

Evaluation of ten years pastoral management of a cork-oak forest overgrown by a maquis of *Erica arborea*, in the French Mediterranean region

Goby J.P., Rochon J.J.

in

Lindberg J.E. (ed.), Gonda H.L. (ed.), Ledin I. (ed.).
Recent advances in small ruminant nutrition

Zaragoza : CIHEAM

Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 34

1997

pages 59-64

Article available on line / Article disponible en ligne à l'adresse :

<http://om.ciheam.org/article.php?IDPDF=97606114>

To cite this article / Pour citer cet article

Goby J.P., Rochon J.J. **Evaluation of ten years pastoral management of a cork-oak forest overgrown by a maquis of *Erica arborea*, in the French Mediterranean region.** In : Lindberg J.E. (ed.), Gonda H.L. (ed.), Ledin I. (ed.). *Recent advances in small ruminant nutrition*. Zaragoza : CIHEAM, 1997. p. 59-64 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 34)



<http://www.ciheam.org/>
<http://om.ciheam.org/>

Evaluation of ten years pastoral management of a cork-oak forest overgrown by a maquis of *Erica arborea*, in the French Mediterranean region

J.P. Goby and J.J. Rochon

Institut Universitaire de Technologie de Perpignan hemin de la Passio Viella,
66860 Perpignan Cedex, France

SUMMARY - In the Pyrénées Orientales, a study of the management of an *Erica arborea* scrub used by high yield milk producing goat herd links the nutritive needs of productive goats with the upkeeping constraints of a fire-prone environment. A follow-up of the ruminal parameters according to the food diet showed that the high level of fibrous tissues of *Erica arborea* does not impair the animals' digestion, but on the contrary favours the cellulolytic activity of the rumen. In the pasture, the feeding behaviour leads to a systematic search for arborescent heather. This preference leads to a rapid depletion of grazing resources due to an impoverishment of the 0-2 metres layer, leading to problems when driving the flock on the scrub (escape) and the appearance of a thick cistus bush growth, which is impossible to master by grazing, in the clearer areas. The animal-grazing relationship is a complex one, both from the point of view of the goats' digestive physiology as well as the management of the grazing possibilities available. Mastering the goats' behaviour without prejudicing their food supply necessitates a regular supply of arborescent heather, or the availability of a substitution fodder by cultivating the most favourable zones. Clearing must be well thoughtout and carried out according to the foliage, the farm's location and the cultivation improvement possibilities. A mechanical control of the cistus must be envisaged in the most remote areas. Development by pastoralism is subject to the protection of the environmental against overgrowth as well as a management policy of conservation and improvement of fodder resources.

Key words: Rangeland grazing, management, *Erica arborea*, dairy goats.

RESUME - "Evaluation de 10 années de gestion pastorale d'une forêt de chênes-lièges envahis par un maquis d'*Erica arborea*, dans la région française méditerranéenne". Dans les Pyrénées Orientales, une étude de la gestion d'un maquis d'*Erica arborea* exploité par un troupeau de chèvres hautes productrices de lait a mis en rapport les besoins nutritionnels des caprins en production avec les contraintes de l'entretien d'un environnement prédisposé à l'incendie. Un suivi des paramètres ruminiaux d'après le régime alimentaire a montré que le haut niveau de tissus fibreux d'*Erica arborea* n'est pas un handicap pour la digestion de l'animal, mais au contraire favorise l'activité cellulolytique du rumen. Au pâturage, le comportement alimentaire mène à une recherche systématique de bruyères arborescentes. Cette préférence mène à une réduction rapide des ressources pastorales en raison de l'appauvrissement de la couche 0-2 mètres, causant des problèmes lorsque l'on conduit le troupeau sur les broussailles (fuite) et provoquant l'apparition d'un buisson dense de ciste dans les zones les plus éclairées, impossible à maîtriser par l'activité de pâturage. La relation animal-pâturage est complexe, aussi bien dû à la physiologie digestive des chèvres qu'à la gestion des disponibilités en pâturages. Maîtriser le comportement des chèvres sans porter préjudice à leur apport en aliments, requiert un approvisionnement régulier de bruyères arborescentes, ou la disponibilité de fourrages de substitution en cultivant les zones les plus favorables. Le débroussaillage doit être bien réfléchi et mené en tenant compte du feuillage, de l'emplacement de la ferme et de l'amélioration des possibilités de culture. Un contrôle mécanique des cistes est à envisager dans les zones les plus éloignées. Le développement moyennant le pastoralisme favorise la protection de l'environnement contre l'invasion des broussailles, et constitue également une politique de gestion pour la conservation et l'amélioration des ressources fourragères.

Mots-clés : Pâturage sur parcours, gestion, *Erica arborea*, chèvres laitières.

Introduction

In the framework of part of a training scheme on "the management of Mediterranean resources, farmland and nature zones" at the University Institute of Technology, Perpignan, a study on the

management of the pastoral resources of a cork oak forest, overgrown by a maquis of arborescent heather (*Erica arborea*), was carried out. The maquis in question has been used as a grazing zone for ten years by a herd of high yield milk producing goats.

This study is a follow-up of a series of experiments which were run in order to show the exact feeding habits of the goats, and then to determine the nutrition furnished by the maquis. This being in order to evaluate the effect of grazing on the vegetation.

The aim was to define a way of managing the circuit which would allow for a good utilization of the available resources and would insure their perenniality.

Materials and methods

The site of the research

The research was done on a goat farm, in close contact with the breeder, who participated in the different experiments carried out.

Situated at the foot of the "Pyrenean Albères" range (47°32'N and 2°59'E), between 50 and 150 metres above sea level, the site (50 hectares) includes a 19th century cork oak plantation. The heavy undergrowth, due to the closing-down of the cork exploitation, implies a high fire risk.

The ancient plantation was divided into eight 1.5 to 8 hectare enclosures, cleared of bush over about one third of their area. In 4 enclosures the cleared area was sown with subterranean clover (*Trifolium subterraneum*).

The vegetation consists of a very limited herbaceous layer, due to the lack of ground light under the bushes.

The main bush species in these areas is arborescent heather. This has developed under the trees and occupies a space of 0 to 3 metres space. Other species found are: Montpellier cistus (*Cistus monspeliensis*), sage leaf cistus (*Cistus salviaefolius*), and fewer amounts of thorny gorse (*Ulex parvifolius*), and prickly broom (*Calycotome spinosa*).

The upper layer is composed of cork oaks. Here the forage supply is negligible because of its inaccessibility. However, the acorns produced represent an important source of fodder for animals.

The consumable fraction of the maquis can be estimated as being between 5 and 6 T. of dry matter/hectare.

The herd comprises 62 milk producing Alpine and Saanen goats. The kidding takes place in winter, and the adults produce on average 800 litres of milk for a lactation period of 300 days. The best producers manage to give 1000 kg of milk per year, with a lactation peak of 6 litres/day.

The nourishment consists of grazing the maquis in the afternoon for 5 to 6 hours a day, and of a distribution of 1 kg of medium quality hay, and, for the lactating goats, a certain amount of concentrates (barley, sunflower seed cake) depending on the production level (from 600 to 800 g/day). This ration is distributed twice a day, in the morning during and after milking (1 to 2 hours before being let out to graze), and in the evening when the herd comes back to the farm.

In the summer the herd is not on the circuit.

Measuring techniques

Feeding behaviour measurements were taken on a sample of 12 goats (4 good producers of more than 900 l/year, 4 of 900 to 700 l/year, and 4 of less than 700/year), and 4 goats with ruminal fistulae.

The amounts ingested were measured by direct observation of the animals during the entire grazing period, and quantified by the "number of bites" method (Bourbouze, 1980).

The quality of nutrients ingested was obtained by fibre analysis (Goering and van Soest, 1970) and the total nitrogenous matter by microkjeldhal. Ruminal degradabilities, according to the method *in sacco* (Demarquilly and Chenost, 1969) were measured on the goats with fistulae.

The nutritive value of the maquis is measured in UFL, based on the estimation of goats needs according to INRA standards (Jarrige, 1988) and on a controlled supplying of hay and concentrate foodstuffs.

The evolution of the bushes' structure, according to the duration of the use of the maquis, was checked in an original way inspired by the destruction method. This then allowed a calculation of the biomass by morphological analysis, and thus, its evolution could be followed after a given grazing period. Bushes were felled and cut up into 50 cm pieces which were defoliated, in order to separate the ligneous stalks from the leaves and terminal buds, the last two items representing the eatable fraction of the plant.

The stalks and leaves were dried and separately weighed so as to evaluate the leaf-wt./total-wt. ratio (L/T). This ratio gave a picture of the morphological evolution of the heather plant.

Results and discussion

Goat activity and behaviour on the circuit

The herd stays grouped up all day long, and activity changes are synchronized, even in the areas where the contact between animals is reduced by the abundance of undergrowth.

The goat's feeding behaviour varies depending on the pastoral improvements made to the enclosures.

Whatever the season, the grazing time represents 69% of the herd's daily time out in the cleared and sown enclosures, whereas in the unsown, uncleared ones this time represents only 59% of the time out.

Fodder uptake is divided into meal times of 1 to 1.5 hours separated by displacement or rest periods of 20 to 30 minutes. The search for food goes on during the whole stay in the improved enclosures, whereas in the unsown ones the goats stop all feeding activity during the last two hours.

The difference of time spent by the goats in the more overgrown areas compared to the clearer sections hardly changes throughout the year, except towards the end of the gestation period. When starting to graze they go into the maquis, and then move towards the clearer areas, and stay there until coming out to the enclosure. The time spent in the maquis represents on average 30% of the herd's time outside.

As from the fourth month of gestation (December) the animals find it difficult to move in the thick maquis zones.

Qualitative and quantitative composition of the ingested ration in the maquis

The fibrous parts, mainly taken from arborescent heathers but also from cork oaks and cistus, consists of 37% of the dry matter ingested in the maquis, on a yearly average, with a minimum in spring (16% in March) and a maximum at the beginning of summer and in autumn (54% in June and 46% in November). Grasses and acorns, not always present in the maquis, complete the ration (Table 1).

Table 1. Chemical and botanical composition of the diet ingested on the circuit

	Nov.	Dec.	Jan.	Feb.	March	May	June
Chemical composition of the ingested (%)							
NDF	46	26	18	25	16	46	54
CP	11	19	5	5	9	9	7
CP/NDF	0.24	0.74	0.28	0.22	0.59	0.20	0.1
Daily intake (g of dry matter/day)							
Total	940	630	1150	630	1340	1090	600
Oak	122	19	95	107	0	185	24
Heather	300	0	0	107	0	425	558
Cistus	348	50	23	0	13	0	0
Grasses	170	498	12	6	429	404	12
Acorns	0	63	920	403	898	0	0
Others	0	0	0	7	0	76	6

The amount ingested follows the evolution of the nutritive value of resources and their availability. In winter, when there are no acorns and in summer after the hardening of spring growth, the amount taken in is less, and in spring and autumn, the presence of new growth and herbaceous resources favours ingestion.

A difference in ingestion is noted in correlation with the milk production level. The high yield goats ingest on average 42% more dry matter than the low yield ones.

Nutritive value of arborescent heather

Because of their capability to choose, goats eat the most digestible parts of plants. The ruminal degradability of heather fragments from 0 to 8 hours (Dr-8 h) after their consumption is high (29%), corresponding to the disappearing of the soluble part, rich in sugars. Then an important slow down in the disappearance of dry matter is observed, indicating that *Erica arborea* is poorly digestible (Dr-24 h = 36%, Dr-48 h = 39%). For the first two hours of grazing, the ruminal pH shows a fall of 0.6 points and the rumen juice NH₃ concentration increases by 25% (11.7 mg/l to 14.6 mg/l).

Shrubs taken from the maquis, arborescent heather in particular, consist of a scarcely digestible filler-up, nevertheless they also provide sugars which temporarily stimulate the microbial activity of the rumen, improving the ingestion and digestion of the grass or the hay eaten before going out on the circuit.

On average the circuit provides the goat herd with between 0.53 and 0.95 UFL/day. The lowest supply is in winter, a period in which the animals have problems in getting around the circuit because of their well advanced gestation and the impoverishment of fodder resources. The highest supply is in spring, when the vegetation growth in the maquis is abundant and the needs of lactating goats are at their greatest.

Throughout the whole year 39% of the goats' energy needs are provided by the maquis.

Impact of grazing on the vegetation

In the uncleared zones frequent grazing impoverishes the lower part of the bushes, resulting in an opening up of the terrain but also in a decrease of the nutritive supply (Table 2).

Table 2. Ratio leaves' weight/total weight according to the height and the number of grazing period of *Erica arbo*

	Height (cm)				
	0-50	50-100	100-150	150-200	200-250
4 grazing	0	0	0	9	33
2 grazing	0	2	10	28	41
1 grazing	0	3	19	59	-
0 grazing	6	30	42	47	-

The morphological analysis of heather plants shows that after several grazings, the edible parts of the plants (leaves and new growth) are found at heights inaccessible to the animals, and the lower parts have no forage value at all. The renewal of this forage resource is not guaranteed. This result seems encouraging from a fire control point of view (a break in the vertical continuation of the ground-tree top line), but the perenniality of the production system is not sure.

On the cleared and sown areas the goats eat the heather regrowth, which, kept in a low, brush-like state, gradually degenerates and disappears after 5 years grazing. The cork oak regrowth disappears by a preferential grazing after 6 years, the roots being totally sapped up. On the other hand the cistus bushes multiply by seeding and their development is favoured by a lack of competition. The goats do not consume these at all for the first 3 years and then afterwards they just graze the tips. To control this growth, an intense animal pressure and a rapid rotation is needed in all the enclosures, at the moment when their ingestibility is at its greatest (beginning of autumn).

The development of more suitable adapted herbaceous species in the pastures is not sensitive to animal action, but depends on climatic conditions. Forage production reaches 1.5 T of dry matter/ha on average, between November and June.

Conclusion

The quantitative contribution of the maquis to the goats' nutrition is important, the role of the quality of fodder grazed on the milk production has to be specified.

This forage resource, which principally comes from the consumption of an initial stock, made up of the lower parts of trees and bushes, rapidly runs out, and its renewal calls for the introduction of new species for forage, which would gradually substitute bush resources. It also means that a managing system which protects this initial stock has to be found.

The arrangement of the exploitation of the maquis in clear and sown areas means an intensive usage of dense undergrowth zones. The installation of fencing within these mixed enclosures should allow the protection of bushes in the spring so that the lower branches can be regenerated without harming the herd's nutrition, which at this time has herbaceous resources available. The biomass produced by the bushes provides a reserve to be used in the autumn. The balance between bushy and herbaceous resources is complicated: in the spring when the growth of grasses is rapid, the herd does not need to fall back on bush grazing. In the autumn the thick maquis zones provide an important part of their ration and improve the digestive use of residual dry grass, thus allowing a renewal of production in the sown areas.

References

- Bourbouze, A. (1980). Utilisation d'un parcours forestier pâturé par des caprins. *Fourrages*, 82: 121-144.

- Demarquilly, C. and Chenost, M. (1969). Etude de la digestion des fourrages dans le rumen par la méthode des sachets de nylon. *Ann. Zootech.*, 18: 419-436.
- Goering, H.K. and van Soest, P.J. (1970). *Forage fiber analysis*. U.S. Dep. Agric., Agric. Res. Serv. Handb., 379: 20.
- Jarrige, R. (ed.) (1988). *Alimentation des Bovins, Ovins et Caprins*. INRA, Paris.