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Research Article

A Comparison of the Main Zootechnical Parameters of Kababish and Arab Sheep in the Ouara Department of the Ouaddaï Province of Chad

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Abstract

A survey study was conducted and weight-gain monitoring was carried out every 10 days for 4 months, from March 1 to June 30, 2015, in 50 households, covering 1,436 animals of the Kababish and Arabian breeds. The data collected concerned household characteristics, breeding and production performance, as well as culling criteria and age of the two sheep breeds, Kababish and Arabian. The results show that sheep are raised in the study area largely by married men aged between 41 and 50. The animals are raised for self-consumption and sale, and more than half of those surveyed are involved in sheep farming and trading. The study revealed that the average weight of adult male Kababish sheep is around 60.15 ±5.46 kg, while that of Arabian rams is 53.95 ±5.91 kg. In terms of reproductive parameters, Kababish ewes start breeding at 10.27 ±1.08 months, whereas Arabian ewes start breeding at a higher age, 11.85 ±1.16 months. Lactation lasts an average of 6 ±0.47 months in Arab sheep and 5.79 ±0.68 months in Kababish sheep. Concerning the reasons for culling animals in the study area, disease was reported as the cause of culling. In conclusion, the results showed that Kababish sheep have better zootechnical performance than Arab sheep, and a good predisposition for meat production that can be better valorized for sheep fattening in the study area. A more in-depth study of Kababish sheep should be carried out to improve our knowledge of their zootechnical and reproductive performance in the Ouadda ïregion, in order to better identify their genetic potential.

Keywords

Kababish Sheep, Arab Sheep, Zootechnical Parameters, Ouadda ïRegion

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1. Introduction

Nearly 80% of the world's undernourished people live in rural areas, and most of them depend on agriculture, mainly livestock [1]. In Africa, small ruminants play a key role in the livestock sector and the economy of many countries [2]. Small ruminants offer a number of advantages: they are easy to handle due to their small size and require little feed. The amount of meat produced by one animal can meet the needs of a family. No religion prohibits its consumption [3]. In many developing countries, animal husbandry is a multifunctional activity. In addition to its role as a source of income and food, livestock is a valuable asset that serves as savings, collateral for loans and essential security [1]. In Africa, small ruminants must be considered primarily as a source of meat and meat products. There is evidence of strong demand for meat in several areas. According to FAO (Food and Agriculture Organization of the United Nations) (1982), tropical Africa has one-sixth and one-third of the world's sheep and goat herds, respectively. Total meat production from small ruminants in Africa was about 1.3 million tons (or 16% of the world's total from sheep and goats). Chad is a Sudano-Sahelian country whose economy is mainly based on agriculture and livestock. These two sectors account for most of the socio-economic activities of the population. The rural sector plays a dominant role in the national economy. Agriculture and livestock are the mainstays of this sector, contributing on average 40% to GDP of which 21% for agriculture and 19% for livestock. It employs 80% of the working population, more than half of whom are women [4]. In Chad, the livestock sector employs 80% of the population in the Sahel zones and contributes about 53% of the rural sector GDP, 20% of the agricultural GDP and 30% of the country's trade. It also employs almost 40% of the working population [5]. In addition to cattle, which is one of Chad's main export commodities, small ruminants are estimated at over 56 million head (26,436,170 sheep and 30,519,349 goats) [6]. In addition to food security, small ruminants form the basis of family economies (income from sales) and participate in human socio-cultural activities (marriage, various festivals, rituals, and various sacrifices), thus contributing to poverty reduction in rural areas [7]. Among small ruminants, sheep are the most sought after for various sacrifices during Muslim festivals [8]. Given the importance that breeders attach to this sheep breed, whose breeding promotes the expansion of other species throughout the Sahelian strip of Chad, it is necessary to know its zootechnical performance. The aim of this study is to compare the main zootechnical parameters of the Arab and Kababish sheep breeds in the department of Ouara, in order to improve the performance of sheep in this region.

2. Materials and Methods

2.1. Presentation of the Study Area

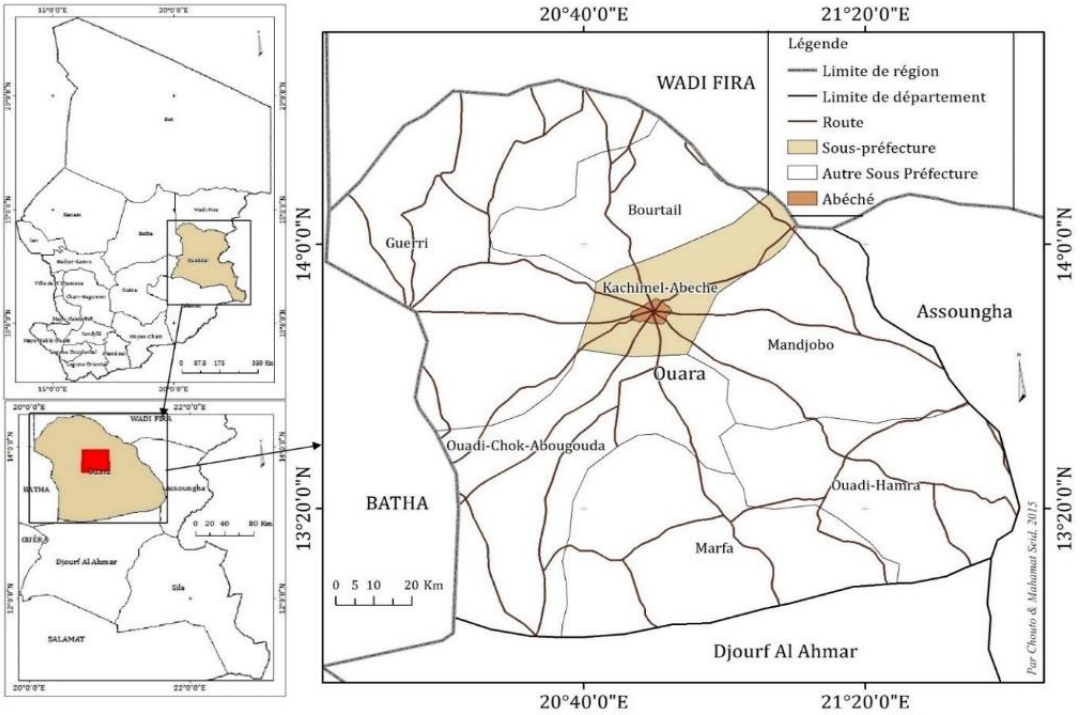

Figure 1. *Presentation of the study area (Source: Chouto and Mahamat Seid, 2015).*

The study took place in the department of Ouara between March and July 2015. The city of Abéché is the capital of the Ouadda ïregion. It is located between 13 °48'584" north latitude and 20 °50'139" east longitude. The study area is subject to an intertropical climate with a 9-month dry season and a 3-month rainy season. The pattern of these two seasons is determined by fluctuations between dry air masses from the north (harmattan) and humid maritime air masses from the southwest (monsoon). The average annual rainfall is about 300 mm. Temperatures vary from season to season. The average annual temperature in Abéché is around 28 °C, with variations in the cold season (December to February) from 16 to 35 °C and in the dry season (April and May) from 25 to 41 °C.

2.2. Sampling and Data Collection Methods

The study was conducted through a survey and follow-up from March 16 to July 16, 2015 among fifty (50) households, including 20 in Abéché and 15 in Abougoudam, 9 in Facha, 4 in Tando, and finally 2 on the road to Biltine. The survey was conducted randomly and involved a total of 1436 sheep, distributed by sex and zone as shown in (Table 1).

Table 1. *Distribution of animals by zone.*

Zone	Number of breeds	Sex		Total Number of animals
		Male	Female	
Abéché	20	98	280	378
Abougoudam	15	108	485	593
Fâcha	9	101	221	322
Tando	4	33	74	107
Route de Biltine	2	12	24	36
Total	50	352	1084	1436

A semi-structured questionnaire was used as an interview guide. The main points covered in the survey were: household characteristics, weight parameters (adult male and female weight, weaning weight and farrowing weight), and reproductive parameters and age of reformed animals.

2.3. Survey Methodology

Figure 2. *Weighing two lambs (source Mahamat Seid, 2015).*

The survey was semi-structured, with questionnaire forms filled in by the interviewer. It consists of a series of closed and open-ended questionnaires on identical individual survey forms covering several parameters. The language used is local Arabic. The interviews are conducted in the morning or evening at the respondent's home. Systematic weighing was used to determine the weight parameters of the animals. The animals are weighed very early in the morning or late in the evening when they return from grazing.

2.4. Statistical Analysis

The collected data were entered in Excel. SPSS (20.0) and XLSTAT (2007.8.04) were used for statistical analysis. The variables measured were weight parameters (birth weight and adult weight, weaning weight). Descriptive analysis was used to calculate dispersion parameters (mean and standard deviation), and analysis of variance was performed with the Newman-Keuls test at 5% threshold.

3. Results

3.1. Household Characteristics

Household characteristics (sex, marital status and educational level) are described in (Table 2).

Table 2. Profiles of sheep farmers in Ouara.

Settings	Status	Number	Percentage (%)
Gender	Male	47	94[a]
	Female	3	6[b]
Marital Status	Married	45	90[a]
	Single	2	4[b]
	Divorced	1	2[b]
	Widower	2	4[b]
Level of Education	Primary	24	48[a]
	Secondary	4	8[b]
	None	22	44[a]

Within the same row, means followed by the same letter do not show a significant difference ($p<0.05$).

Sheep farming in Ouara is mainly practiced by men, with women in the minority ($p<0.05$). More than the majority of the farmers interviewed were married, and a small percentage was single, widowed or divorced ($p<0.05$). The highest proportion of respondents had primary education, followed by illiteracy, and the lowest proportion had secondary education ($p<0.05$).

3.2. Age Distribution of Sheep Farmers

The age distribution of sheep farmers is summarized in (figure 3).

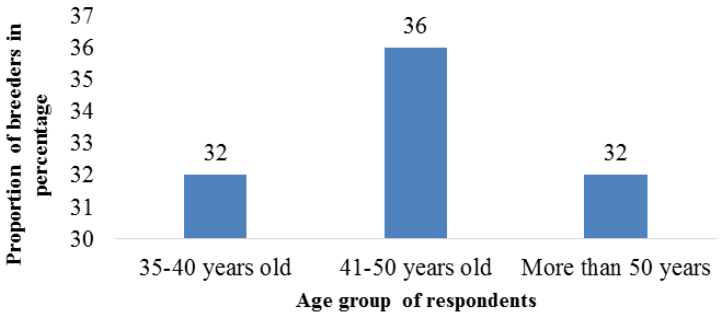

Figure 3. Age distribution of sheep farmers.

Breeders aged between 41 and 50 were the most numerous, followed by those aged between 35 and 40 and those aged over 50.

3.3. Objectives of Sheep Breeding in Ouara

The objectives of sheep farming in Ouara are shown in (figure 4).

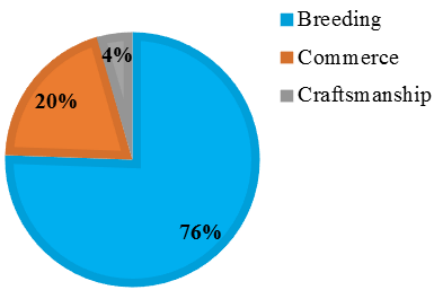

Figure 4. Sheep rearing objectives in Ouara.

More than half of the sheep farmers raise their sheep for sale and for their own consumption. Sale plus own consumption of the animals is the main form of sheep farming, followed by sale of the animals. The remaining part rears its sheep for prestige and other ($p<0.05$).

3.4. Activities of Sheep Farmers in Ouara

Sheep farmers in Ouara are engaged in several activities (figure 5).

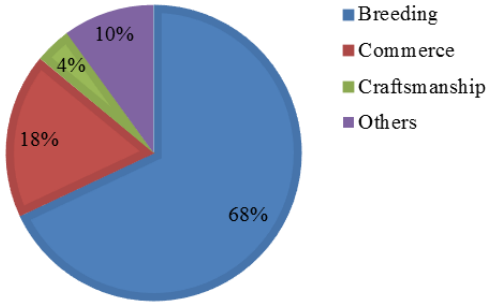

Figure 5. Distribution of sheep farmers by activity in Ouara.

More than half of the sheep farmers in Ouara are involved in animal husbandry, while the rest are involved in trade, handicrafts and other activities ($p<0.05$).

3.5. Seniority in Sheep Farming in Ouara

The distribution of sheep breeders according to seniority in breeding is summarized in (figure 6).

Breeders aged between 6 and 10 years have been breeding sheep in Ouara for the longest time, followed by those aged between 0 and 5 years, and the rest for the shortest time.

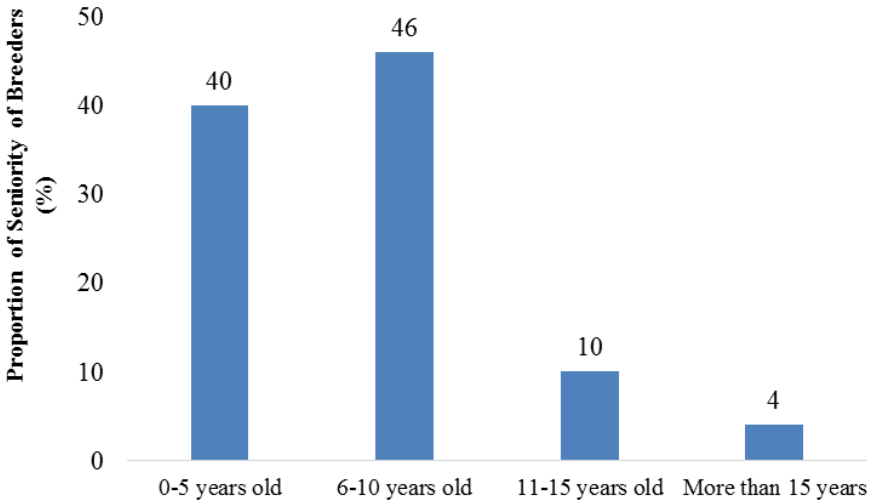

Figure 6. *Distribution of sheep breeders according to seniority.*

3.6. Sheep Weight Development in Ouara

Adult male weights of Kababish and Arabian sheep are 60.15±5.46 kg and 60.15±5.46 kg, respectively (p>0.05). At farrowing, the average lamb weights were 4.63±0.88 kg for Kababish sheep and 3.77±0.64 kg for Arabian sheep (p>0.05). At weaning, the sheep weighed 15.02±1.13 kg and 13.74±0.76 kg for the Kababish and Arabian breeds, respectively (p>0.05) (table 3).

Table 3. *Weight parameters of sheep in Ouara.*

Parameters	Breed of sheep	
	Kababish	Arabe
Adult male weight (kg)	60.15±5.46[a]	53.95±5.91[b]
Adult female weight (kg)	49.44±6.77[a]	39.74±6.9[b]
Weight at birth (kg)	4.63±0.88[a]	3.77±0.64[b]
Weight at weaning (kg)	15.02±1.13[a]	13.74±0.76[b]

Within the same row, means followed by the same letter do not show a significant difference (p<0.05).

Adult weights were higher for the Kababish breed and lower for the Arab breed in the department of Ouara (p<0.05). Lamb birth and weaning weights differed between the two breeds in the study area (p<0.05).

4. Sheep Breeding Performance in Ouara

The breeding performance of Kababish and Arab ewes in Ouara is shown in (Table 4).

Table 4. *Breeding performance of sheep in Ouara.*

Parameters	Breed of sheep	
	Kababish	Arabe
Weaning age (in months)	4.46 ±0.87[a]	4.97 ±0.73[b]
Age at first calving (in months)	16.41 ±0.69[a]	17.08 ±0.75[b]
Age at first breeding (in months)	10.27 ±1.08[a]	11.85 ±1.16[b]
Duration of lactation (in months)	5.79 ±0.68[a]	6 ±0.47[a]
Duration of gestation (in months)	5.87 ±0.61[a]	6.02 ±0.55[a]
Interval between lambings (in months)	6.58 ±1.13[a]	7.79 ±0.46[b]

Within the same row, the means followed by the same letter do not show a significant difference (p<0.05).

Lambing interval was shorter in Kababish ewes (p<0.05). Length of lactation and gestation did not differ between the two breeds (p>0.05).

4.1. Age and Culling Criteria of Ouara Sheep

The age and culling criteria of sheep in the study area are shown in (figure 7).

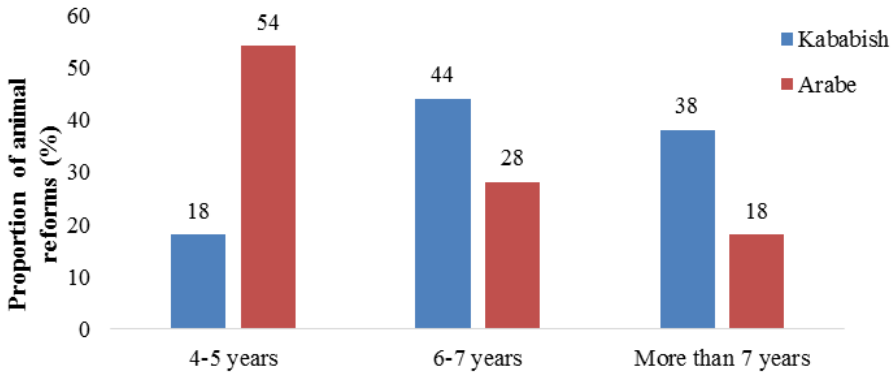

Figure 7. *Sheep culling age in Ouara.*

Sheep culling in the study area was highest in the Arab breed between the ages of 4 and 5 years, and in the Kababish breed between the ages of 6 years and above.

4.2. Reasons for the Reforms Sheep

The reasons for the reforms sheep in the study area are shown in (figure 8).

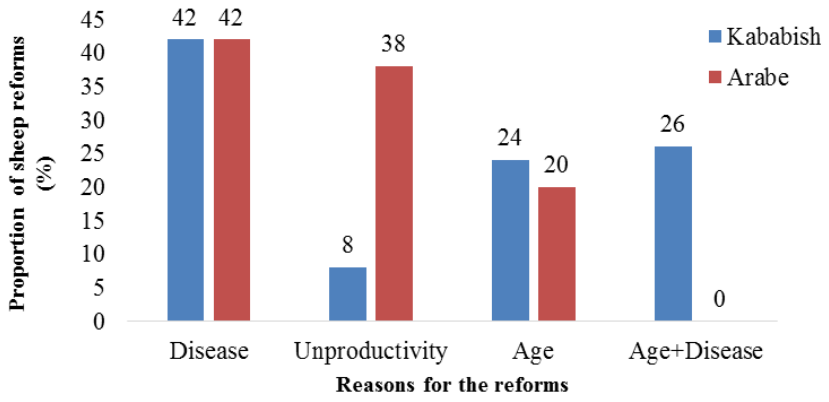

Figure 8. *Reasons for the reforms of sheep in Ouara.*

Illness was the main reason for the reforms of sheep in Ouara of two breeds, while unproductivity was the main reason for the reforms Arab sheep.

5. Discussion

5.1. Household Characteristics

Sheep rearing in Ouara is more common among men (94%) than women (6%). The higher proportion of men in this activity is due to the fact that sheep rearing is a more commercial activity, whereas livestock trading in Chad is generally a male-dominated business. This proportion of men in this activity in Ouara was slightly lower than the 96.5% reported in Cameroon by [9] and higher than the 75% for men and 25% for women reported in Oum-Hadjer, Chad by [10]. The majority of sheep farmers in Ouara are married (90%). The high proportion of married respondents reflects the social importance of small ruminant farming in the study area. These results are slightly higher than the 85.5% married reported in Cameroon [11] and lower than the 94.5% reported in Niger by

[12]. Most respondents have primary education (48%), followed by those with no education at all (44%). The rest have secondary education (8%). This justifies the high rate of school dropout and illiteracy among pastoralists in the study area. These findings are different from those reported in Niger and Burkina [13, 14].

5.2. Age Range of Breeders

The majority of breeders are between 41 and 50 years old (36%). These results differ from those reported by [9] in Cameroon, where the highest age range of breeders is between 41-60 years.

5.3. Objectives of Sheep Farming

The objectives of sheep farming in the study area are numerous: sale (income), sale plus own consumption (sacrifices, festivals, baptisms, etc.) and prestige (socio-cultural value). The main objective of livestock farming is sale plus consumption (68%). This enables the farmers to pay the salaries of the shepherds and the veterinary and zootechnical inputs. This high rate of commercial use of the sheep breed justifies the high demand for this breed in the commercial sector in the study area. These results corroborate those obtained in Cameroon, where the main objective of sheep breeding is sale by [11] in the Far North of Cameroon. In turn, these results are similar to those obtained by [15] in Western Cameroon. On the other hand, other authors in the country report that the main objective of sheep farming is self-consumption [16], which differs from the results obtained by [17] in Mauritania.

5.4. Activities of Sheep Farmers in Ouara

The majority of sheep farmers surveyed (68%) have animal husbandry as their main activity, followed by trade (18%). These results are different from those reported in Cameroon, where most sheep breeders' main activity is farming, followed by livestock farming, as in [9] in the Mvila and [16] in the Far North of Cameroon, and [15] in West Cameroon, where the majority of breeders are farmers, followed by breeders whose main activity is livestock farming.

5.5. Long Experience of Sheep Rearing in Ouara

The vast majority (46%) of breeders have been involved in this activity for between 6 and 10 years. This shows that small ruminant farming is a long-standing activity among the inhabitants of the study area. This is followed by 40% of the respondents who have been practicing this activity between 0 and 5 years, and finally a minority who have been practicing it for 11 years and more. These results are different from those obtained by [11] in the extreme north of Cameroon, where more breeders had 21 years or more of breeding experience.

6. Weight Performance of Sheep

The average weight of adult male Kababish sheep in Ouara was 60.15±5.46 kg, and the weight of male Arab breed was 53.95±5.91 kg. This result was close to 58.49±1.68 kg and 52.31±1.39 kg reported by [10] in Chad for the Kababish and Arab breeds in Oum-Hadjer, respectively. The lambs of the Arab breed weigh less than the lambs of the Kababish breed, the Kababish lambs are heavy at birth, weighing 4.63±0.88 kg compared to other Sahelian breeds with a weight ranging from 2.8 to 3.1 kg reported by [18]. At weaning, the Kababish breed had a weaning weight of 15.02±1.13 kg and the Arab breed had a weaning weight of 13.74±0.76 kg. This result was close to those reported in Oum-Hadjer in Chad by [10].

6.1. Reproductive Performance

The age of lambs at weaning is 4.46±0.87 months in Kababish sheep and 4.97±0.73 months in Arab breed lambs. These results confirm the results obtained in Ghana where the age at weaning was between 3 and 5 months as reported by [19] and those obtained in Abéché, Chad by [20]. The average age at first lactation of Kababish ewes was 10.27 months, which is relatively low compared to the age of Arab breed ewes at 11.85 months. These results differ from those reported for Mossi sheep in Burkina Faso, where the age ranges from 11.5 to 14 months [21], and for small ruminants in the pastoral areas of central and southern Tunisia [22]. This age is consistent with results reported for sheep in the Sudanese-Sahelian zone of Mali [23]. The age at first lambing for Arab breed ewes is about 17.08±0.57 months. This age is closer to 16.41±0.69 months for ewes of the Kababish breed. These results corroborate those reported in free-ranging sheep in the peri-urban area of Maroua in the extreme north of Cameroon [24] and those documented in Oum-Hadjer in Chad [10]. However, this age at first lambing was lower than the 19.83±2.40 months reported by [25] in the peri-urban area of N'Djamena in Chad.

6.2. Age and Reasons for Culling Sheep

Most of the breeders interviewed indicated that sheep culling in Ouara is done at a younger age for Arab breed sheep, which is 5 years old. From the age of 6 years, the culling of Kababish sheep became significant. This age of culling was in line with the range of 5-9 years reported for sheep in Senegal [26] and that obtained in Cameroon [18], which is between 7 and 8 years. According to the majority of sheep farmers in the study area, disease was the main reason for culling sheep. This is consistent with the observations reported by [25] in N'Djamena, Chad.

7. Conclusion and Application of Results

The comparison of the main zootechnical parameters of

Kababish and Arab sheep in the Ouara department determined the performance of these two breeds. This study shows that men are more likely than women to engage in sheep farming, primarily for the purpose of selling, but also for self-consumption. Most respondents identified livestock farming as their primary activity. In terms of body weight parameters, Kababish sheep have a better meat-to-bone ratio than Arabian sheep in the study area. Kababish lambs weigh more than Arabian lambs at birth, allowing them to grow very rapidly. To achieve an earlier age of puberty and first breeding, a more in-depth study of their genetic potential is necessary, as well as crossbreeding to produce mixed individuals with higher genetic potential in the study area.

Abbreviations

GDP	Gross Domestic Product
FAO	Food and Agriculture Organization of the United Nations

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Author Contributions

Mahamat Seid Souleyman: ensured the prescribed preparations of outline, the data analysiss, the plan of manuscript writing and tender.

Issa Youssouf Adoum: validated the plan of manuscript-writing and approval the manuscript before its tender.

Ousmane Issa Abdel Djalil and Ali Barka Mahamat were associated with the data acquisition. Adam Bakhit Mustapha and Ziebe Roland were associated in the drafting and the review of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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