



# Institutional impacts on the resilience of mountain grasslands: an analysis based on three European case studies



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## ABSTRACT

Over the centuries, specific farming practices shaped permanent grasslands in mountains. With socio-economic change, farming practices have changed and with them the landscape. Over time, food production has been increasingly decoupled from the preservation of permanent grassland, endangering the delivery of crucial ecosystem services. This contribution looks into the role of institutions – including normative, regulative and cultural-cognitive elements – in preserving current bundles of ecosystem services provided by mountain grasslands. In particular, we investigate how such institutions affect farmers' management choices. Based on a review of scientific literature and empirical data from three case studies, we compare institutions in Austria, France and Norway. The cases represent different modes of multi-level governance (EU and non-EU), different grassland management practices, linked to different farming systems (dairy, breeding, rearing of heifers, suckler cow and sheep production) and different socio-economic conditions. The results underpin that ecological insights into the impact of farming practices on the ecology of grassland need to be combined with an understanding of the complex institutional interactions that affect farming practices, to ensure the resilience of mountain grasslands. If the design of regulatory measures considers both changing dynamics, it may enable farms to adapt and transform while maintaining traditional grassland management practices

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## 1. Introduction/background

Mountain ecosystems provide a vast array of goods and services to society, both to people living in mountainous areas and to people living in urban centers (e.g., MA, 2005; TEEB, 2010; Grêt-Regamey et al., 2011). Yet, these mountain ecosystems are sensitive to current pressures (e.g., Körner, 2000; Schröter et al., 2005; Engler et al., 2011) which manifest themselves in changes of land use practices, infrastructure development, unsustainable tourism and fragmentation of habitats (EEA, 2002; Grêt-Regamey et al., 2011). These pressures in turn are local expressions of global socio-economic and climatic changes.

European marginal grasslands are biodiversity hot-spots owing to biophysical constraints, natural heterogeneity, and centuries

of agriculture. Currently it is not clear to what extent these unique systems are affected by ongoing environmental and societal changes, or if they have developed a high resilience over their history of co-evolution. The critical thresholds—beyond which radical changes in the ecosystem are likely—are unknown, and their prediction fraught with uncertainty. This uncertainty lies largely in the poor knowledge of resilience mechanisms of both the ecological and social sub-systems, as well as those underpinning robustness or vulnerability of the entire system, which is coupled through land use decisions and ecosystem services.

Resolving this uncertainty is essential to guide policy development, especially in the areas of biodiversity conservation, agri-environmental and rural development. These different policies may have conflicting objectives, affect farmers' grassland management choices and thus threaten the delivery of the ecosystem services, which society demands from permanent grassland in mountain regions.

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Generally, four types of ecosystem services can be distinguished: *provisioning services*, including all products we obtain from an ecosystem; *regulating services*, which include benefits from the regulation of ecosystem processes; *cultural services*, focusing on the immaterial aspects, and *supporting services*, which are needed to provide all other ecosystem services (MA, 2005). Policies influence the delivery of these services, not least because they have induced a decoupling of provisioning services (i.e., food production) from regulating and cultural services linked to mountain grasslands. Within the Common Agricultural Policy of the European Union (CAP) this decoupling is mirrored in the division between measures supporting competitiveness of food production, measures safeguarding rural development and measures supporting traditional practices, which provide aesthetic grassland landscapes, clean water and carbon sequestration.

However, besides policy interventions there are a number of economic, societal or technological incentives and constraints influencing the social-ecological resilience of farms and the management of grasslands (Young et al., 2008). This paper aims to assess how diverse formal and informal institutions impact the management of marginal grasslands, thereby affecting the delivery of specific highly interrelated and interdependent ecosystem services.

Building on case studies from Austria, France and Norway we analyze the impact of different frameworks for traditional management practices on marginal grasslands. We highlight the importance of integrating different scales (grassland, farm, landscape) to understand the dynamics of diverse drivers influencing management choices. The management of marginal grassland is crucially connected to the management of more productive parts of a farm, which is embedded within economic and technological changes that are in turn linked to wider rural development (e.g., the possibilities to generate off-farm income).

In the following section we first present our analytical framework, building on the concepts of resilience, institutions and a polycentric governance system. We then provide a short account of our approach to data collection and a description of the empirical case study regions in Austria, France and Norway. Building on these cases, we analyze the interplay of cultural-cognitive, normative and regulative institutions with farmers' practices in the section that follows. In the last section we look into the effects of these institutions on traditional management methods and thus on the resilience of permanent mountain grasslands.

## 2. Analytical framework

To conceptualize interactions between the social and ecological domains, we use the concept of social-ecological resilience. Walker et al. (2004, p1) define resilience as “*the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks*”. While initially developed by ecologists, it is now widely used to study how interactions between ecological and social subsystems induce and drive changes (Adger, 2000; Folke, 2006; Davidson, 2010; Rickards and Howden, 2012). The concept of resilience builds on an understanding of eco-systems as dynamic and evolving under the influence of external social forces. Moreover, a system is understood as embedded in hierarchies, with slow and fast changes at larger and smaller scales (Holling, 2001). This helps structuring the assessment of drivers of change at different spatial scales acting at faster or slower rates.

Applying resilience thinking to agriculture, Darnhofer (2014) distinguishes three capabilities that characterize resilient farms: the ability to buffer shocks, the ability to adapt through implementing marginal changes, and the ability to transform through implementing radical change. Indeed, while in literature on ecosys-

tems the focus is often on maintaining an ecosystem within thresholds, arguably in social systems adaptability and transformability play a more important role. Thus while farms need to be able to buffer or absorb shocks in the short term (e.g., after an extreme weather event or a sudden spike in prices), over the medium and long-term, they also need to be able to adapt or even transform.

In this study, the unit of our analysis is not the entire farm, but mountain grasslands. This includes meadows and pastures close to the homestead at the valley bottoms, as well as extensively grazed pastures, which are usually at higher altitudes, often on steep slopes.

The ecosystems of marginal grasslands have specific species compositions and provide specific ecosystem services. We use resilience to conceptualize these ecosystems as dynamic and as being influenced by diverse social processes at different scales, e.g., at farm, regional, national and international level. To avoid shifts in species composition, for instance through scrub encroachment, their continued use is crucial. In other words, they depend on the integration of marginal grasslands into farming systems as sources of fodder, which in turn depends on the viability of farming in the region.

Thus, we specifically examine farming practices that contribute to maintaining such permanent grasslands in mountain areas. From an ecological point of view, their biodiversity is linked to traditional extensive farming practices. These are threatened by both abandonment (collapse of the social system represented by active farming) and by intensification (maintenance of the social system of the farm, but collapse of the traditional farming practices). Grassland resilience thus results from the interactions between the social and ecological sub-systems: unless the social sub-system (and the grassland management practices linked to it) is maintained, the persistence of the ecological sub-system will be threatened.

A web of institutions (Fig. 1) influences the maintenance of specific grassland management practices. Institutions denote rules governing the behavior of actors (North, 1990; Scott, 2008), not physical structures or organizations. North (1990) views institutions as the ‘rules of the game’ while organizations are the actors on the field. Institutions can be formal, as in the case of legal restrictions; or informal, as in the case of shared societal norms and non-codified rules of good practice. Scott (2008, p: 48) defines institutions as “*comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life*.” This definition distinguishes three elements of institutions, each of which involves different capacities. Firstly, there are *regulatory* elements. These involve the capacity to establish regulations and laws. They are coercive and disobedience is sanctioned. People comply out of fear of punishment by legal sanctions. In connection to farmers' practices, they are not restricted to regulations but include the prescriptions to be eligible for transfer payments and subsidies. Secondly, there are *normative* elements. They involve the creation of binding expectations to follow social obligations. Non-compliance does not result in punishment but rather in shame, as norms are morally governed. Thirdly, there are *cultural-cognitive* elements. These involve the creation of shared understandings that are taken for granted. They result in common beliefs and shared logics of actions. Acting in opposition to cultural cognitive elements of institutions creates confusion, while compliance is culturally rewarded.

This institutional environment acts at different levels, forming a multilevel governance system. Pahl-Wostl (2009) uses the notion of a polycentric governance system, which she defines as “*complex, modular systems where differently sized governance units with different purpose, organization, spatial location interact to form together a largely self-organized governance regime*” (Pahl-Wostl, 2009; p: 257). For example cultural-cognitive institutions that give meaning to grassland farming at local level may inform normative institu-

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