

Article

Situation of Camel breeding in Algerian Southwest - Biskra

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Abstract: The study of camel breeding conduct in Biskra region (2019), with 30 breeders surveyed, highlighted the importance of small breeders (25 heads, 46.67%). They are all most sedentary (66.68%) men aged 40 to 60 (75%), whose level of education does not exceed the primary level (37%). According to the local population of the study region, this breeding is practiced in the majority of cases (80%) for multiplication reasons of the species among themselves. Reproduction occurs naturally during the period of struggle, which extends from November to April. The breeding age for females is 4 years old while it is more than 5 years old for males. A predominance of breeding camels (66.90%) of the El Hamra breed (85%) is noted, this breed is the most sought because of its famous skilfully Algerian Bernous and Kachabia. Dairy production and that of camel meat is weak in the economy of the wilaya, it is practiced only for self-consumption because of the free conduct of the herds and the weakness of spontaneous plants and the natural sources in water as well as the constraining climatic conditions of the current year.

Keywords: Arid regions, camel breeding, situation, Biskra.

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1. Introduction

The livestock system is an old activity that is part of a current economic context, it has a social and economic function by maintaining activities, jobs and income in difficult regions and by contributing to quality productions (meat, wool, skins...) [1]. About 200 million pastoral households raise nearly 1 billion head of camels, cattle and small ruminants practiced in countries with vast pastoral territories, Extensive pastoral production is practiced on 25% of the world's land and provides 10% of the world meat production [2]. In Algeria, pastoralism is characterized by a great diversity of breeding (sheep, cattle, goats and camels), immense rangelands that extend over 30 million hectares (tellian, Saharan, steppe, forest) [1]. The Algerian Saharan space is dominated by arid and semi-arid with more than 80%, through which animals are raised. Among these animals, the dromedary which had the ability to take advantage of the essential food from an environment with scarce resources and limited agricultural development possibilities [3]. This animal contributes to the normalization of the lives of millions of inhabitants. It has a particular interest, being the animal that can live, reproduce and produce despite the difficult conditions. It allows pastoral or agricultural populations to live and to have an economic activity from its productions (milk, meat, work...) [4].

In recent years, we have witnessed a fragility of the rangelands of the Saharan environment (degradation of plant cover) due to the combination of climatic factors (high temperature, scarcity of rain, etc.) [4] and anthropogenic factors, in particular anarchic and irrational grazing, which has led to a decline in camel breeding [5]. The pastoral systems

of the Sahara offer a perfect illustration and are thus experiencing profound transformations linked to these changes, which concern social organization, the livestock economy and the biodiversity of ecosystems [6].

Research on the camel breeding system and its management in the arid Algerian region especially concern the South-West regions (Ouargla, Ghardaia, Bechar, etc.). On the other hand, the dromedary has received little attention in the Biskra region despite its specificities and aptitudes. We can make the current observation that it is a marginalized breeding, most of the time absent from development actions although it is the first victim of the degradation of pastures and which has a productive potential, still unknown. In order to enhance this animal of economic importance, this study aims to identify and know the different camel breeding systems existing in the Biskra region and to diagnose the different compartments.

2. Materials and Methods

2.1. Study area and sampling sites

The wilaya of Biskra (4°15' and 6°45' E and 35°15' and 33°30'N) elevated at 09m and 1931m above the sea level. It is located in the center-east of Algeria in the region of Aures at the gates of the Sahara Desert. The capital of the wilaya is the city of Biskra, located at 115 km south-west of Batna, 222 km north of Touggourt and approximately 400 km south-east of Algiers. It is bounded to the north by the wilaya of Batna, to the east by the wilaya of Khenchela, to the west by the wilayas of M'sila and Djelfa and to the south by the wilayas of Ouargla and El Oued (Figure 1a). The total area of the wilaya is 20,986 km², with an estimated population of 849,671 inhabitants, i.e. a density of 39.5 inhabitants/km² [7,8].

Biskra has a continental desert Saharan climate characterized by low winter temperatures, high summer temperatures, violent sandstorms and low humidity [9,10], and strong temperature contrasts with 22.9°C maximum average (Figure 1c) and light rainfall ranging from 78mm to 500mm (Figure 1d). The characterization is made from a climate synthesis of 50 years entered from data from (worldclim-global climate data).

2.2. Data collect and treatment

Based on their cooperation and availability, our survey was conducted with 30 breeders among the 44 existing in the Biskra region starting from January until April 2019 (Figure 1e).

To diagnose the situation of camel breeding in the Biskra region, it is important to go through the identification of breeders, their typologies as well as knowledge of the situation of herds and routes through a survey. The main axes of this survey must concern the three constituent poles of the breeding system and which are: the breeder; the dromedary and the routes they use in common.

The survey was carried out directly with breeders (30 breeders), most of the questions were closed in order to guide the answers. To ensure proper use of survey results. The data collected was organized, grouped by theme and computer coded using a previously developed grid. Data processing was done using SPSS and Excel software.

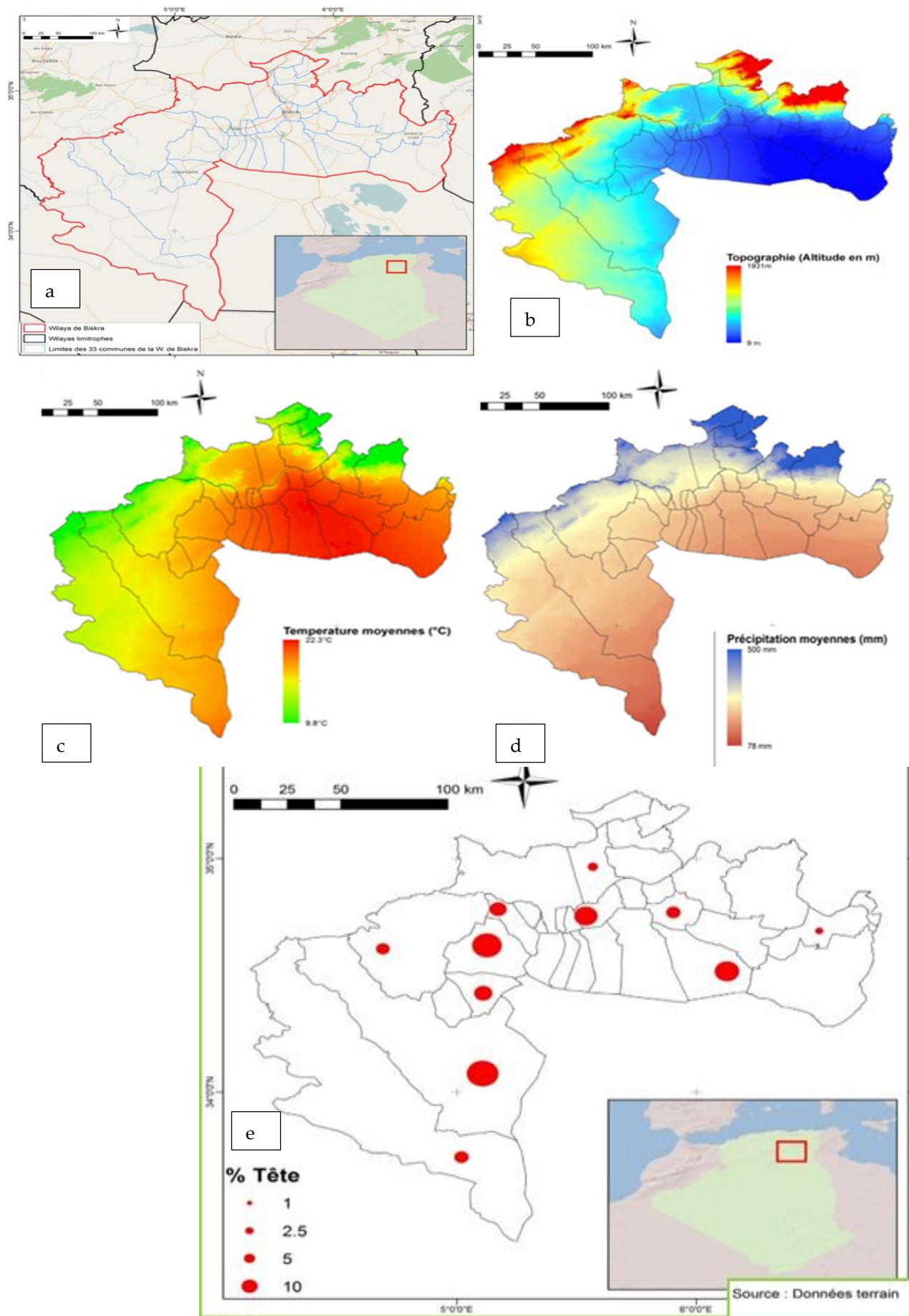


Figure 1. Wilaya of Biskra. a. Study area localisation, b. geographic formation, c. temperature, d. precipitations e. Importance of breeding camel and survey sites

3. Results and discussion

3.1. General structure of camel breeding in the Biskra region

The obtained results from the surveys carried out among the 30 breeders surveyed in the Biskra region show that 66.68% of the breeders are sedentary, 26.66% semi-nomadic and 6.66% nomadic (Figure 2a) living in tents, permanent houses or mixed tent and permanent house.

The predominance of sedentary breeders is justified by the unavailability of shepherds as well as the difficulty of moving to the north during spring time (Achaba), the high cost of transport is another factor that hinders their movement. The limited number of nomads is justified by the fact that they own a limited number of heads (less than 10 heads) transported using their own vehicles. The comparison of our results with those obtained by [11] who worked in the region of Ouargla and Ghardaïa respectively, indicated a high rate (77%, 28.57%) of semi-nomads in comparison with sedentary (14%, 59%) and of nomads (9%, 12%). The analysis of the surveys shows that 100% of the breeders surveyed are men, which indicates that camel breeding in the study region is a strictly male activity. Although the women own dromedaries (inheritance), they entrust them to trustworthy men because of the difficulty of driving them. Other results obtained through this investigation indicated that 96.66% were married, and 3.34% single. Married couples with children with an average of 5 children for all the breeders surveyed. Generally, the age of breeders is 75% between 40 and 60 years old. This age corresponds to the active period of an individual's life. Despite the low percentage (25%) of breeders over the age of 60, mainly nomads, they still remain a source of knowledge for young breeders. The transmission of the profession to children is a practice followed by all breeders, it remains a profession that is learned in the family, transmitted from one generation to another, from father to son. The surveys carried out by [12] in the region of Oued Souf, show that the category of breeders aged 60 also dominates, while in the region of Ghardaïa, [13] has advanced a high rate (50%) of breeders aged 60 years. 41 to 60 years old. The level of education of the breeders surveyed is 16% illiterate, 25% have not exceeded the average level and 37% have a primary level. The 22% of the stockbreeders, have been deprived of any schooling except the Koranic school. This low rate of herders with no schooling (16%) represents elderly and nomadic herders whose permanent displacement does not allow them to attend school. As a result of the sedentarization of stockbreeders, young stockbreeders are increasingly attracted by the continuation of the school curriculum, which explains the high rate of schooling 37% and 25%. In their studies [14, 11] and, indicate that the reasons for the sedentarization of nomads are the schooling of their children. On the other hand, nomadic cameleers, because of their permanent mobility, prefer to keep their children with them.

For the majority of herders, camel breeding is considered as a means of savings and valuation in our study region, it is for this reason that herders practice different categories of profession (Figure 2b). A high rate (65%) of breeders with a liberal professional activity. They are either traders, merchants, transporters, or service-providing workers (masons, mechanics, carpenters, etc.). other breeders are either exclusively camel drivers (7%) who live solely on the income from their breeding or practice a production system based essentially on the livestock-agriculture association (28%). 1 confirms that some breeders practice other activities apart from breeding. Note that camel breeding in the study region is characterized by a totally or partially kept herd. Depending on the composition and size of the herd and its destination, herding is done by the breeder and his children or by the shepherd, in other cases by both at the same time. 65% of the breeders surveyed are shepherds associated with the owner of herds who only help them during the breeding season and when watering.

To classify the size of the herd, we took as a reference an important criterion in the religious life of the nomads where legal alms is limited to 25 heads. Based on surveys carried out throughout the wilaya, the 30 breeders surveyed have 4,103 heads, or 80.26% of the total number reported by the Directorate of Agricultural Services [7], but this numbers must be taken with reserve because the breeders do not declare never their real number of heads out of caution. The processing of survey results revealed 3 distributed classes

(Figure 2c). The 1st Class which includes small herds with a number less than or equal to 25 heads. This class is found in 14 breeders that represented 46.67% of the total number of breeders. The 2nd Class includes 25 to 49 heads and was represented by only 5 breeders (16.67%). The 3rd Class includes 50 heads, with 11 breeders (36.67%) of the breeders surveyed.

In general, the composition of the camel herd varies according to various factors, the most important of which is the vocation of the breeding, whether for meat production or dairy production. According to the survey, the total number of camels of the breeders surveyed (30 breeders) is around 4,103 heads divided into 22.50% males with 66.90% breeding camels and 10.60% young calves (Figure 2d). The predominance of productive camels is due to the ban on the slaughter of females unless they are unproductive or culled. On the other hand, the low rate of camels is due to its slaughter [15] as well as to the appreciation of its meat by some people from the south if the age of slaughter is not very advanced.

The majority of breeders surveyed (80%) only take into account the selection of males (fertility, size, resistance to diseases and tolerance to drought, etc.). Little selection (20%) is based on females (udder size, lactation times, etc.). All females are considered keepers for the maintenance and growth of the herd, but attention is always focused on the males. According to the survey, all the breeders surveyed (100%) indicate that a single breeding male can ensure the fertility of 50 to 80 camels, in accordance with the results reported by [16], or a single male can cover more than 80 females per season. This is why these breeders often keep one or two other males in their herds to use them in case of need, according to [17], these males who must not enter into a fight with the stallion, leader of the herd. The El-Hamra (85%), el Soufia (12%), and Targuia (3%) breeds of camels make up the majority of the herd in the Biskra wilaya. The Targuia breed is known for its thin hair, while the El breed is valued for its coat color and its hair, which nomadic families use to make kachabias, khaïma, and bernous camels.

3.2. Camel breeding management in the Biskra region

In camels, as in other herbivorous species, a balanced diet is necessary to maintain animals in good health and allow them to express their energy potential [18]. More than 68% of breeders rely on natural fodder to feed their livestock. Breeders who know the region very well indicate that the natural rangelands present a great diversity and a variable composition of floristic procession according to the availability of rains by season and according to the regions. The breeders surveyed indicate that acheb or ephemeral pasture from annual vegetation and permanent pasture composed of woody and bushy perennial vegetation or even halophilic vegetation (Table 1), are the staple food for their animals. In recent years, these routes have not been able to meet the needs of livestock, especially during the winter period when there is low productivity of the routes, so they have resorted to coarse feed (stubble, straw and concentrate such as barley, dry bread) where we recorded 32% of the breeders surveyed give supplementary feed to their animals in case of rare vegetation (dry bread). During the summer, the animal feeds on available perennial plants (Drinn, Begle, Sedra, Dhimran, etc.). While in spring and autumn, its diet is mainly based on certain herbaceous plants (achebs) that appear just after the rains (Lalma, Saadane, etc.). Some plants are recognized by breeders as being toxic plants dangerous for camels case of *Nerium oleander* (Oleander); *Thapsia garganica* and *Artemisia campestris*, which can cause internal bleeding and subsequently death, the composition of the plant cover is confirmed by other studies carried out in the wilaya [19,20,21]. Breeders declare that in hot weather the dromedary grazes early in the morning and before sunset, this information was confirmed by [14], for 4 to 8 hours a day, with 6 hours of rumination [22]. While the calf is lightly grazed from 20 to 30 days after birth depending on the availability of the cover vegetation acheb.

Table 1. Main spontaneous plants grazed by camels in the wilaya of Biskra

Family	Species	Arabic name	Appreciation
Poaceae	<i>Aristida pungens</i>	Drinn	+++
	<i>Cynodon dactylon</i>	Nedjm	++
	<i>Panicum turgidum</i>	Bourekba	+++
Zygophyllaceae	<i>Peganum harmala</i>	Harmel	+
	<i>Fagonia glutinosa</i>	Chouraik	+
	<i>Zygophyllum album</i>	Agga	+
Fabaceae	<i>Astragalus armatus</i>	L'kded	+++
	<i>Astragalus gombo</i>	Faila	
	<i>Retama retam</i>	R'tem	++
	<i>Genista Saharae</i>	Merkh	++
Tamaricaceae	<i>Tamarix gallica</i>	Tarfa	++
Cistaceae	<i>Helianthemum lippii</i>	R'guig	+
Rhamnaceae	<i>Zyziphus lotus</i>	Sedraya	+++
Chenopodiaceae	<i>Salsola tetragona</i>	Harmegue,	++
(Amaranthaceae)		Houraiche	
	<i>Anabasis articulata</i>	Dhimrane	+++
	<i>Arthrophytum scoparium</i>	Remthe	+++
	<i>Agatophora alopecuroides</i>	Baguel	+++
Plumbaginaceae	<i>Limoniastrum guyonianum</i>	Zaita	++
Polygonaceae	<i>Calligonum comosum</i>	Larta	+++
Rosaceae	<i>Neurada procumbens</i> L	Saadane	+
Plantaginaceae	<i>Plantago ciliata</i>	Lalma	++

(+) : appreciated ; (++) ; moderately appreciated (+++) ; most appreciated

3.3. Reproduction

The dromedary is the only animal that supports thirst. According to the declaration of the breeders surveyed. The analysis of obtained results indicated that 100% of the tot: investigated breeders water their camels once a week in winter and once every three days in summer. Were, 35% use boreholes, 9% wadis as the main sources of watering and 56% use cisterns at the location of the herd.

All the breeders of the Biskra region confirm that the lifespan of the dromedary is very important, it is 25 to 28 years with a culling age for the female which varies from 17 to 24 years, it is linked to the number of calving during his career decrease in the quantity of milk, and the number of young calves, the cull age of the male is an average of 17 years. The mating in camels is done naturally from November to April, if the animal is subjected to a good diet, it will have an early mating. During mating, the projection is done freely after the choice of parents with a duration of 10 to 25 minutes or it can be repeated several times in the same day. The camels (nagas) are bred at the age of 4 years and the male at the age of more than 5 years. This age difference is justified by the fact that the breeding male is only introduced into the herd of camels if he will be able to cope with other breeding animals during periods of heat [23]. While [24], argue that the male in Algeria, reaches its breeding age of 4 to 5 years, in the same sense, [25] reported that in extensive breeding, young camels are often fertilized at the age of 3 to 4 years. All of the breeders surveyed (100%) also confirms that gestation in camels lasts one year (one year of gestation + one year of breastfeeding), for Algerian camels, this result is corroborated by [24], While [26], reported that it varies from 11 to 13 months. Similarly, the breeders surveyed (100%) confirmed that the interval between two calvings for a camel is 24 months, with an average of 4 to 10 individual calves (one calf per litter) throughout its life. This was also advanced by [23] in his research work. While [26] spoke of 3 to 7 births during the career of the camel.

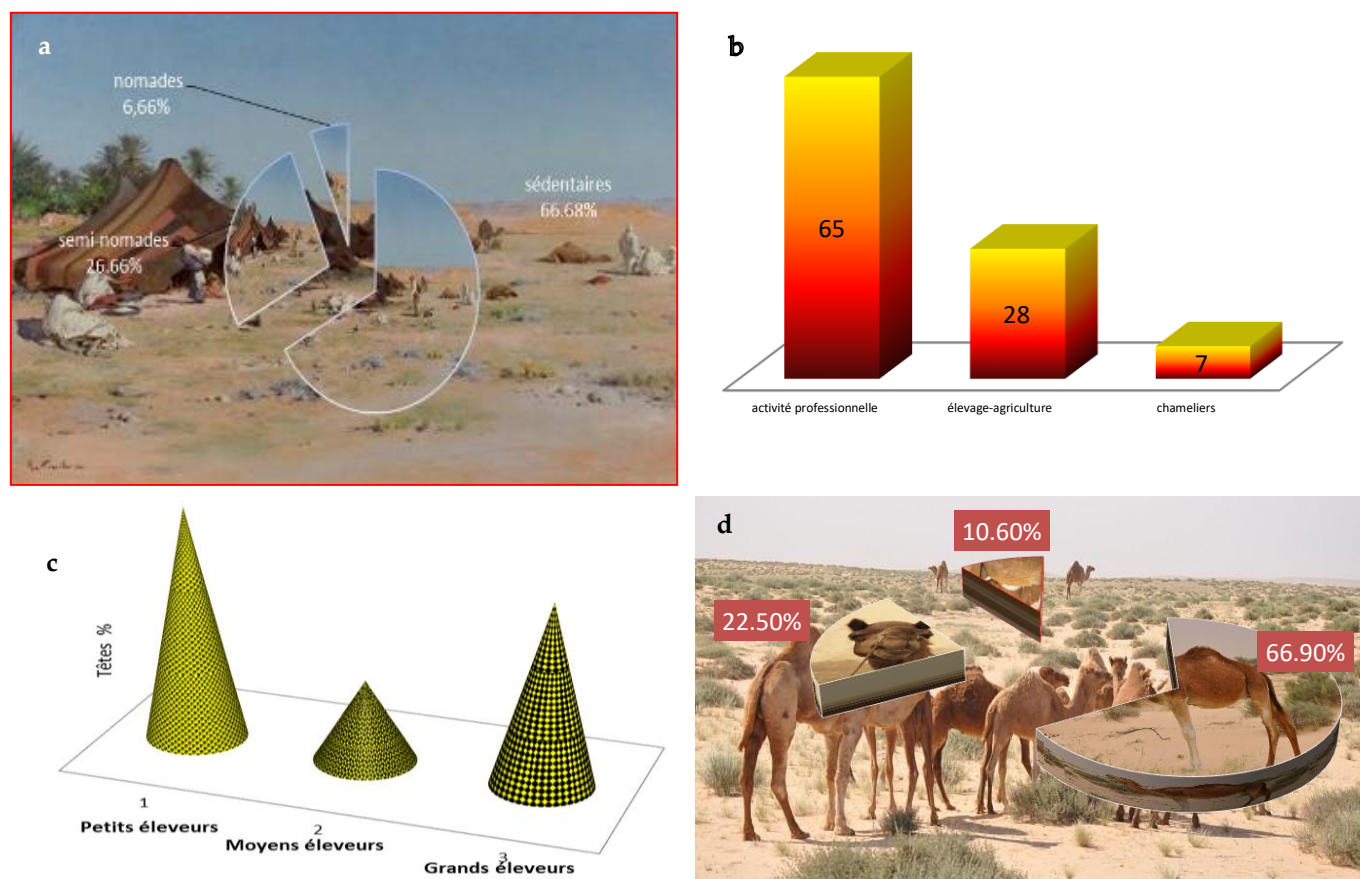


Figure 2. Identification of a. farming systems, b. different categories of income sources for livestock keepers, c. classes of herders according to the size of their herds, d. composition of the camel herd at the wilaya of Biskra.

3.4. Camel market in Biskra

According to the obtained results, the sale of dromedaries concerns males much more during the spring period, the female was only sold if it was sick or old. The camel meat in the economy of the wilaya is low compared to that of sheep, beef and goat meat. This is explained by the fact that this breeding is practiced in the majority of cases (80%) for reasons of multiplication of the species between breeders or the breeding males are sold with a price of 150,000 DA. The most famous places of sale are especially towards the wilayas of Oued Souf, Ghardaïa, El Bayedh and à Djelfa. The slaughter of camels is generally done for the one-year-old "hoar" camel which reaches 1.70 Qx up to 2 Qx with a price of 70,000 to 10,000 DA (price of one Kg of camel meat is 400 DA).

Cameline dairy production has not yet been popular on a national scale, but it represents an essential food source for nomads and populations of desert regions who consume it mainly raw. The majority of breeders (70%) do not practice milking because of free herd management, and if it is practiced (10%) it is intended for self-consumption. But lately some (20%) choose places next to the road with a limited workforce which consists of a few females with their calves for the sale of milk. According to the breeders surveyed, milk production varies from 3l/d to 5l/d depending on the availability of feed and its nature. According to [17], Algerian camels produce 6 to 9 liters per day, which is very high compared to the quantity reported by [27] 2-4 l/day and 28 3-5 l/day at the level of the Sahara.

The best hairs are harvested from young "oaber" camels during spring and summer. Based on the results of surveys, these hairs are either sold as a raw product with a price of 2,000 DA/Kg. Either valued by the know-how of the women who make the most famous skilfully Algerian "Bernous" and "kachabia". They also make blankets, make tents and weave carpets. These products are either used by family members or for sale at the local

market. This is confirmed by [25], which states that the fleece is used alone or blended for the weaving of clothing. [29] affirms by declaring that the fleece of camels, shorn from their first year of age, is the most sought after.

3.5. Pathology and pharmacology

Because of its resistance to various diseases, the breeders of the study region do not give importance to the medical treatment and veterinary follow-up of camels compared to other livestock (sheep and goats). They surveyed state that the mortality rate varies according to the seasons and the years. They can have a food origin after consumption of certain plants known by the shepherds or after supplemental feeding. Perinatal mortality affects camels aged between 0 and 15 days following neonatal diarrhoea. Mortality caused by diseases, accidents in herd and road accidents.

Table 2. The main camels' diseases encountered in the Biskra region

Diseases	Arabic name
Trypanosomiase	Dhebeb
Les parasites externs	Djereb
Pneumopathie	Sedar
Avortement	Trah
Parasite gastro-intestinale	/
Diarrhée	/
Météorisation	Nafkh
Rétention du placenta	Maslatech

To treat these diseases, 91% of breeders generally resort to traditional treatments (Table 2) except in the most complicated cases where they call the veterinarians in the case of abortions, trypanosomosis and camel diarrhea. Trypanosomosis, gastrointestinal parasitism, neonatal camel diarrhea are responsible for significant direct or indirect economic losses [30]. 9% buy veterinary products for the most well-known cases such as vitamin complexes, anthelmintics (Albendazol), antiparasitics (Ivomec), broad-spectrum antibiotics (oxytetracycline), anti-inflammatories (Phenylbutazone) and practice themselves the treatment. According to [24], in camels, ticks do not transmit pathogens. Control on the host can be envisaged by the use of acaricides or by individual sprays based on organophosphates (Diazinon) or deltamethrin [29].

All farmers benefit from the treatments carried out by the agricultural services department (DSA) as part of the annual prophylactic program; it is a preventive treatment (anthelmintic, antiparasitic and antibiotic).

4. Conclusions

To feed themselves, the camels graze spontaneous plants, in recent years, the rangelands were unable to feed their needs, especially during the winter period, they have resorted to supplementary feeding and watering on the spot. The surveys carried out in the Biskra region that have for objectives to have an idea about the situation of the camel breeding system, revealed major constraints that hinder its development. These constraints mainly concern those related to the degradation of natural rangelands accentuated by the combined action of man and climatic conditions. The development of agriculture at the expense of pastoral rangelands is the major constraint. The sedentarization of breeders is another factor that has led to the degradation of rangelands. In addition, the insufficiency in rangelands imposes the stockbreeders to incorporate additional food; straw and the stubble and dry bread and finally the remoteness of the rangelands which imposes the difficulty of watering and the access of the health workers for vaccination and livestock monitoring.

To remedy these problems, some perspectives are proposed; the development of a participatory approach involving breeders and official organizations to avoid the degradation of rangelands, preserve and promote the extension of pastoral rangelands, the introduction of species with high fodder values adapted to the edapho-climatic conditions

of the region and especially to prohibit the extension of agriculture on pastoral rangelands routes.

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