

# Impact of Livestock Farming Systems on Fire Prevention in French Cork Oak Forest

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## Abstract

Four livestock farming systems whose grazing area were essentially located in the cork oak forests of Pyrénées Orientales (south of France) where analysed during 2 years. Their impact on fire prevention was estimated by the control of the shrub stratum by animals. Half of the grazed area is correctly maintained and the real impact on fire prevention will depend of the correct localisation of such farms in the regional area.

## Introduction

The cork oak forests in the French mediterranean region are in the highly degraded condition since cork harvesting was abandoned in the 1960's leading to rapid scrub encroachment and an increase in the number of fires. In the last ten years several elements have emerged which encourage the renovation of these forests :

- An increase in the demand for cork for corking quality wines.
- A growing sensitivity of the populations and authorities, to the problem of fire prevention in the mediterranean region, notably in touristic areas.
- The development of equipment for scrub clearing and financial subsidies for mediterranean forest upkeep (EU, state)

But once fire breaks have been created, their maintenance rapidly poses a problem. Numerous trials using livestock farming have been set up on these areas. The idea is to control scrub regrowth by animal grazing. We are thus confronted by several different land use logics within the same space :

- The aim of the livestock farmer is to feed his herd and to balance his farming system,
- The landowner or collectivity seeks to maintain and valorise the forest.

Our objective is analyse, on 4 sufficiently distinct experiments in the Pyrénées Orientales, how the livestock farmer has tried to reconcile these 2 aims of production and maintenance. The study here is essentially situated at the farm level and we will analyse the articulation between farm organisation level and the rural space level.

## Methodology

The method used is a global analysis of the economic, technical and social functioning of the farm. The livestock farmer can only plan at the level of the complete system-i.e the totality of the: herd, the space utilised, and its activities. (BARELLO et al 1987). On each farm, data on the grazing and feeding strategy has been carefully collected over a two-year period. The data are presented on a plan, which shows each plot used by the animals as well as the supplementation and the different stages in herd management. (GUERIN et al 1994). The state of the vegetation, which is a result of the effect of the farmer's grazing management, is assessed by a synthetic criterion in terms of shrub phytovolume (cover x height).

### Results : impact of pastoral management on the shrub stratum under cork oak forests

The study has focused on 4 farming systems where grazing on cork oak forest constitutes an essential element in the farm territory.

#### A dairy goat farmer

This is an intensive livestock farm with sixty high potential dairy goats, with on-farm cheese production and local selling, employing two full-time workers. Purchased supplementary feeds is indeed important to sustain milk production, but analysis of the feeding system shows that half of the herd feed requirements are provided by 45 ha of grazed cork oak forest, which 15 ha were cleared and sown and 5 ha simply cleared. The farmers plan how the areas are to be used in function of herd needs. Winter feeding is normally problem free because of winter forage production by Mediterranean species sown on cleared areas (subterranean clover, MASSON et al. 1991). The lactation peak (March - June) corresponds well to the period of maximum forage production (spontaneous or sown herbaceous, bushes, essentially *Erica arborea*, young sprouts of *Quercus suber* and *Quercus pubescens*).

The problem of forage resources is, of course, situated in summer; even if some of the paddocks are sufficiently wooded to allow a certain lengthening of herbaceous or shrub production during this season. An important part of shrub resources under cork oak consists of *Erica arborea* and it is well used by goats (GOBY 1993). Its consumption is more rapid than its renewal and the farmer is preoccupied by this reduction in resources. His strategy is to create new paddocks where the animals can consume the standing stock of accumulated shrub. The new paddocks also have a « buffer » effect during periods of drought or difficult seasons. The function of forest maintenance is clearly subordinate to obtaining a balanced feed ration for the herd. On 15 ha of cleared and sown paddocks the level of maintenance is very good with a shrub phytovolume of less than 2000 m<sup>3</sup>/ha, but there is, however, a problem with the control of *Cistus monspeliensis* in the most open areas. On the contrary maintenance is not so good on the 25 ha of uncleared areas where although browsing by the goats has considerably reduced the 0 to 2m stratum (*Erica arborea*), the total phytovolume remains relatively high at 7000 m<sup>3</sup>/ha to 15000 m<sup>3</sup>/ha.

### Example of 3 part time farmers

These are a goat farmer (producing mohair wool and meat), a cattle farmer, and a horse breeder. In these three cases the production is clearly less intensive and preoccupations with forest maintenance are given a greater importance by the farmers. On the three farms animal feed requirements are highest in Spring at the end of gestation and the beginning of lactation, which corresponds to a period rich in both herbaceous and woody forage resources, which makes supplementation unnecessary.

The winter season is more difficult when sown forage areas are limited. The farmer accelerates the grazing rotation of paddocks, using some of them simultaneously and the animals adopt selective feeding behaviour; supplementation is often necessary. Summer is obviously the season when grazing resources are low. The cattle farmer adjusts to the situation by transhuming his herd to mountain pastures. The goat farmer opens up his paddocks and allows the flock to graze in semi-liberty at higher altitudes in the forest. On the horse breeder's farm the number of animals present is reduced and the low stocking rate allows supplementation to be kept within reasonable limits. The result on forest maintenance varies according to the farm. On the goat farm, maintenance is very good on 11 ha and satisfying on the remaining 30 ha, (3000 to 3500 m<sup>3</sup> shrub phytovolume). In fact the land used by the farm consists of cleared cork oak forest with an important canopy cover and good soil fertility. An herbaceous stratum, obtained by oversowing or spontaneous, is present on 10 ha. On the cattle farm maintenance is very good on 13 ha of cleared and sown land. However, on the contrary uncleared areas have an important shrub phytovolume of 7500 m<sup>3</sup>/ha despite being opened up by the cattle (67 ha).

Table 1 : Level of shrub phytovolume/surface areas

Shrub phytovolume m <sup>3</sup> /ha	Dairy goat farmer	Wool goat farmer	Cattle farmer	Horse breeder	Total	
					ha	%
<2500	15	11	13	2	41	21
2500-5500	5	30	5	13	53	27
>5500	25		67	12	104	52
<b>TOTAL</b>	45	41	85	27	198	100

At the horse breeder's farm although 27 ha were cleared, upkeep is difficult due to a reduction in the number of animals present caused by economic problems in the market for leisure horses. A small 2 ha paddock close to the farm centre is perfectly maintained. Two other units representing 25 ha are more overgrown with a shrub phytovolume of 5000 m<sup>3</sup>/ha to 8000m<sup>3</sup>/ha. The farmer; who is the only one owning his farm in our sample, behaves more as a property owner residing in the forest than as a farmer obliged to earn a living. The work done on the farm (shrub clearing, perimeter fence, tracks) and the horse breeding allow permanent residence in the forest. This case, property owner rather than livestock farmer; is not to be ignored because within the Mediterranean region as a whole, especially in the littoral

areas, there are numerous residents seeking to ensure the upkeep of land on the periphery of built-up areas. Results for the totality of territory occupied by the farms. The table 1 recapitulates the shrub phytovolume levels on the surfaces of 4 farms after 4 years of grazing. It can be seen that a quarter of the total surface area is very well maintained, another quarter is moderately maintained and the remaining half inadequately maintained. So despite a notable thinning of the scrub as a result of animal grazing the real impact of these livestock systems in cork oak forests concerns approximately half of the area farmed.

## Discussion and Conclusion

The first conclusion we can obtain from these experiments is that they confirm that livestock farming systems are able to contribute to shrub stratum control in cork oak forests and therefore contribute to fire prevention. This granted, the problem is to specify the modes, the conditions and the efficiency of this protection. Analysis undertaken at the experimental plot level has shown that on cleared and sown surfaces in fenced paddocks, herds of goats or cattle could control scrub perfectly when tree cover was sufficient (about 30% or more). At lower tree densities the re-colonisation of the milieu by *Cistus monspeliensis* and *Ulex parviflorus* was very difficult to control.

The present analysis at farm level has shown that implementation of the herd management pattern over time has to be replaced within the totality of the farming system, in the land use plan (what proportion of the area could be reasonably developed to favour the impact of animals on forest maintenance), as well as in the herd feeding system where of course the farmer's strategy is to first ensure correct feeding in order to satisfy his production objective.

Study of the grazing calendar and the feeding system has shown that no herd could live exclusively in the cork oak forest and that it is necessary to plan adjustments at key periods (winter, summer) or during difficult years. These adjustments can be made in different ways:

- by supplementation:
- strong supplementation in the case of intensive dairy farming, which is made possible by the high valorization of the production.
- supplementation designed to facilitate woody species consumption, such as a molasses-urea mixture in the case of cattle farming.
- by the creation of buffer paddocks, where the animals can exercise a selective feeding behavior in the case of necessity.
- by summer transhumance to mountain pastures
- by adopting a globally low stocking rate that allows difficult periods to be passed without excessive problems.

These strategies do not have the same consequences on forest maintenance: strategies of supplementation favour the control of woody species by animals, the other strategies, by reducing the stocking rates on some surfaces limit the impact of animals on the control of the shrub stratum. The result of this set of considerations is that farmers can only maintain a part of the land that they use. The evaluation of the maintenance results on the totality of the territory of 4 farms on 200 ha, has shown that half of the land area was sufficiently maintained to participate efficiently in fire prevention and that the other half certainly benefited from a notable opening up by the animals but it was insufficient for ensuring fire

protection. What conclusions can be drawn at the level of a natural area, or major forest region? The analysis of 4 situations does not allow conclusions to be made but it seems possible as a function of our study to distinguish five zones whose articulation would have to ensure forest protection and management:

- zones of fire break, cleared but not grazed; these classic surfaces for fire protection have to be maintained mechanically,
- sown and cleared zones, grazed, in open areas; the upkeep of these areas by animals will be insufficient and complementary mechanical maintenance is necessary,
- cleared and sown zones, grazed, in cork oak forest with tree cover superior to 30%; animals alone can ensure the maintenance of these zones,
- uncleared zones, grazed; animal action opens up the shrub milieu, reduces the biomass of potential combustible and increases tree accessibility for forest management while forest regeneration capacity seems able to be conserved (Masson 1994),
- uncleared zones, not grazed; these are protected zones for classic forest management and production, or reserved for regeneration.

It is the articulation of these five types of surfaces in the regional space and their positioning in respect to fire prevention that results in a pattern of land use that appreciably reduces the level of fire risk in a sensitive environment.

The implementation of such a program encounters many difficulties, despite considerable efforts by the administration, the agricultural profession, and local collectivities:

- technical difficulties; complexity of the systems to be set up,
- economic difficulties; work costs, low income from farming, from forestry,
- social difficulties; difficult living conditions of farmers, conflicts with other users,
- judicial difficulties; access to land,
- «organisational» difficulties; problem of ensuring the coherence of the set of operations.

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