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"Alpine Pasture-Farms System": A concept to analyse the management of alpine pastures

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Abstract. Adapting to climate change on alpine pastures requires finding flexibility at different levels. The articulation between the alpine pasture and the farms is where potential solutions might be activated. Yet research focusing on alpine pasture management usually considers the farm as a black box. The use of an alpine pasture –which is sometimes collective– nevertheless lends a number of specific characteristics to livestock farming systems. The distance between the alpine pasture and the farmsteads, the mixing up of herds/flocks, the necessary collective organisation, as well as the challenges stemming from the multiple use of these collective spaces, must be taken into account in an analysis of these systems. We propose the concept of the Alpine Pasture-Farms System to analyse the consequences of these specific characteristics in analyses at farm level and to gain a better understanding of interactions between the alpine pasture and farms.

Keywords. Agropastoral system – Alpine pasture – Adaptation to climate change – Flexibility.

Le système Alpage-Exploitations : un concept intégrateur pour analyser la gestion des alpages

Résumé. *L'adaptation au changement climatique sur les alpages impose de trouver de la flexibilité à différents niveaux. Des leviers peuvent être activés à l'articulation entre l'alpage et les exploitations agricoles. Pourtant les travaux portant sur la gestion de l'alpage considèrent généralement l'exploitation agricole comme une boite noire. L'utilisation d'un alpage – qui se fait parfois de manière collective – confère cependant un certain nombre de particularités aux systèmes d'élevage. L'éloignement de l'alpage des sièges d'exploitation, le mélange des troupeaux, une nécessaire organisation collective, ainsi que les enjeux du multiusage de ces espaces collectifs doivent être pris en compte dans l'analyse de ces systèmes. Nous proposons le concept de système Alpage-Exploitations afin d'analyser les conséquences de ces spécificités dans les analyses à l'échelle de l'exploitation agricole, et avoir une meilleure compréhension des interactions entre alpage et exploitations.*

Mots-clés. *Système agropastoral – Alpage – Adaptation au changement climatique – Flexibilité*.

I – Introduction

For many mountain and Mediterranean livestock farming systems, alpine pastures represent the main forage resource during summer. The pastoral resources sought out by livestock farming systems on the alpine pastures are in fact especially vulnerable to climate change and to the associated increase of extreme weather events, especially droughts. Management requires to be adapted, in order to prevent long-term deterioration that would jeopardise both the resource and biodiversity on alpine pastures.

With the challenges of biodiversity, alpine pastures are the focus of a number of concerns. However, climate change does not impact alpine pastures alone. The increasing occurrence of droughts has taken its toll on all spaces used by farms whose flocks and herds have been moved around the Alps since the start of the 2000s (Nettier *et al.*, 2010). Livestock farmers have had to react and change their farm practices. Such changes may have repercussions on the alpine pastures. Conversely, the adaptations implemented to preserve alpine pastures may have an impact

on the farms (Nettier *et al.,* 2010). The current context questions the usual production models and calls for much more flexibility in livestock farming systems (Dedieu *et al.,* 2008).

In order to seek out opportunities for flexibility faced with climate change, a systemic approach seems necessary. The relevant system for analysis is the system made up of the alpine pasture and the farms using it. This is because climate change impacts all of the components making up this system and changes to part of the system are likely to have an impact on the whole. The second reason is that opportunities for improving the flexibility of the system can be found at the articulation between the alpine pasture and the farms (Nettier *et al.,* 2011). We therefore propose to focus on the organisation of the entire "Alpine Pasture-Farms System" (APFS).

II – Differences between the alpine pasture-farms system and the livestock farming system

Research on the management of alpine pasture address the alpine pasture as a system (Deffontaines, 1998) and the farm(s) remain(s) a black box sending up a certain number of animals to the pasture for a certain period time. Conversely, research on livestock farming systems (Darnhofer *et al*., 2012), which studies the trio "Man-Herd-Resource" at the scale of the farm (Landais et Balent, 1993), does not consider the systems using alpine pastures as specific systems. Yet they are systems with specific characteristics, stemming at once from the very specific soil and climate context of alpine pastures, their land status as common areas, and the often collective organisation of summer grazing. Given these specific traits, we need to take a more nuanced approach to the "Man-Herd-Resource" model.

1. "Men": a specific work organisation

In the case of an APFS, the spatial and temporal disconnection between the alpine pasture and the farmstead leads to specific forms of work organisation. Furthermore, one or several herders may be employed. The herder(s) may only work on the alpine pasture, and is/are entrusted with the management of grazing and the state of health of the animals. Such specialisation for a worker in terms of time, space and tasks performed is rare in livestock farming systems.

The APFS is often made up of several farms and therefore several work collectives who from time to time are brought together up on the alpine pastures to perform various tasks (maintenance duties, animal drafting, etc.). Thus, the alpine pasture relieves the farm(s) of animal-related work, which can be essential in summer. However, the alpine pasture also sets a work scheduling, with an impact on the whole work organisation of the different farms.

2. Herds (or flocks): combining different types of livestock management

Using an alpine pasture has an impact on livestock management: issues such as mating time and batching are thought through in relation to the alpine pasture (whether the animals can be fattened, whether they can give birth, the quality of the feeding resources, work organisation and issues such as predation). In the case of collective APFS, the animals of several farms are mixed up together on the pasture. This has consequences in terms of health management: specific attention must be given to the health of the animals before they are taken up to the pasture to prevent them contaminating other herds or flocks, different specifications must be complied with (organic farming, quality labels, etc.) during health treatment.

3. Resources: capitalising on their diversity

The diversity of resources is an essential component in the management of agropastoral systems. In the case of an APFS, this diversity is highly pronounced owing to the considerable alti-

tudinal layering and geographic distance that may exist between the different areas. The combination of resources from several farms increases this diversity, especially given that the farms are located in different geographic contexts, use different types of vegetation, are subject to different climates and weather events, and have different productions. Diversity also stems from resource management modes: on the alpine pasture, unlike in most other areas of an APFS, grazing is often the only management "tool".

4. Management: combining common and individual areas

In most situations, the APFS combines the use of resources used individually on the farms, and common pastoral resources available on the alpine pasture. The latter resources are common owing to their pastoral use, which is sometimes collective, but also because of their land status (most often public areas). In consequence the plants grazed should not only be seen as pastoral resources for livestock farming, but also as biodiversity, landscape and cultural heritage and therefore belong to society as a whole. APFS management must therefore include these other issues, providing sustainable management of both individual and collective resources. In particular, the APFS management must pay attention to the preservation of the commons. The pastoral use of alpine pastures is thus subject to specific rules outlined in grazing agreements and agri-environmental contracts, which differ from the usage rules for individual areas. When an alpine pasture is collective, it is generally coordinated by a collective body representing the different farms. This coordination is essential in order to ensure the right kind of articulation between work, management of herds/flocks and resources, and between the different farms and the alpine pasture.

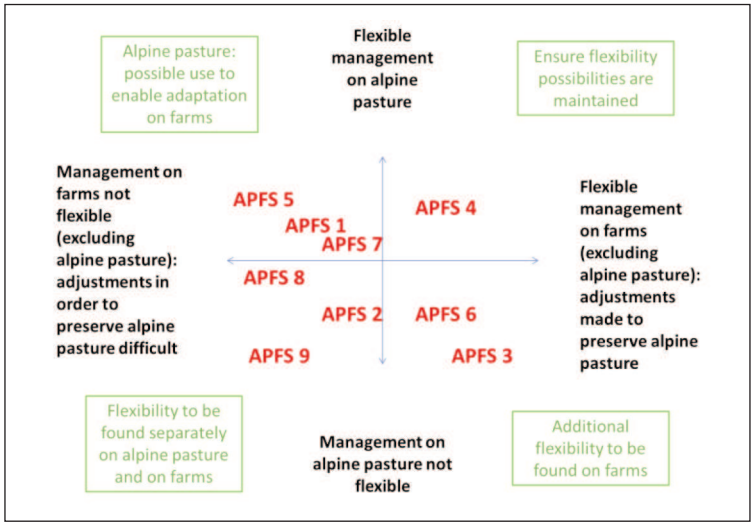

Fig. 1. APFS flexibility analysis framework and relative position of 9 APFS "Sentinelles" in the Ecrins National Park. The boxes list ideas for improving flexibility.

III – For a range of flexibility in Alpine Pasture-Farms systems

To preserve the vegetation on alpine pastures in the face of climate change, without undermining the agropastoral systems, one major avenue that might be explored is how to make APFS operation more flexible.

Potential flexibility may be applied to the alpine pasture, but also to the farmsteads and to the articulation between the alpine pasture and the farm(s) (Nettier *et al.,* 2011). These three sources of flexibility provide an analysis framework that was tested on 9 APFS in the Ecrins National Park in France, as part of the Alpages Sentinelles programme (a network of actors from the Alpine massif working to anticipate the impact of climate change and assess adaptation modes set up to face unexpected climate events).The observation of adjustment practices to counter different events over the past 5 years on these 9 APFS makes it possible to analyse their flexibility, and to position them on a graph (see Fig. 1) according to the level of flexibility implemented on the alpine pasture (vertical axis) and on the farms (horizontal axis), with or without adjustments at the articulation between the alpine pasture and the farm in order to preserve the alpine vegetation (see Table 1 for two examples).

This study of APFS may be of interest to all agropastoral systems using a diversity of resources, articulating individual and collective management and using both common and individual areas.

Table 1. Description and flexibility of 2 alpine pastures-farms systems

	APFS 9	APFS 6
Description of the APFS	5 sheep farms in a mountain village, that use a local alpine pasture. Spring and autumn lambing. Feeding-finishing of spring born lambs on alpine pasture. Salaried shepherd on alpine pasture	3 pastoral sheep farms in South-East of France, that transhume to a distant alpine pasture. Spring lambing only. Lambs go up on alpine pasture. Farmers take turns on alpine pasture.
Flexibility on farms	Long winters, important slopes: No room for manoeuvre: mechanised areas reserved for making hay, sloppy rangelands for spring grazing.	Important adjustments (in response to Mediterranean climatic variability): flocks management, pastoral areas used, grazing schedule.
Flexibility on alpine pasture	Size of the different range allotment reduced, buffer areas limited and best range allotment reserved for lambs: grazing schedule very rigid.	Despite abundant pastoral resource, many constraints limit and rigidify management: lower range allotment short, with late vegetation, higher one big but short grazing period, middle one exposed to predation (no hut).
Adjustments observed at interaction between alpine pastures and farms	Difficult to decrease the animal number or the time spent on alpine pasture. Few evolutions of the management on farms and on alpine pasture. → No flexibility on alpine pasture, or on farms, autonomous management of the different entities.	Important evolutions observed: (1) going up to alpine pasture delayed since 2005, (2) reorganization on farms, with new pastoral areas grazed (ski slopes, firebreaks…). → Lack of flexibility on alpine pasture. Structural adjustment made to preserve it on long-term. Annual adjustments made only on the farms.

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