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Full Length Research

Husbandry practices of livestock farming in the Drâa-Tafilalet region of Morocco

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ABSTRACT: The study was aimed to determine the husbandry practices of livestock farmers in the Drâa-Tafilalet region of Morocco. Five sites in the region were selected. Three to five rural districts, each with one to eight breeders of each livestock species, were randomly selected at each site. A survey consisting total 305 farmers was conducted in 21 districts with 60, 105, 71, 21, 35, 13 farmers of cattle, sheep, goats, camels, poultry and rabbits, respectively. For identification, 31.9% of breeders used ear tags, and 26.3% used notch or fire marks. The study found that 55.4% of breeders kept their animals in barns, 40.2% in "zriba" and 4.38% in open fields. All cattle breeders reported milking their cows, but only 4.72%, 72.1% and 88.9% milked their ewes, does and she-camels (cows), respectively. There were 2.38% of breeders who practiced castration, including 33.3% of sheep breeders, 16.7% of goat breeders, and 50% of camel breeders. In this study, it was found that cattle breeders did not practice castration at all. Natural pasture was used by 19.1% of breeders, especially during the spring and summer months, 21.4% used crop residues, 31.3% straw, 27.2% forages, mainly alfalfa, and 3.09% silage. A total of 83.5% of rangeland breeders kept their herds separate from those of other breeders to prevent mating males from other herds, while 16.5% mixed their herds with those of neighbors. Animals were given water once a day (60.8%), twice a day (25%), once every two days (9.8%), once every three days (0.98%) and 2.94% had access to water all the time. Among the most common diseases were respiratory diseases (30.2%), reproductive tract diseases (10.9%), mastitis (16%), bloat (9.06%), diarrhea (16.3%) and mange/moth (12.4%). Among cattle breeders, 64.9% sold animals, 3.51% sold milk, and 31.6% both sold animals and milk. Breeders of sheep, goats, and camels and rabbits sold 91.3%, 92.5% and 100% of their animals, respectively, whereas chicken breeders sold eggs (26.9%), birds (15.4%) and both eggs and birds (57.7%). According to the study, despite the traditional husbandry practices in the region, successful management programs should consider them.

Keywords: Feeding, health care, housing, identification**,** marketing.

INTRODUCTION

Livestock is an important source of food and income for indigenous population in the Drâa-Tafilalet region of Morocco. It plays a vital role in ensuring food security and maintaining biodiversity. It provides milk, meat, eggs, wool, income and other socio-economic and cultural functions. The region had 108,200 cattle (78% indigenous and 21.6% improved), 1,316,200 sheep, 770,800 goats and 11,498 camels in 2017 (Annuaire statistique du Maroc, 2018). There are high proportions of cattle and sheep in Midelt province (32.3% and 35.8% respectively), goats in Tinghir province (29.5%), and camels in Zagora province (54.6%) (Annuaire statistique du Maroc, 2018). Livestock in the region are mainly of indigenous populations. They are as a result of a natural selection process that has taken place during epidemics and famines. They constitute a national heritage and are the guarantors of part of the biological and cultural information that represents the genetic heritage of the living species. In the Drâa-Tafilalet region, livestock is often managed in a traditional way, relying mainly on poor quality rangelands for their food and receive little feed supplementation and veterinary care. These traditional husbandry practices and skills that

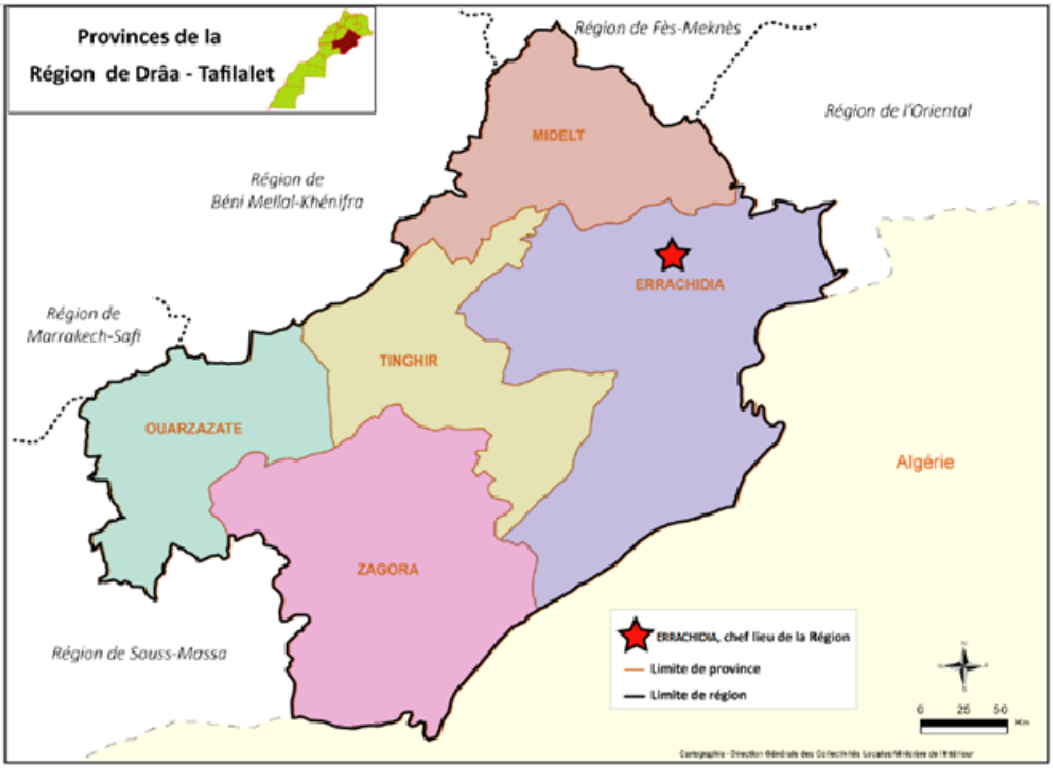

Figure 1. Delimitation of the Drâa-Tafilalet region.

involve selecting animals with desirable traits and breeding them to produce offspring with those traits are important for the conservation and the improvement of local livestock (Zewdu *et al.,* 2006). Improving livestock productivity can play a significant role in alleviating household food insecurity and poverty. To implement improvement strategies, it is important to gain a good understanding of the local practices used by farmers. Zewdu *et al.* (2006) reported that the absence of such knowledge leads to unrealistic breeding goals in livestock genetic improvement programs, putting indigenous animal genetic resources at risk. In this regard, there is little information on indigenous knowledge of livestock genetic resource management and livestock practices of breeders in the Drâa-Tafilalet region.

Therefore, this study was planned to assess breeders' husbandry knowledge affecting livestock production in the Drâa-Tafilalet region. The information collected would be helpful especially in developing strategies for livestock improvement in this region of study.

MATERIALS AND METHODS

Study site

The study took place in the Drâa-Tafilalet region of southeastern Morocco (Figure 1). The region covers an overall area of 88,975 km^2, which represents 12.5% of the national territory. It is known not only for its semi-desert climate and for insufficient rainfall, but also for the lack of water resources and the phenomenon of desertification. It is characterized by very hot summers (40°C) and harsh winters whose temperature varies between -7°C and -1°C. The average annual rainfall in the region is marked by its strong spatiotemporal irregularity, ranging from 300 mm in the High Atlas Mountains, 200 mm in the valleys, 120 mm on the plateau of Ouarzazate to 60 mm in Zagora. The rainy periods are spread between September and May and the number of rainy days varies from 30 to 40 days per year (Anonymous, 2018).

Sampling method, number and distribution of surveys

Five pilot sites Z1, Z2, Z9, Z15 and Z17 were identified in the Drâa-Tafilalet region, representing mountain oases, intermediate oases and plain oases, in order to conduct a study on livestock production. These sites are located in the provinces of Tinghir, Midelt, Errachidia, Ouarzazate and Zagora, respectively, and cover 24 districts (3 to 6 districts per site). In each site, 3 to 5 rural districts were selected based on the number of cattle, sheep, goats and dromedaries. In each district, one to eight farmers of each livestock species were randomly selected and interviewed. Depending on the main livestock species owned by the breeder, the interviewer completed the species-specific questionnaire. At the end, a survey on 305 farmers was

Table 1. Number of surveys conducted by site and livestock species.

Site	Breeders of						Total
	Cattle	Sheep	Goats	Dromedaries	Chickens	Rabbits	
Z1	15	21	22	0	6	1	65
Z2	19	24	8	0	10	4	65
Z9	12	22	12	7	10	5	68
Z15	14	22	14	3	8	3	64
Z17	0	16	15	11	1	0	43
Total	60	105	71	21	35	13	305
%	19.7	34.4	23.3	6.88	11.5	4.26	100

conducted in 21 districts, of which 21.3%, 21.3%, 22.3%, 21.0% and 14.1% were conducted in sites Z1, Z2, Z9, Z15 and Z17, respectively, with 19.7%, 34.4%, 23.3%, 6.88%, 11.5% and 4.26% of cattle, sheep, goat, camel, chicken and rabbit breeders, respectively (Table 1).

The field surveys were conducted between April 1 and 8, 2021 in sites Z2 and Z9 and between May 25 and June 4, 2021 in sites Z1, Z15, and Z17. Subsequently, focus discussion groups of 12 to 15 people in each pilot site were organized. These groups included men and women with a good knowledge of the area's livestock and animal genetic resources, representatives of livestock associations and cooperatives, as well as managers and technicians from the administrations involved in the study. Meetings were held to discuss the results obtained in the present study and details or missing information on topics not covered in the surveys as well as to gain a deeper understanding of the topics discussed during structure interviews.

To compare frequencies across sites and livestock species, the Chi-square test was used.

RESULTS AND DISCUSSION

Identification of the animals

Out of total breeders, 31.9% used ear tags for identification and 26.3% used notch marks or fire marks on certain body parts. The rest of breeders relied on color and external appearance (23.5%), names (7.17%) that were often assigned based on external appearance, body shape or special events that coincided with the birth or purchase of the animal, and 11.1% used either paint or a mixture of two or three of the above methods. The majority of breeders with small herds identified their animals by names only or by remembering their colors. In contrast, the majority of breeders with large herds used ear tags or branding as the primary means of identification. Zergaw *et al.* (2016) reported that breeders in Ethiopia identify their goats mainly through names, coat color, notches, and ear tags.

The Chi-square test showed that the identification methods varied according to the livestock species ($p<0.05$). Thus, 83.3% of the breeders identified their cattle by ear tags, 56.7% and 38.9% identified their goats and dromedaries, respectively using marking, while 39.0% opted for the color of the fleece and the external appearance to identify their sheep, especially in the case of the D'man breed that is multicolored (Figure 2).

Housing of animals

The study found that 55.4% of breeders housed their animals in a built barn, 40.2% in a “zriba” and 4.38% in the open air as for sheep, goats and camels on the rangelands. The majority of the built barns was constructed using rammed earth (63.0%) or stones (37.0%), and often located in the main dwelling home. The “zriba” is a fence constructed using tree and shrub branches, date palm leaves or stones and often without shade, and located outside the dwelling home. On the rangeland areas, animals were kept in the so locally called "Tafargout", built using only stones collected in the area and without shade. The housing was located inside the breeders' family dwellings (22.3%), near the dwelling (43.7%) or far from the dwelling when it is on the range. The floors of cattle housing were not paved, which predisposed animals to hoof diseases. Moreover, cattle were either tethered (82.1%) or loose (17.9%). Adult males and females were housed together. However, 95% of the breeders separated the calves from their mothers in order to prevent them from suckling. Separating livestock by age, sex, or pregnancy stage was very challenging for other livestock species. Hailemariam *et al.* (2022) reported that 56.7% of dairy farmers in Dilla Zuriya district built a separate dairy cattle house from the main dwelling home, using available construction materials like mud and wood. Moreover, 91.7% of smallholder dairy farmers confined all classes of dairy animals together while separating calves only. Furthermore, 76.1% of smallholder dairy farmers in the Gurage zone confine their dairy cattle in the family house (Aduna and Ayalew, 2019). 82.8% of farmers housed their sheep with shelter constructed inside the main house, 10.3% constructed separate house for their sheep and 6.8% of them housed their sheep with open barn. About 78.3 and 55.7% of the farmers shelter lambs

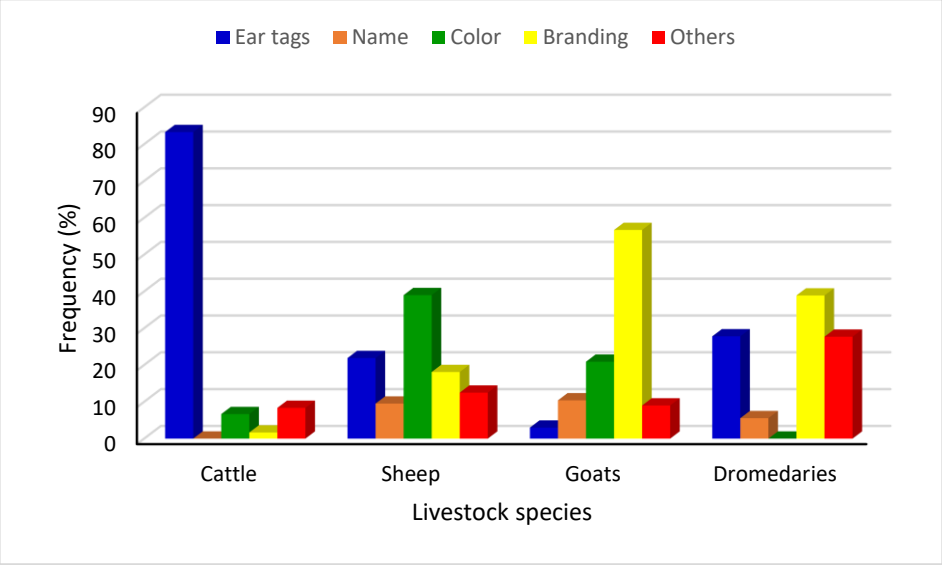

Figure 2. Frequency distribution of animal identification methods of each livestock species.

with adult sheep, and sheep with other livestock, respectively (Taye *et al.,* 2016). Ruminants were generally provided with some form of shelter structure (cattle 82.2%; small ruminants 93.0%), while only 12.8% of farmers provided shelters to village chickens. A larger proportion of cattle (82.2%) and small ruminant farmers (93.0%) provided overnight shelters for animals (Zaw Win *et al.,* 2019).

For backyard animals, housing was provided only during the night for poultry in a kind of traditional henhouse or night shelters (78.9%), and directly on the ground (61.5%) in the case of rabbits. Melak *et al.* (2021) showed that 77.8% of respondents replied that their chickens spent the night inside perch trees and the remaining 13.3% and 8.9% spent the night in the basket and the house with the households, respectively. Jaouzi *et al.* (2006) reported that in Morocco rabbit rearing on the ground represented 86.9%, of which 42% was in a building and 58% below ground level in wells or “matmouras”, while rearing in wire cages represented 10.1%. Moreover, they revealed that 87.8% of breeders did not separate rabbits by age and 85.5% did not separate them by sex.

The cleaning frequency of housing was once a day (28.1%), twice a day (1.12%), once a week (15.2%), once a year (23.6%) or no cleaning at all (1.03%). The lack of cleaning was observed mainly in the case of "Tafargout" on the rangelands. It should be noted that the shelters of chickens and rabbits are cleaned more frequently than those of other animal species.

Milking of females

All the breeders declared that they milk their cows, while only 4.72%, 72.1% and 88.9% milk their ewes, does and she-camels (cows), respectively. Cows were milked in the morning only (10%) or in the morning and evening (90%). Does were milked in the morning only (43.7%), in the evening only (42.0%) or in the morning and evening (14.3%). She-camels were milked in the morning only (75.0%) or in the morning and evening (25.0%), while ewes were milked once a day, either in the morning (80.0%) or in the evening (20.0%).

Furthermore, ewes, does and she-camels were milked manually. Cows were milked manually (93.3%) or using milking machine (6.70%). She-camels were milked in the presence of the calf, which starts and ends the milking; indigenous and some crossbred cows were milked in the presence of the calf (76.7%) or in its absence (23.3%). The milk obtained from ewes, goats and camels was self-consumed, whereas milk from cows was self-consumed (85.0%), sold (13.3%) or both self-consumed and sold (1.67%).

Practice of castration

Castration of males is a technique rarely practiced by breeders in this area of study. Indeed, only 2.38% of them practiced castration. Among those who practiced castration, sheep breeders accounted for 33.3%, goat breeders for 16.7%, and camel breeders for 50%. No breeder practiced castration on cattle. These findings are in disagreement with those of Zaw Win *et al.* (2019) who reported that in central dry zone of Myanmar, castration was more common in cattle households (64.9%) compared to small ruminant households (5.0%). Further, 83.3% of breeders who practice castration were found in site Z17 and 16.7% in site Z15. These breeders claimed that castration makes the males quieter and enables them

to be kept in the herd until advanced ages, thereby allowing them to be sold at high prices without being able to breed females. Dossa *et al.* (2015) reported that castration of male sheep was an uncommon practice (only 3% of breeders) in West Africa, while it is more commonly practiced on male goats (about 31% of breeders) in order to eliminate the “buck odor” and to improve growth rates. Edea *et al.* (2012) and Godadaw *et al.* (2014) reported that 97.6% of the farmers practice castration on their sheep to improve their fattening potential and on their cattle to make them more docile, respectively. Getachew *et al.* (2010) reported that the majority of the Menz (96.7%) and Afar (97.2%) sheep owners practice castration in order to improve fattening, to avoid unnecessary mating or to improve the behavior of the ram.

Castration was practiced at young age for sheep, goats and camels. This is consistent with the age at castration for sheep that is 7.7 months (Dossa *et al.,* 2015), but not in line with the age of 28.7 ± 11.1 months if the ram was used for breeding and 12.1 ± 4.10 months if the ram was not used for breeding (Taye *et al.,* 2016).

Feeding management

The daily feeding of the herds varied. 19.1% of breeders used natural pastures, especially during the spring and summer periods, 21.4% distributed rations including crop residues, 31.3% straw, 27.2% forages, mainly alfalfa, and 3.09% silage. In addition, 7.61% of the breeders located in Z1, Z15 and Z17 relied exclusively on rangeland for feeding their herds, the others distributed a ration composed of one or more feeds. The most frequent feed mixtures among breeders were: crop residue - straw - forage (12.5%), forage - silage (4.90%), rangeland - straw (3.34%) and straw - forage - silage (3.12%).

Out of total breeders, 91.6% distributed feed supplements to their herds. This proportion was influenced by the site ($p<0.05$), while it was not affected by the livestock species ($p>0.05$). Thus, breeders from sites Z1, Z2, Z9, Z15 and Z17 offering supplementary feed to their herds represented 87.7, 98.0, 100, 76 and 97.6%, respectively. The supplementary feeds were mainly compound feed (18.5%), barley or corn grains (36.4%), wheat bran (21.8%), dry beet pulp (14.9%) and date waste (8.36%). Of the breeders who supplemented their herds, 10.4% offered a single supplementary feed, while the rest (89.6%) combined two or more feeds. The most frequent mixtures of supplementary feeds were: compound feed - cereal grains (5.67%), grains - bran (3.88%), grains - bran - dry beet pulp (3.88%), compound feed - grains - bran (3.58%) and compound feed - bran (3.28%). This feed supplementation is usually distributed to dairy cows, indoor ewes and goats, fattening animals or during winter when the grazing land is not sufficient to meet the needs of the herd. Breeders also indicated that the use of concentrate feed promotes milk production in lactating females. Similarly, the crushed mixture of date waste and barley improves fattening of sheep. A traditional practice used by some breeders, especially women, is the distribution of roasted barley mixed with hot water and a little salt to cows just after calving, in order to improve their body condition and milk production.

A total of 20.2% of breeders reported that their chickens were scavenging, 31.1% distributed grains, 18.5% bran, 26.6% household waste and 4.20% compound feed. The feed offered was distributed on the ground (65%), in cans (12.5%), in pots (15%), on a portion of sheet metal (5%) or in a hopper (2.50%). Zaw Win *et al.* (2019) reported that 90.0% of village chicken flocks scavenging all the year, and additional feeds are rice (90.0%), food scraps (48.0%), maize/sorghum (25.0%) and broken rice (10.0%). Moreover, the study showed that water for drinking was placed in cans (82.5%), pots (15%) or tin boxes (2.5%). Benabdeljelil and Arfaoui (2001) revealed that the vast majority of Moroccan farmers surveyed (94%) provided their birds with water using rudimentary pottery pots, earthenware and plastic ware, cans, and a variety of other containers from wells (61%) or from natural springs (9%).

For rabbits, 30.8% of breeders used household waste, 25.6% green fodder, 23.1% dry fodder, 15.4% crop products and by-products, and 5.13% a compound feed. Jaouzi *et al.* (2006) reported that 17.3% of Moroccan farmers distributed dry fodder, 27.0% green fodder, 25.1% agricultural products and by-products, 23.6% household waste and 6.99% compound feed. Meals were distributed once a day (15.4%), twice a day (15.4%) and 3 to 4 times a day (69.2%). The food was distributed on the floor (76.9%), in pots (15.4%) and in plastic boxes (7.69%). Water for drinking was placed in cans (46.1%), pots (30.8%) or tin boxes (23.1%). In addition, the site did not affect ($p>0.05$) the proportions of feed distributed for either poultry or rabbits. Jaouzi *et al.* (2006) reported that 8.5% of rabbit farmers distributed feed in modern metal hoppers, 48.3% in plastic pots, 6.9% in pottery pots, 11.7% in cans and on sheet metal portions and 28.0% on the ground. They also reported that the material used for watering was plastic pots (70.0%), pottery pots (17.1%), sheet metal and cans (12.2%) and other materials (0.8%) such as tires, etc.

Range herding and use

Of the breeders, 91.4% used the rangelands throughout the year and 8.62% only during the spring and summer periods. The rangelands used are communal land (88.8%), forest (1.72%), or fallow land and stubble (9.48%). The distance covered daily by the herds varied from 1 to 20 km, with an average of 8 km. The average grazing time was 8 to 10 hours per day.

On the rangelands, 83.5% of breeders kept their herds separate from those of other breeders to avoid mating males from other herds, while 16.5% mixed them with those of neighbors, probably for easy driving and

convenient grazing. Gebreyesus *et al.* (2013) reported that 85% of goat farmers in Ethiopia keep their herds isolated on the rangelands of other farmers, while 15% mix them with those of others. Similarly, 58.6% of the breeders mixed different livestock species (mostly sheep and goats), while 41.4% kept them separate. Taye *et al.* (2016) revealed that most of the farmers herd their sheep with other livestock (63.2%), while 36.7% of them herd separately. In addition, 81.9% of breeders declared that watering points are available on the rangelands, although some are unreliable, especially during the summer. The frequency of watering animals was once a day (60.8%), twice a day (25%), once every two days (9.8%), once every three days (0.98%) and 2.94% have access to water all the time. These frequencies varied according to the season and the proximity of the water point. The origin of the water used for watering was wells (46.2%), rivers (15.9%), natural springs (16.7%), potable water (5.52%) or a combination of 2 sources. Hailemariam *et al.* (2022) reported that dairy farmers used two sources to water their cattle; either from the river (54.3%) or from the pipe (45.8%). Among rangeland users, 25% practiced transhumance over several hundred kilometers; the rest practiced vertical transhumance or sedentary rangeland living while the animals are on the move.

The Chi-square test showed that site and livestock species influenced ($p<0.05$) the range use. Breeders who used the rangeland represented 68.4%, 15.7%, 30.2%, 49% and 70.7% in sites Z1, Z2, Z9, Z15 and Z17, respectively. Similarly, among these users, 5.08%, 32.1%, 89.5% and 100% were cattle, sheep, goat and camel breeders, respectively.

Health care

The most common diseases in terms of frequency of occurrence were respiratory diseases (30.2%), reproductive tract diseases (10.9%), mastitis (16%), bloat (9.06%), diarrhea (16.3%), mange/moth (12.4%), abscesses (4.53%) and hoof disease (0.61%). Similar diseases affecting herds in different regions were reported (Ndebele *et al.,* 2007; Edea *et al.,* 2012; Genzebu *et al.,* 2012). These diseases occur throughout the year (36.6%), in winter (22.4%), summer (21.3%) or spring (15.8%). They affect animals of all ages (65.4%), only adults (23.1%) or only young animals (11.5%), which are very vulnerable, especially during the dry season and the beginning of the rainy season.

To treat diseases, 70.8% of breeders used modern treatments, 20.3% used traditional treatments, especially breeders located in districts that are far from major centers, and the rest used both modern and traditional treatments. Traditional treatments are often mixtures of several substances, such as olive oil, salt, vinegar and even bleach, which are applied to the skin, the wound, or used as beverages. The veterinary services provide vaccinations against diseases legally considered contagious, such as sheep pox and foot-and-mouth disease, during vaccination campaigns organized by the Ministry of Agriculture. Thus, 87.6% of breeders regularly used to vaccinate their animals, 50.4% practiced deworming and 58.5% called a veterinarian when necessary. Nevertheless, many breeders complain about the lack of veterinary interventions on their herds. Thus, if any disease appeared, they ask either other breeders or they provide care themselves, sometimes buying veterinary products at the souk (rural market) or from a technician, but without any prior diagnosis.

Various diseases affect livestock species. Cattle are mainly victims of bloat (24.5%), sheep, poultry and rabbits of diarrhea (24.8%, 40% and 75%, respectively), goats of respiratory diseases (25.9%) and camels of mange/moth (35.1%). In a given production system, high productivity is achieved when diseases are controlled.

Marketing of animals and products

One of the main objectives of livestock production is to generate income through the sale of animals and animal products. The products marketed differ according to the livestock species (Figure 3). Thus, 64.9% of cattle breeders sold animals, 3.51% sold milk and 31.6% sold both animals and milk. Those marketed by sheep breeders were animals (91.3%), both animals and manure (4.36%) and both animals and wool (4.37%). The products marketed by goat breeders were animals (92.5%) and both animals and manure (7.47%). Dromedary and rabbit breeders sold only the animals (100%). Poultry breeders sold eggs (26.9%), birds (15.4%) and both eggs and birds (57.7%). These sales are made to cover household expenses or to purchase feed and veterinary products for the herd.

Different categories of animals were sold (Figure 4). Breeders preferentially sold young males (25.3%), adult males (9.68%), both young males and females (18.9%) or all categories of animals (12.4%). Adult females are sold only when there is an urgent need for money, while males are sold at an early age following to high market demand. However, selling males at an early age might have negative effects on selection if preference is given to individuals that reach sale weight faster than those that are not sold. Therefore, the question of how to retain replacement animals, especially males, requires a great deal of attention for sustainable use of available animal resources and improvement of overall herd productivity. Total 81.5% of the farmers reported that the average age at sale of the rabbits is 4.1 months and the live weight at sale was 1.86 kg (Jaouzi *et al.,* 2006).

The animals were sold after fattening (74.5%) or without fattening (25.5%). However, this operation differs according to the livestock species ($p<0.05$). Thus, 70.6%, 83.7%, 70.5%, 43.8% and 77.8% of breeders sold their

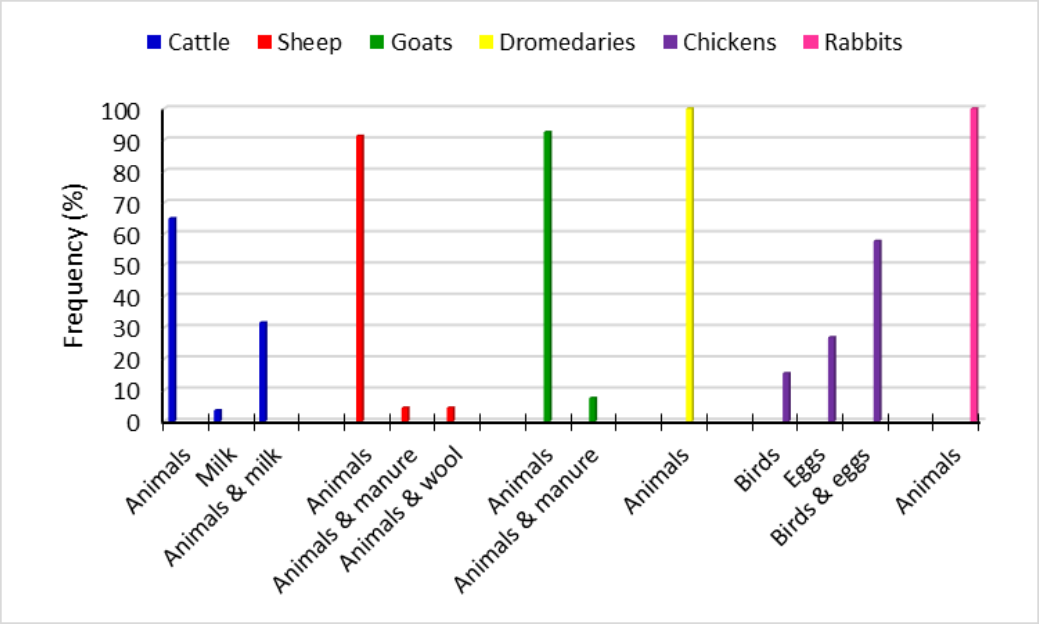

Figure 3. Frequency distribution of marketed products.

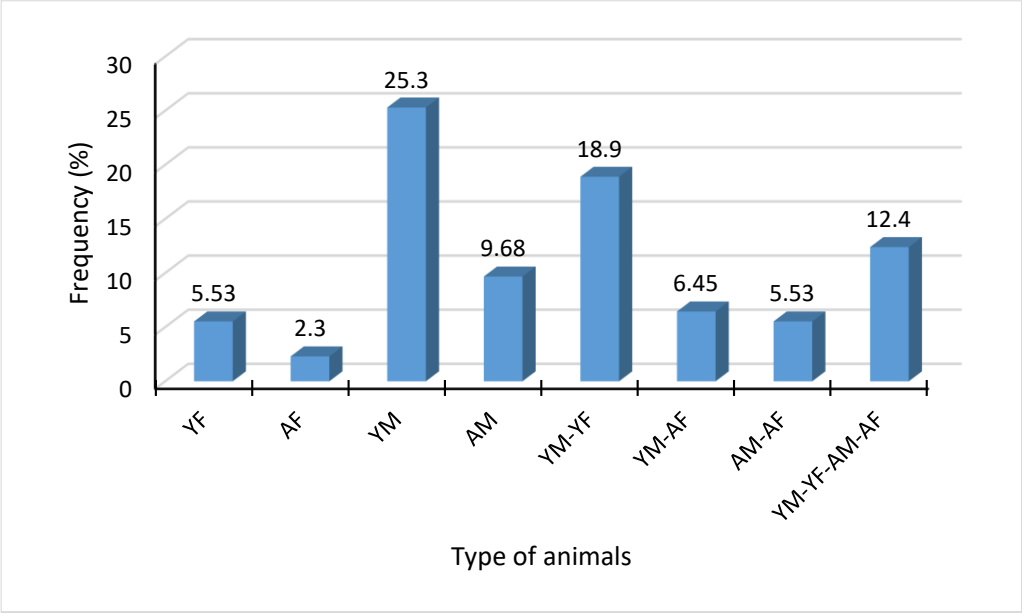

Figure 4. Frequency distribution of types of animals marketed by breeders (YF: young females, AF: adult females, YM: young males, AM: adult males).

cattle, sheep, goats, dromedaries and rabbits, respectively after fattening for one month (10%), two months (50%) or more than two months (40%).

Out of total breeders, 47.6% sold their animals at the souk, often the nearest one, 33.5% at the farm and the rest both at the souk and at the farm. These proportions differ according to the livestock species ($p<0.05$), since 40.8% of cattle, 53.1% of sheep and 52.4% of goats were mainly sold at the souk, whereas dromedaries, chickens and rabbits were mainly sold on the farm (81.2%, 66.7% and 66.7%, respectively) (Figure 5). Sales were made to intermediaries, consumers, or to other farmers. The breeders sell their animals when they need money, although they would prefer to sell them at times when market demand and prices are high. Note that milk from cows was sold to dairy cooperatives and eggs were mainly

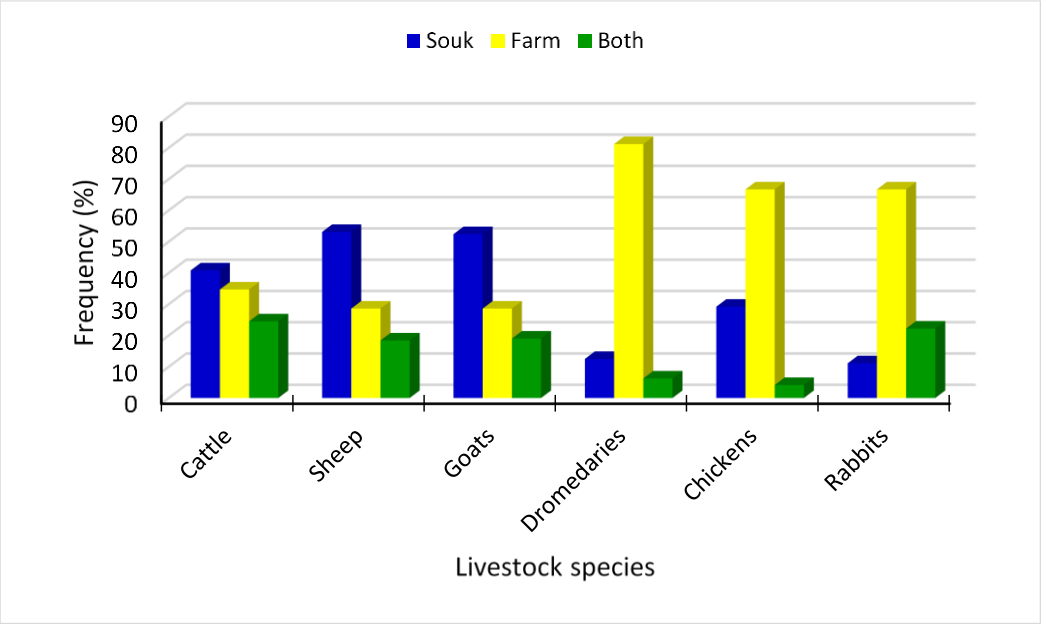

Figure 5. Frequency distribution of where animals are sold.

sold on the farm, at the souk, and even sometimes at the district grocery store. Jaouzi *et al.* (2006) found that 59.7% of farmers sold their rabbits at the weekly rural souk and 16.7% at the farm.

Conclusion

This study revealed that the management style practiced by breeders in the Drâa-Tafilalet region is mostly traditional and extensive. Breeders use a variety of methods to identify their animals, but ear tags are used by 31.9% of them. Barns, "zribas" or open fields were used to house animals. It is common for cows, does and she-camels to be milked once or twice per day, while ewes were rarely milked. In the study region, breeders rarely practiced castration of males. Feeding was essentially based on rangeland (19.1%), with a supplementary ration in periods of shortage and drought. To avoid breeding males from other herds on the rangelands, most breeders (83.5%) kept their herds separate from others. Breeders often treated diseases without consulting veterinarians first. Livestock income was generated by the sale of animals and animal products, either on the farm or at the weekly market.

It was concluded that when developing livestock improvement strategies, it is important to consider the indigenous knowledge of the breeders.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest.

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