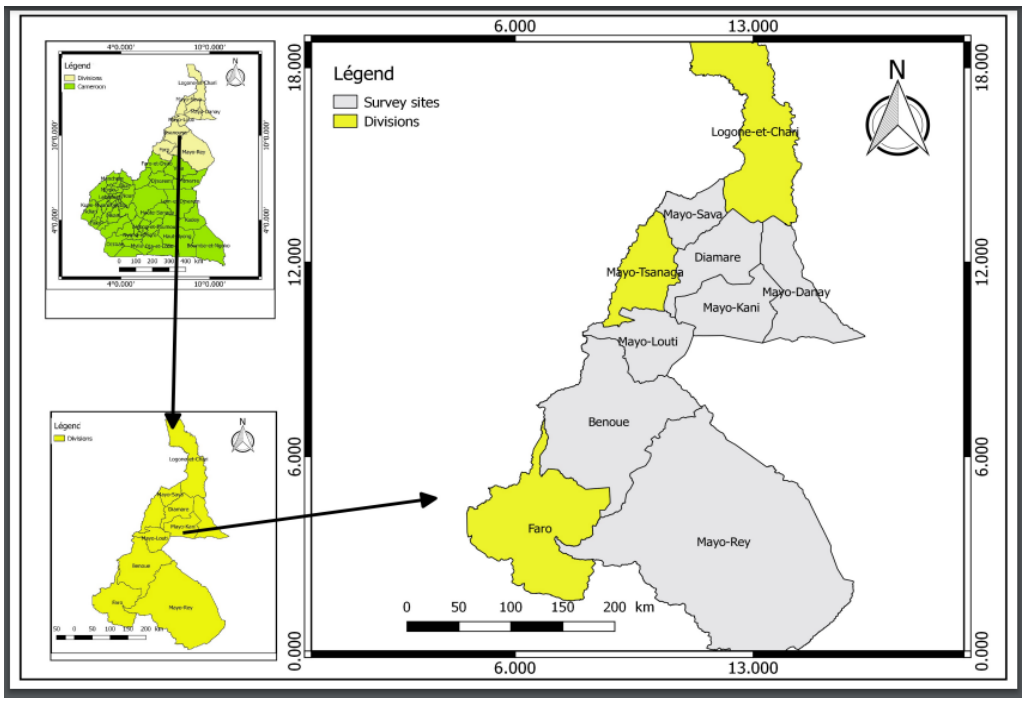

Figure 1. Zone of study.

2.2. Data Collection

The choice of farms was made using the snowball method according to the approach described by Solomon [15]; Chauvet [16] on voluntary farms with ewe that has given birth at least once. The snowball method consists of starting from one breeder to obtain several breeders in the locality. A total of 324 female ewes of 05 genetic types (Balami, Uda, Poulfouli, Kirdi and Djallonké) spread across 124 farms were used for data collection. Data on the exploitation and reproductive characteristics in different localities and farms were collected through interviews and direct observations of selected farms. This data was collected using a harmonized survey framework according to the FAO [17] and AU-IBAR [18] guidelines and mainly focused on: the management characteristics of herds, housing, diet, health, reproduction, production objective and reproductive characteristics. The age of ewes given by interview of breeders was completed by observation of the dentition following the Hamito [19] scale, considering that the animal reaches adulthood from 4 pairs of incisors [17] [20]. The rank of farrowing or parity was given by interviewing the breeders. Reproductive characteristics included: litter size and litter birth weight for each female. Litter size here is the number of lambs born per birth per female. The litter birth weight was collected no later than 24 hours after giving birth using an electronic scale (Table 1).

Table 1. Distribution sheep and breeders sampled by regions and localities.

Regions	Localities	Number of farms surveyed	Total	Number of sheep sample	Total
Far North	Diamaré	22		57	
	Mayo-Danay	15	**70**	38	**203**
	Mayo-Kani	15		53	
	Mayo-Sava	18		55	
North	Benoué	23		53	
	Mayo-Louti	17	**54**	37	**121**
	Mayo-Rey	14		31	
Total		**124**	**124**	**324**	**324**

2.3. Statistical Analysis

Descriptive statistics were used to describe the distribution of exploitation and reproductive characteristics. The chi-square test was used to determine the relation between variables and regions. Analysis of variance was used to evaluate the effect of traits on litter size and lamb birth weight. The Duncan test and the T-test were used to separate the means, when the factors were significant. The significance level was set at $p < 0.05$. These analyses were carried out using SPSS software version 21.0.

3. Results

3.1. Exploitation Characteristics of Sheep in the Sudano-Sahelian Zone of Cameroon

Herd and housing management characteristics.

Table 2 shows that the parameters are not significantly influenced by the region ($p > 0.05$). The majority of the breeders surveyed (79.03%) inherited the sheep from their parents while 17.74% acquired their animals by purchase. The mode of acquisition by gift is present at a very low frequency (3.31%). This dominance of acquisition by inheritance demonstrates the desire of breeders to keep their sheep and pass this breeding to their descendants. Sheep are mainly raised for sale (99.19%) regardless of the region. Pastoralism is the most practiced management mode regardless of the region (83.87%) followed by seasonal confinement (12.90%). This can be explained by the fact that these breeders are constantly looking for new pastures and water resources. The types of housing encountered are, in order of importance huts (50.00%), sheds (20.96%), and enclosures (18.55%). However, 11.29% of breeders do not have housing for their animals.

Table 2. Herd and housing management characteristics by regions.

Characters	Modalities	Regions				Total regions		χ^2
		Far North		North				
		n	%	n	%	**n**	**%**	
Mode of acquisition	Purchase	13	18.57	9	16.66	**22**	**17.74**	
	Legacy	54	77.14	44	81.48	**98**	**79.03**	0.707^{ns}
	Gift	3	4.29	1	1.89	**4**	**3.23**	
Production target	Sale	69	98.57	54	100.00	**123**	**99.19**	0.378^{ns}
	Home-consumption	1	1.43	0	0.00	**1**	**0.81**	
Herd management	Pastoralism	56	80.00	48	88.89	**104**	**83.87**	
	Seasonal confinement	11	15.71	5	9.26	**16**	**12.90**	0.563^{ns}
	Permanent confinement	3	4.29	1	1.85	**4**	**3.23**	
Type of accommodation	Enclosure	12	15.71	11	20.37	**23**	**18.55**	
	Cage/hut	39	57.71	23	38.89	**62**	**50.00**	0.142^{ns}
	Shed	15	21.43	11	20.37	**26**	**20.96**	
	No housing	5	7.14	9	16.67	**14**	**11.29**	

χ^2: khi-deux; ns: not significant ($p > 0.05$); n: number.

3.1.1. Feeding Management Characteristics

It appears from Table 3 that apart from mineral supplements which were significantly influenced by the region ($p < 0.05$), the other parameters do not vary ($p > 0.05$) with the region. Animals find their food mainly in natural rangelands

(96.77%). The animals are driven all day to natural grazing areas and brought back to the village or camp at the end of the day. Some of these animals receive food supplements (21.77%) which are most often by-products of family consumption and crop residues such as corn bran, rice, millet, cottonseed meal and peanut. The use of mineral supplements (salt and natron) varies ($p < 0.05$) between the two regions studied. Breeders in the Northern region use mineral supplements more (51.85%) compared to those in the Far North region (11.43%).

Table 3. Feeding management characteristics by regions.

Characters	Modalities	Regions				Total regions		χ^2
		Far North		North				
		n	%	n	%	**n**	**%**	
Food	In enclosure	3	4.29	1	1.85	**4**	**2.42**	0.447^{ns}
	Natural trails	67	95.71	53	98.15	**120**	**96.77**	
Food supplements	Yes	18	25.71	9	16.67	**27**	**21.77**	0.226^{ns}
	No	52	74.29	45	83.33	**97**	**78.23**	
Mineral supplements	Yes	8	11.43	28	51.85	**36**	**29.03**	0.000**
	No	62	88.57	26	48.14	**88**	**70.97**	
Sources of water	Rivers/streams	54	77.14	41	75.93	**95**	**76.61**	
	Drilling	2	2.86	1	1.85	**3**	**2.42**	0.965^{ns}
	Pond	10	14.28	8	14.81	**18**	**14.52**	
	Traditional Well	4	5.71	4	7.41	**8**	**6.45**	

χ^2: khi-deux ; ns : not significant ($p > 0.05$); ** significant($p < 0.05$); n: number.

3.1.2. Health Management Characteristics

From Table 4 it appears that the parameters are not significantly influenced by the region ($p > 0.05$). Results show that 91.94% of farms vaccinate their animals compared to 8.06% who do not vaccinate their animals. 78.23% of breeders resort to veterinary care compared to 21.71% to traditional treatment.

Table 4. Health management characteristics by regions.

Characters	Modalities	Regions				Total regions		χ^2
		Far North		North				
		n	%	n	%	**n**	**%**	
Vaccination	Yes	63	90.00	51	94.44	**114**	**91.94**	0.367^{ns}
	No	7	10.00	3	5.56	**10**	**8.06**	
Care	Veterinarians	55	78.57	42	77.78	**97**	**78.23**	0.507^{ns}
	Traditional	15	21.42	12	22.22	**27**	**21.77**	

χ^2: khi-deux; ns: not significant ($p > 0.05$); n: number.

3.1.3. Breeding Management Characteristics

It appears from Table 5 that the parameters are not significantly influenced by the region ($p > 0.05$). Breeders do not choose the animals for reproduction (100%) and mating takes place naturally (freely) in the enclosures or on the pasture during the range periods (100%). There is no control over reproduction; males and females are kept in the same herd and breeding takes place naturally. Breeders are unaware of modern breeding methods such as heat synchronization and artificial insemination (AI). Single births are the most frequent and represent 72.73% compared to 27.27% for double births. Triple and quadruple births are rare and represent 1.61% and 0.81% respectively.

Table 5. Breeding management characteristics of sheep by regions.

Characters	Modalities	Regions				Total regions		χ^2
		Far North		North				
		n	%	n	%	**n**	**%**	
Selection	No	70	100.00	54	100.00	**124**	**100.00**	-
	Yes	0	0.00	0	0.00	**0**	**0.00**	
Reproduction	Free	70	100.00	54	100.00	**124**	**100.00**	-
	Controlled	0	0.00	0	0.00	**0**	**0.00**	
Type of birth	Simple	46	65.71	42	77.78	**88**	**70.96**	
	Twice	22	31.3	11	20.37	**33**	**26.61**	0.418^{ns}
	Triple	1	1.43	1	1.85	**2**	**1.61**	
	Quadruple	1	1.43	0	0.00	**1**	**0.81**	

χ^2: khi-deux; ns: not significant ($p > 0.05$); n: number.

3.2. Reproductive Characteristics of Sheep in the Sudano-Sahelian Zone of Cameroon

Results in Table 6 show that the parameters were significantly influenced ($p < 0.05$) by localities. The highest litter size ($p < 0.05$) is observed in Mayo-Danay (1.79 ± 0.08), the other localities being otherwise comparable ($p < 0.05$) to each other. It should also be noted that litter size varied ($p < 0.05$) among ewes in the two regions, with the highest litter size observed in the Far North.

The lambs with the highest weight ($p < 0.05$) are recorded in Mayo-Sava (2.84 ± 0.08 kg) and in Mayo-Louti (2.76 ± 0.10 kg) and Mayo Kani (2.70 ± 0.08 kg), followed by Benoué (2.47 ± 0.08 kg). Mayo-Danay lambs have the lowest weight ($p < 0.05$) (2.16 ± 0.10 kg). It should be noted that lambs from the North and Far North regions are comparable ($p > 0.05$) for this parameter.

From Table 7, litter size is influenced ($p < 0.05$) by the consumption of food and mineral supplements. On the other hand, the lamb birth weight does not vary ($p > 0.05$) depending on the consumption of food and mineral supplements and the type of care. The ewes receiving food and mineral supplements had higher litter sizes (1.52 ± 0.15 and 1.53 ± 0.12 respectively for food and mineral supplements) than those not receiving supplements (1.27 ± 0.05 and 1.24 ± 0.05 respec-

tively for food supplements and minerals).

Table 6. Reproductive characteristics according to localities and regions.

Regions	Localities	n	Litter size $\bar{X} \pm SE$	p-value	Lambs birth weight $\bar{X} \pm SE$	p-value
Far North	Diamaré	57	1.35 ± 0.06^{a}		2.63 ± 0.08^{bc}	
	Mayo-Danay	38	1.79 ± 0.08^{b}		2.16 ± 0.10^{a}	
	Mayo-Kani	53	1.25 ± 0.06^{a}		2.70 ± 0.08^{c}	
	Mayo-Sava	55	1.20 ± 0.06^{a}	0.023**	2.84 ± 0.08^{c}	0.412^{ns}
North	Benoué	53	1.23 ± 0.06^{a}		2.47 ± 0.08^{b}	
	Mayo-Louti	37	1.32 ± 0.08^{a}		2.76 ± 0.10^{c}	
	Mayo-Rey	31	1.23 ± 0.08^{a}		2.58 ± 0.11^{bc}	
Total		**324**	**1.34 ± 0.03**		**2.59 ± 0.03**	

a, b, c and d; means under the same factor and parameter with different superscripts are significantly different ($p < 0.05$); $\bar{X} \pm SE$; mean ± standard error; ns: not significant ($p > 0.05$); ** significant ($p < 0.05$). n: number.

Table 7. Reproductive characteristics according to food and mineral supplements, type of care and season of birth.

			Litter size		Lambs birth weight	
Characteristics	**Modalities**	**n**	$\bar{X} \pm SE$	**p-value**	$\bar{X} \pm SE$	**p-value**
Food supplements	Yes	71	1.52 ± 0.15	0.036**	2.63 ± 0.13	0.633^{ns}
	No	253	1.27 ± 0.05		2.57 ± 0.06	
Mineral supplements	Yes	94	1.53 ± 0.12	0.007**	2.69 ± 0.10	0.177^{ns}
	No	230	1.24 ± 0.05		2.53 ± 0.07	
Type of care	Veterinarians	253	1.34 ± 0.06	0.500^{ns}	2.62 ± 0.06	0.183^{ns}
	Traditional	71	1.26 ± 0.09		2.44 ± 0.10	
Season of birth	Dry	108	-		2.35 ± 0.06	0.000**
	Rainy	216	-		2.73 ± 0.04	

ns: not significant ($p > 0.05$); ** significant ($p < 0.05$); $\bar{X} \pm SE$; mean ± standard error; **n**: number.

On the other hand, the lamb birth weight did not change significantly ($p > 0.05$) with the consumption or not of food and mineral supplements. This could be justified by the intervention of factors endogenous to the ewes (age, birth number, genetic type). The litter size and birth weight are statistically ($p > 0.05$) equal whether in the presence or absence of veterinary care. This could be explained by the fact that the litter size and birth weight are more linked to other endogenous factors of the ewes (age, farrowing number, genetic type). The rainy season generally corresponds to the peak of lambing compared to the dry season. Lambs born in the rainy season have a higher weight compared to those born in the rainy season.

Results in Table 8 show that the characteristics varied significantly ($p < 0.05$) depending on the parameters considered. litter size does not vary ($p < 0.05$) with the age of the ewes. The largest litter sizes are obtained between 3 and 5 years of age. Likewise, the birth weight changes ($p < 0.05$) with the age of the ewes: the youngest ewes giving lighter lambs at birth (2.09 ± 0.09 kg) and the oldest ewes giving of the heaviest lambs (2.78 ± 0.05 kg).

Litter size is influenced ($p < 0.05$) by parity with the highest litter sizes obtained at the fifth farrowing (1.65 ± 0.09). Likewise, the birth weight varies ($p < 0.05$) with the birth number; the heaviest lambs (3.00 kg) are obtained at the fourth and fifth births and the lightest (2.00 ± 0.12 kg) at the first. Lambs born in rainy seasons have a higher birth ($p < 0.05$) weight (2.73 ± 0.04 kg) than those born in dry seasons (2.35 ± 0.06 kg).

Table 8. Reproductive characteristics according to age and parity of ewes.

Factors	Modalités	n	Litter size $\bar{X} \pm SE$	Lambs birth weight $\bar{X} \pm SE$
Age (year)	1 - 2	43	1.21 ± 0.08^{a}	2.09 ± 0.09^{a}
	3 - 5	152	1.39 ± 0.04^{b}	2.61 ± 0.05^{b}
	6 et plus	129	1.29 ± 0.04^{ab}	2.78 ± 0.05^{b}
Parity	1	21	1.24 ± 0.05^{a}	2.00 ± 0.12^{a}
	2	98	1.25 ± 0.06^{a}	2.31 ± 0.05^{b}
	3	54	1.33 ± 0.11^{ab}	2.70 ± 0.07^{c}
	4	31	1.39 ± 0.09^{b}	3.00 ± 0.10^{d}
	5	61	1.65 ± 0.09^{c}	3.00 ± 0.07^{d}
	6	28	1.40 ± 0.07^{b}	2.64 ± 0.10^{c}
	7	31	1.29 ± 0.09^{ab}	2.58 ± 0.10^{c}

a, b, c and d; Means under the same factor and parameter with different superscripts are significantly different ($p < 0.05$); $\bar{X} \pm SE$; mean ± standard error; n: number.

From results in Table 9 litter characteristics at birth were influenced ($p < 0.05$) by the parameters considered. Lambs with the highest birth weights ($p < 0.05$) came from Balami ewes (3.09 ± 0.09 kg) and the lowest from Kirdi (2.30 ± 0.07 kg). The other genetic types being comparable ($p < 0.05$) for these parameters.

Table 9. Reproductive characteristics according to genetic types of ewes.

Genetic types	n	Litter size $\bar{X} \pm SE$	Lambs birth weight $\bar{X} \pm SE$
Kirdi	63	1.71 ± 0.06^{c}	2.30 ± 0.07^{a}
Djallonke	52	1.35 ± 0.06^{b}	2.62 ± 0.08^{b}
Poulfouli	97	1.25 ± 0.05^{ab}	2.54 ± 0.06^{b}
Uda	69	1.19 ± 0.06^{ab}	2.67 ± 0.07^{b}
Balami	43	1.12 ± 0.07^{a}	3.09 ± 0.09^{c}
Total	**324**	**1.34 ± 0.03**	**2.59 ± 0.03**

a, b, c and d; Means under the same factor and parameter with different superscripts are significantly different ($p < 0.05$); $\bar{X} \pm SE$; mean ± standard error; n: number.

4. Discussion

This study showed that the main modes of animal acquisition are, in order of importance legacy, purchase and gift. This result corroborates with that of [21] [22]. In the same vein, Ghassan [23] in Liban noted that the transmissibility of small ruminant farms is prioritized through legacy and not through purchase and concludes that this mode of transmission is more effective for sustainability know-how and breeding activity for small ruminants in rural areas. These sheep are raised mainly for sale (99.19%). These results are similar to those of [10] in the West Cameroon region, [24] in the South, and [25] in the Far North region of Cameroon. However, although sheep are mainly raised for sale, it is rare to find breeders with these as their main activity whatever the region [10] [24] [25]. Sheep are generally kept with other species and apart from other activities. This could be explained by the lack of prioritization of the activity despite its numerous zootechnical and socio-economic assets.

Pastoralism is the management method mainly found in the Far North of Cameroon [25]. This is confirmed by our observations. It is characterized by the seasonal and cyclical movement of breeders for the exploitation of temporary fodder and water resources in specific agricultural areas [25].

The accommodations are huts (50.00%), sheds (20.96%), enclosures (18.55%). These results are comparable to those of [25] in the Far North who found that the types of housing were, in order of importance, huts, sheds, enclosures [26]. In the same vein, [12] on the study of Fulani sheep breeding in Senegal showed that the breeders had habitats made up of enclosures built using branches of thorny shrubs and without a roof. Contrary to our results, [27] recorded that a majority of small ruminant breeders in northern Benin did not have any housing. Similarly, [28] observed that the majority of Fulani herders in Niger do not have housing for their animals. This difference is due to the fact that sheep farming in these countries is mainly in a pastoral system with a lot of animal movement. Animals find their food mainly in natural rangelands (96.77%). Some of these animals receive mineral supplements (29.03%) and food supplements (21.77%) which are most often by-products of family consumption and harvest residues such as corn bran, rice, millet, cottonseed meal and peanuts. These observations are similar to those of [14] [25] [26] in the Far North where breeders supplemented the animals basic ration and contrary to the observations of [29] in South Cameroon who observed that animals were fed exclusively on fodder natural. The results showed that 91.9% of breeders vaccinate their animals and 78.23% seek veterinary care. These results are close to those of [25] in the Far North who observed that 80.00% of owners of small ruminants had access to veterinary care and 71.00% regularly vaccinated their animals against plague of small ruminants. On the other hand, [29] in the Southern region observed that only 10.00% of breeders regularly vaccinate their animals and 38.27% use modern veterinary care. [14] In the Far North and [22] in the Chari-Baguirmi and Mandoul provinces of Chad observed that reproduction is not controlled and 100% of breeders allow their females to be bred by males

during grazing. Which corroborates with our results. On the other hand, the results of [10] in West Cameroon revealed that reproduction was uncontrolled and 51% of breeders allowed their females to be bred by males during grazing. Our study showed that litter size and lamb birth weight were not influenced by the presence or absence of care. However, the work of [30] showed that antiparasitic treatment against strongyles and coccidia of Djallonké sheep in Togo made it possible to record better reproductive performance. In the same vein, [31] showed that various pathologies, particularly parasitic, alter reproductive performance as well as growth by causing morbidity and mortality at different stages of development in Djallonké sheep. Our results could be explained by the dietary differences and especially the variability in the genetic types of the ewes observed during our study. Ewes that received food and mineral supplements had higher litter sizes ($p < 0.05$) than those that did not receive supplements. Indeed, poor reproductive performance can be the manifestation of a deficient nutritional state [21] [31]-[35]. On the other hand, the lamb birth weight did not change significantly ($p > 0.05$) with the consumption or not of food and mineral supplements. This could be justified by the intervention of factors endogenous to the ewes (age, birth number, genetic type). The rainy season generally corresponds to the peak of lambing compared to the dry season. Lambings in the rainy season are in most cases much more beneficial than those in the dry season [31] [36] [37]. The influence of the season of birth is more linked to the quality and quantity of forage available. [31] notes an increase of +60 g in birth weight in Djallonke sheep in Benin; [38] observed variation in litter size and litter birth weight among sheep in Congo and concluded that this difference in litter size and lamb birth weight across regions was likely related to genetic type breed, and breeding method. This is confirmed by the observations of this study.

Litter size is strongly influenced ($p < 0.05$) by the age of the ewe. [38] [39] showed that ewes aged 3 years are more prolific, more fertile than young ewes aged between 1 and 2 years. This increasing evolution of reproductive characteristics would result from an increase in the ovulation rate, a greater capacity of the uterus, and an improvement in other maternal characteristics linked to reproduction with age [40]. These observations corroborate with our results which showed that the age of the ewes had an influence ($p < 0.05$) on the litter size. The lamb birth weight increases ($p < 0.05$) with the age of the ewes. This increase with age would likely be due to an increase in the volume of the pelvis which changes with the age of the ewes [38].

Parity significantly ($p < 0.05$) influenced lamb distribution according to litter size. This is in consonance with the report of [41] and [42] indicating that the first lambing ewes produced significantly single and lighter lambs than subsequent lambing. It also agrees with the report of [43] which indicated a progressive increase in overall fertility and fecundity as the type of birth of lambs' increases from single to triplet. As parity increases in the present study the number of twin lambs born increases while single decrease. In other words, fertility increases with parity

which is in line with the report of [44] that fertility increases from first to sixth lambing and then decreases with age. But results of this study show prolificacy in older ewes than in yearlings and hogget. This may be due largely to differences in reproductive physiological maturity that may affect ovulation rate. Parity significantly ($p < 0.05$) influenced lamb birth weight. Primiparous ewes tend to produce significantly ($p < 0.05$) lighter lambs at birth than multiparous ewes. This has been supported by literature cited by [45] on Yankasa Sheep. Birth weight significantly ($p < 0.05$) increased from first to fourth parity, and begins to decrease at the fifth parity. Also, the result obtained in this study is in line with the report of [46] [47] which indicated a decline in birth weight at the sixth and fourth parity.

5. Conclusion

It appears from this study that in Sudano Sahelian zone of Cameroon, the keeping system of sheep breed is the traditional extensive type. Animals find their food mainly in natural rangelands. Some of these animals receive mineral and food supplements. Pastoralism is the management method mainly found and the accommodations are in order of importance huts, sheds and enclosures. The basic herd is often formed by legacy, purchase and gift. The ewes receiving food and mineral supplements had higher litter sizes. The rainy season generally corresponds to the peak of lambing compared to the dry season. Lambs born in the rainy season have a higher birth weight compared to those born in the rainy season. Reproductive characteristics increase with the parity and the age of ewes. Also, reproductive characteristics vary with localities and genetic type. An on-station study to evaluate the reproductive characteristics of these animals will make it possible to obtain more concrete results for better valorization of these animals.

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Conflicts of Interest

The authors declare that there is no conflict of interest related to this study.

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