

Sustainable Management of Natural Resources in Depopulated Areas: a Biotechnical Viewpoint in the Dynamics of Sheep-Farming. A Case-Study in South Massif-Central (France)

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Abstract

Sustainable land use management is more than an ecological and social issue as long as farmers design and run technical systems. A case-study in South French Massif Central is presented along this viewpoint. In this area, land use by sheep farming is to be understood, at different organisation levels, as depending on schedules and types of sheep feeding and production; for this purpose, a specific software is designed at the farm level. Due to farmers diversifying their activity systems, other innovations emerge, affecting land use. Pluridisciplinary and participative research work is needed. Proposals are made for this purpose.

Background and questions

In one of the most depopulated areas of France, in the heart of the Grands Causses, a 340 sq.km. plateau offers a stepped landscape of high biological and cultural interest (Brun *et al.*, 1979 ; Jollivet, 1989). The main question is how to secure a welcoming countryside and open landscapes, in relation to the Parc National des Cévennes, created in 1970. Thirty years ago, a strong public land development intended to establish a human presence based on modern sheep farming and thereby to manage the natural resources (85% of rough grazing or even bad pine woods). However, only 55 sheep farms are nowadays scattered on the Causse Méjan plateau, with a still diminishing population (less than 1.5 inhab./sq.km). By places trees and bushes are overgrowing and sheep farming is facing difficult markets and doubtful public incentives.

Is it realistic to rely on the long-lasting trends of agro-pastoral economics and culture, through land-ownership and sheep farming practices ? As farmers' income and interesting landscapes both depend on well-fitted management of pastoral resources, our work mainly deals with the strategic issue of the underlying technical systems: through their practices, farmers put together and run a complex assembly of land, machinery, animals and diverse fluxes (Osty & Landais, 1991).

Main issue: the role of technical systems

Linking biological rules and human choices, changes in the technical systems give shape to the driving forces in the management of both ecological and socio-economic changes (Lardon *et al.*, 1995). Previous surveys suggested to take advantage of the diverse and diversifying ways of farming and we proceeded to a rapid exhaustive appraisal centred upon the farm and the flock. Since farming systems in such marginal hill land are poorly referenced, the study mobilised experts' assessments and farmers' collaboration in order to understand the current evolutions. A software was designed and implemented for investigating the spatial organisation of sheep farming. This point is also a contribution to the pluridisciplinary approach of the sustainable management of this kind of depopulated area.

Main results and discussion

Contrasts in the farm running

In relatively large farms, sheep production remains diverse and evolutive. The main figures are 480 ha and 350 ewes in 1991 (+16% and +63%, respectively, since 1974, the sold lambs increasing faster and milk 3 folds...). Rather intensive milk production (for high quality cheese) as well as lamb production include indoors wintering (until recent attempts with Scotch breeds).

Most farmers go on enlarging and improving their farms in various ways (building sheepfolds and barns, clearing and stone-broking to enlarge or improve their scarce fields, establishing pens...). While some farmers (frequently bachelors) are strictly specialized, a growing number is diversifying their farm business towards specific quality products and/or tourist accommodation (Figure 1).

Basic organisation levels

From the grazed pen to the future landscape, levels of organisation were identified:

- * the land plot, designed for and defined by the management of pastoral resource: it may be variable in time, due to guarding of grazing flocks, and is always heterogenous: any sheepfold includes several cadastre parcel and soil type.

- * the territory of the farm, which consists of all the land used, whatever the property and enterprise status are: many farmers - so calling what may be an numerous family collective - have the eventually conflictuous individual use of common lands, and have tacit contracts with landowners.

- * the locality, which may be an uninhabited estate or a tiny hamlet without a farmstead: a locality name is used not only for an isolated farm (generally gathering the farmer's home and farm buildings), but also for most estates included in the farm; in the long time, the estates remain consistent (buildings and surrounding lands) and underlie property movements (inheritance and second homes).

Main features and trends of the technical systems

* the production is strongly scheduled by the mating date. The sooner in Summer the ewes are mated, the higher the Winter diet is, the less pasture resources are required. According to the main production, milk or lambs, the lambing period used to occur at mid-Winter or at the end of it, respectively; typically, in case of hay shortage, lamb producers used to make adjustment along this line. Now, due to machinery and fertiliser use, forage harvests become significantly higher and allow lambing to come sooner in Winter. The same trend occurs for a strong part of lamb production, meaning a relative fall of the diet taken from pasture, what is related to bush overgrowing.

* nevertheless, the number of ewes, stimulated by EU incentives, is growing faster than the land area, and due to new market opportunities, most lambs are sold younger, mostly after fattening indoors. With better fed and sooner dried up ewes, a higher frequency of second lambing may occur in Autumn, the ewes being genetically apt to it.

* interactively, the pasture management is changing, owing to the changes in seasonal grazing pressure and through fence establishing. This heavy investment depends on land structure (morcelling, uncertain tenure, common property). So, according to localities, sheep everyday are led for a complex roundabout or are grazed in plots. Besides that, flocks may be divided into bands, according to specific constraints or aims; for instance, dried ewes go and trim rough or remote herbage, while pregnant or lactating ewes are grazed half time in legume regrowths... As the will of spare time is obvious among young farmers, the management of these heterogeneities becomes problematic.

The stake of the spatial organisation

The management of the technical system was represented as combining production schedules, animal bands and land plots, from an inquiry about the previous year (GuÈrin *et al.*, 1994). The first step, using a G.I.S., consists of recording, coding and digitising the plots and their main assignment. The second step is the recording of the events concerning the flock and particularly the grazing sequences. With the farmer, the issue is to piece together land allotments and animal bands, that is to obtain a logic account of preferential places and times of specified land uses.

A software has been designed and built for the calculations and graphic representation (Culos *et al.*, 1995). The tool is now being used on several years and contrasting farms, to assess the assumption that the feeding strategy, once identified, provides useful guidance to the spatial characteristics prevailing in land uses practices and therefore in current resource dynamics.

Elements for discussion and future prospects

Qualitative-comparative studies: weak stone-corner, promising first step?

When the hill sheep-farming became commodity-oriented, along the XXth century, it was more and more economically marginal, even if each individual farm was growing large and well equipped. It is only the change in the socio-economic context that appears to offer new

chances to such areas with praised landscapes and biological richness. To that new environment, farmers have to respond through their farming systems (Osty, 1994). Knowing by experience that several points of view are to be constructed (Osty & Landais, 1991), we here put forwards the management unit, what enlightes ill-known but strategic practices concerning land use evolutions. Such are the different ways of scheduling the mating, as a key to the different ways of creating and managing production fluxes.

Before any measure, the first step is to assess its significance, the more so since extensive sheep farming is poorly documented. Qualitative evidence gives an important leading role to the nature and display of equipments (shelters, lanes...) for the management strategy and subsequent practices. We are in touch with teams working on the formalisation of knowledge acquisition (Hubert et al., 1995) and our software is on the bench.

Farming activities: are they long during and promising for sustainability management ?

Opposite to the standard census of agriculture, our study takes into account the "life history" of every farm in order to assess the bio-technical systems that make farming effective, as an obvious condition for a sustainable human presence. Historical backgrounds are useful, as anthropologists have shown (Lemonnier, 1993). But the actors' initiatives are an evidence (Long & Van der Ploeg, 1989), as well to create employment as to manage and share capital resources (Röling, 1994). Through the unexpected diversification of the studied farming systems, we have got acquainted of the stakes of living in isolated localities, on one hand, and of those of boxes and junipers at the plot level, on the other hand...

Walking, gathering or sight-seeing, while creating some trouble in the functioning of farms, mean emerging multipurpose land uses and subsequently original activity systems. While the history testifies for the key role of diversified occupations, maybe farmers are contributing to devise a new rural modernity...

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