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Mountain pasture management by goat farmers: case of the Kabylia region (Algeria)

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Abstract. The aim of this study is to characterize goat breeders' pasture management strategies. 16 goat farms, located in a steep mountainous area in Tizi-Ouzou, were monitored for one year. Results show that goat breeding, with flocks ranging from 5 to 136 head, is regarded as the principal activity and under extensive conditions. Feeding is primarily based on the exploitation of pastures. On average, animals spend 6 hour/day on pasture. Pastures are made up of natural meadows, maquis and forests. The surface area of these pastures varies during the year according to the seasons, from 5 to 9 ha / breeder. It is in autumn and winter when the grazing period is reduced, and therefore the animals' requierements are not sufficiently covered. For this purpose, hay, stubble and limbing are used during this part of the year. Limbing concerns plant species such as Algerian oak, cork oak, ash, broom and olive leaves. In addition, the distribution of supplements is based on the goat's milk production strategy (low, medium and high production). Animals receive, throughout the year, a small amount of supplements, on average 135 g/head/day. These supplements may be green fodder, straw or concentrates. The latter is initially intended for cows, and contains wheat bran, corn or barley.

Keywords. Goat breeding – Pastures – Feed – Mountainous area – Algeria.

Gestion des parcours de montagne par les éleveurs caprins : cas de la région de Kabylie en Algérie

Résumé. *L'objectif de ce travail est de caractériser les stratégies de gestion des parcours de montagne par les éleveurs caprins. 16 exploitations caprines, situées en zone montagneuse à forte pente de Tizi-Ouzou, ont été suivies pendant une année. Les résultats montrent que l'élevage caprin, dont la taille des cheptels varie de 5 à 136 têtes, est considéré comme activité principale menée de façon extensive. L'alimentation se base essentiellement sur l'exploitation des pâturages. Le temps passé par les animaux sur les pâturages est en moyenne de 6 heures/jour. Les pâturages sont constitués de prairies naturelles, maquis et forêts. Durant l'année, la surface de ces pâturages varie en fonction des saisons de 5 à 9 ha/éleveur. C'est en automne et en hiver que la période de pâturage diminue, de ce fait les besoins des animaux ne sont pas suffisamment couverts. À cet effet, le foin, les chaumes et l'ébranchage sont exploités durant cette partie de l'année. L'ébranchage concerne les espèces végétales comme le chêne zéen, le chêne-liège, le frêne, le genêt et les feuilles d'olivier. En outre, la distribution de complément se fait en fonction de la stratégie de production de lait de chèvre (faible, moyenne et forte production). Les animaux reçoivent, durant toute l'année, une faible quantité de complément qui est en moyenne de 135 g/tête/jour. Ce complément peut être du fourrage vert, de la paille ou du concentré. Ce dernier est constitué de concentré destiné initialement aux vaches, de son de blé, de maïs ou d'orge.*

Mots-clés. *Exploitation caprine – Pâturages – Alimentation – Zone montagneuse – Algérie.*

I – Introduction

In mountainous areas in Algeria, as in other countries of North Africa and the Sahel, small ruminants contribute substantially to the food and economic security of mountain households (Bengoumi *et al.*, 2013). Changes in the farming environment affected small ruminant production systems. These changes induced adaptations related to conducting of breeding and production orientation (Dubeuf and Boyazoglu, 2009).

In Tizi-Ouzou in the Kabylia region (Algeria), dairy goat farming operates in an appropriate environment because of its relief and vegetation (presence of vegetation, forests, ...). Breeding is conducted under extensive conditions. These food sources seem to be insufficient for the animals, from where the appearance of complementation with concentrates.

Flocks are of small size and are characterized by low productivity, about 1 kg milk / goat / day according to Kadi *et al*. (2013) and Mouhous *et al.* (2015). According to Kadi *et al*. (2015), in this type of farming system, production is not always sufficient, but it is at a lower cost.

This work aims to characterize the feeding behaviour related to grazing management in the mountainous zone of Tizi-Ouzou (Algeria).

II – Materials and methods

The study was conducted in the mountainous region of Tizi-Ouzou (Kabylia), 100 km east of Algiers). Five different physical arrays by topography and vegetation cover characterize the study area (Figure 1). The average rainfall reached 762 mm / year. The study area has 25,370 ha of pastures and rangelands and 115,000 ha of forests, accounting for 10% and 47% of the total land area, respectively.

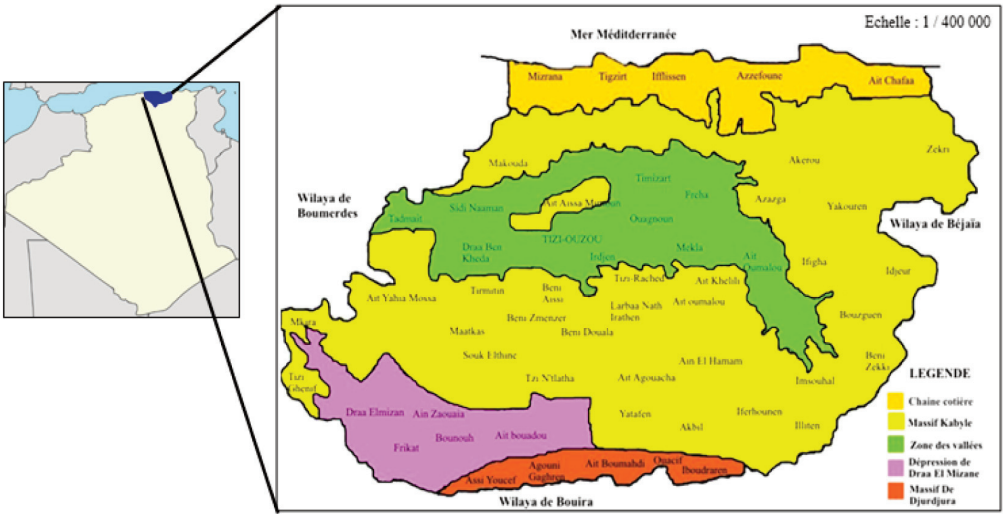

Fig. 1. Physical settings of the study area (DPAT, 2010).

Sixteen goat farms were chosen to be monitored from March 2012 to February 2013. In the selection process of farms, farmers's consent was provided so as to be monitored for a year and receive researchers once or twice a month. The farms are distributed as shown on the physical settings of the study area.

The sections of the questionnaire were related to the feeding behaviour of goats related to mountain pasture management and supplementation with concentrates.

In mountain areas where the forage supply is low, goat farms have low utilised agricultural area (0-4 ha, on average) and the number of dairy goats does not exceed 86 per farm (Table 1). In these 16 farms, goat farming is the main activity.

Table 1. Characteristics of 16 monitored farms

Characteristics	Minimum/maximum	Average	Standard deviation
Number of workers	1 to 3	2.24	0.66
Cultivated UAA (ha)	0 to 4	0.9	1.0
Livestock (head)	5 to 136	34	32.2
Number of dairy goats (head)	3 to 86	16	19.6
Amount of milk sold (kg/year/farm)	72 to 39 350	3 854	9 607

III – Results and discussion

1. Feeding behaviour

Concentrates are distributed in small amounts. The follow-up of goat farms has established a forage calendar. This shows the importance of grazing in goats' diet. The extensive system managed by goat farmers is primarily based on pasture management to meet the dietary requirements of animals as already reported by Kadi *et al.* (2015).

2. Grazing management in goat farms

Goat farms are generally located in mountainous areas with steep slopes. According to the feeding calendar, animals graze all year round in the forest (Figure 2). Supplementation with concentrates is also all year round but in very small amounts (on average, 135 g/head/day). This practice is not reported in neighbouring countries such as Morocco (Chentouf *et al*., 2006).

Complementation by limbing is practiced in autumn and winter. The main plant species used for feeding goats are Algerian oak (*Quercus canariensis*), cork oak (*Quercus suber*), narrow leaf ash (*Fraxinus angustifolia*), spinybroom (*Calycotum spinosa*) and olive leaves (*Olea europea*). Animals receive hay during autumn and winter, when pastures do not cover the the animals' nutritional needs sufficiently and the grazing period is reduced. Stubble, which surface area is small, is only used for two months after mowing hay.

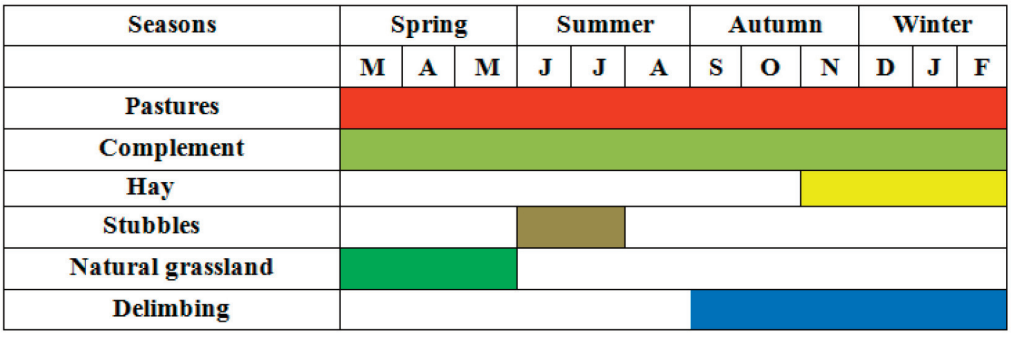

Fig. 2. Feeding calendar in goat breeding (March 2012-February 2013).

Furthermore, grazing time varies from season to season (Figure 3). In spring (March to May), grazing time is 7 hours. Animals go out from 12.00 to 19.00. In summer (June-August), the time spent grazing increases to 9 hours / day. Moreover, animals graze in the morning and in the afternoon. They rest at noon on the farm when the temperature is very high. In autumn and winter, grazing time is reduced. Animals graze in the afternoon (12:00 to 15:00) given the rough climatic conditions and very low temperatures in the mountains.

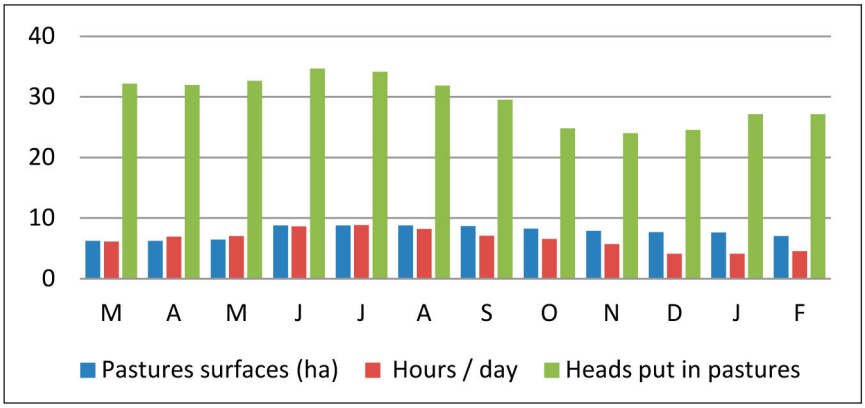

Fig. 3. Pasture Management in goat farms (2012-2013).

Grazed surface areas change from season to season. In spring the average pasture area is 5 ha / farmer. Forests, scrub and native grasslands make up this area. However, in summer the area of pastureland is 9 ha / farmer, on average. This increase in size is stubble is grazed during this period. The use of pastures is a special characteristic of an extensive breeding mode and is common in several countries throughout the world (Escareño *et al*., 2013) and in the Mediterranean area in particular (Oregui and Falagán, 2006).

3. Supplementation in goat farms

Breeders also distribute some green forages, straw and concentrates. Livestock unit numbers (LU) have been used for variables easy to discuss. Indeed, the quantities of green fodder distributed are negligible. Breeders have also been classified according to the amount of milk produced, and three groups have been formed: low, medium and high milk production. Low and medium production groups amount to 3 kg/LU, while the high production group (big farmers) produce twice the amount of milk as the previous groups (6 kg/LU). As in the case of green fodder, straw is distributed in small amounts that do not even reach ½ kg for groups 1 and 3. Green forages and straw are distributed only to females. Concentrates are distributed to all animals. They are wheat bran, barley or industrial concentrates. This is the average production group that reports the largest amount distributed (335 g/goat/day and 260 g/goat/day). Other groups do not exceed 200 g/animal/day.

The low production group distributes less than 100 g/head/day, and the high production group 150 g/head/day. Consequently, taking into account pasture use and feeding practices, milk production is 3 854 kg/year/farm, on average.

IV – Conclusion

In mountainous areas, goat farms are managed under extensive conditions. Pastures are mainly forests and natural grasslands. These are the main sources of feed for goats. With the aim of reducing feed costs, goat flocks of small size use these pastures on a daily basis and throughout the year. The average surface area of pastures exploited is 8 ha/breeder with an average time spent on pasture of 6 hours/day.

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