



The “mountain effect” in the abandonment of grasslands: Insights from the French Southern Alps



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ABSTRACT

Land use change studies increasingly integrate geographic factors to explain uneven patterns of land abandonment. For mountain areas, biophysical factors, such as altitude, and economic factors, such as distance from core areas of economic and urban development, have been associated with agricultural land abandonment. These interpretations have led to agricultural and land use policies based on compensatory measures to maintain economic activity in mountain regions without much consideration of the intra-regional differences in agricultural land abandonment patterns. This paper argues that such differences are significant and should be taken into account in land use and rural policy design. Based on GIS estimations of land cover change for the 1990–2006 period and regression analysis of socio-economic attributes for 417 mountain municipalities in Provence-Alps-Côte d’Azur in Southern France, our research shows that high altitude grasslands are less likely to be abandoned than those located in lower altitude areas. This result is counter-intuitive given the understanding that remoteness and biophysical constraints are often associated with low land rents, therefore with higher levels of abandonment. Our findings also suggest that grassland abandonment is caused by a combination of both local and regional/global factors. European Union policies for maintaining agricultural activity in marginal areas were not fully effective in reducing grasslands abandonment.

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1. Introduction

The European semi-natural grasslands are biodiversity hot spots owing to ecological constraints, biophysical heterogeneity, and centuries of agriculture (Blondel, 2006; European Commission, 2011; Lamarque et al., 2011). In the Alps, these grasslands have structured economic activity and livelihoods, embedding people in the mountain environment (Garde et al., 2014; Scotton et al., 2014). Under adequate management, alpine grasslands have provided ecosystem functions for biodiversity conservation (Princé and Jiguet, 2013; van Oudenhoven et al., 2011). Since the modernization of agriculture in Europe, farms that extensively use the Alpine semi-natural grasslands have become increasingly marginalised given that they suffered from stringent constraints to intensification.

Traditional farmers who could not become highly mechanised were sometimes forced to abandon their land (European Commission, 2011). As stated in an EU commissioned report on European mountains: “In the context of globalisation, mountain areas face three contradicting challenges: to turn into ‘open museums’ or areas for recreation and protected nature for industrialised societies; to be regarded as regions to be economically exploited, or even over-exploited; and abandonment” (NORDREGIO, 2004, p. xi). These concerns have prompted policy responses to address land abandonment, for example through the EU measures regarding mountain agriculture, aimed at compensating for the geographical disadvantages of mountain farmers to maintain livelihoods in the mountainous rural areas (Renwick et al., 2013).

Much of the literature on agricultural land abandonment in marginal regions is inspired by Ricardo’s and von Thünen’s land rent theories, which assume that each piece of land is devoted to the use that yields the highest rent considering land quality and distance to the market (Jäger, 2009). Marginal land becomes wilderness because expected returns from agriculture are too low. Individual land use decisions aim at maximizing the expected utility from the more profitable land use, which is influenced by bio-physical,

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socio-economic, institutional and policy variables (Veldkamp and Lambin, 2001). Concentration of intensive agriculture in the most fertile and accessible plains is the expected response to biophysical constraints, coupled with policies that often reinforce an abandonment of marginal lands (e.g., in the EU, Brouwer et al., 1997; Keenleyside and Tucker, 2010; Terres et al., 2013; NORDREGIO, 2004). Consequently, remote areas tend to experience a higher level of abandonment than areas near production centres and urban markets because of natural constraints (i.e., adverse biophysical conditions) and the farmers' strategies to cope with marginal conditions. Such strategies include: change from one agricultural land use to another, changes within farming systems, abandonment of less accessible parcels, and abandonment of productive farming while seeking other sources of income (Brouwer et al., 1997; Keenleyside and Tucker, 2010).

Yet, recent empirical observations highlight a counter-intuitive phenomenon of permanence of economic activity in some very disadvantaged mountain areas of Europe. These could result from a resistance to land abandonment by farmers in disadvantaged regions. For example, in France, Garde et al. (2014) report the continuity of sheep herding in the Southern Alps, as opposed to the declining trend observed in other mountain regions of the country. In Norway's remote uplands, despite being "overwhelmingly peripheral and marginal in an international context," dairy production has remained the most important type of agricultural production (Bjørkhaug and Rønningen, 2013, p. 53). In Galicia, the hilly peripheral region of Spain with predominance of small-scale family farms, Corbelle-Rico and Crecente-Maseda (2014) report that land abandonment was lower in less populated municipalities. While these studies do not claim theoretical significance, they lend support to observations that human enterprises can overcome strict environmental constraints and adapt their land use to restrictive environmental conditions, as suggested by the geographic theories of *possibilism*, pioneered by the French Paul Vidal, and of the *morphology of landscape*, by the American Carl Sauer. Both postulate that human groups adapt to the limits and possibilities that nature sets for human settlement according to their particular livelihood strategies. They depart from strict environmental determinism to allow for understanding of localised human–environment interactions leading to specific land uses (Martin, 2005).

The objective of this study is to better understand geographic patterns of land use and land abandonment in mountain environments. Through a quantitative analysis of the abandonment of grasslands from 1990 to 2006 in the French Southern Alps, it provides new insights on the causes of grassland abandonment and highlights the spatial heterogeneity in this process. Our study challenges generalizing thinking about marginal territories, such as "the mountains", which have underlined land use policies at the national and EU levels. Given the observed spatial heterogeneity of land use change in mountain areas (Hilal et al., 2011; Zimmermann et al., 2010), we test the hypothesis that there is not a single pattern of land abandonment in Alpine rural territories and that the expected positive relationship between location in high mountain zones and higher levels of agricultural land abandonment is not universally valid.

1.1. Background on causes of land abandonment in mountain areas

Land abandonment is defined as the process whereby human control over land, for example agriculture or forestry, is given up and the land is left to nature (FAO, 2006). Drivers of agricultural land abandonment and policies to prevent or reduce it are multiple and operate at diverse scales. Global market forces and nature conservation regulation have been identified among the most influential global-scale factors on land use (Beilin et al., 2014;

Meyfroidt et al., 2013). Regional, national and local land use policies play a mediating role by exerting a friction effect that resists change by preventing, slowing down or changing the direction of land use change (Beilin et al., 2014). With economic modernization and global economic integration, territories have been reshaped through a spatial rearrangement of land use, to better match actual land use to land potential. For example, marginal rural areas have been integrated into touristic circuits through seasonal tourism in the Mediterranean region (Querini and Bizzarri, 2009) and second home developments in Norway (Overvåg, 2010).

Scholars who emphasize the local and micro scales rather argue that land abandonment, particularly in mountain areas, do result more from local changes in agricultural management than from exogenous factors such as global trade, technology, demography and national policies (Busch, 2006). For example, in the Pyrenees, a loss of grasslands was associated with changes in agricultural systems and rural emigration, and lignification of vegetation was associated with a decrease in livestock numbers, a loss in herd diversity, and changes in herd management and pastoral practices (Roura-Pascual et al., 2005). In the Western Polish Carpathians, similar changes were associated with a decline in farmers' income (Bucala, 2014).

The dichotomy between global and local approaches to land use change have influenced the interpretation of long-term trends of land abandonment. A spatially aggregated view has often led to a representation of homogenous spaces such as "the economically disadvantaged areas," "the periphery" and "the mountains." These simplified spatial representations have hidden differences from within and have become an important part of the discourses that structure everyday views of these spaces and the policy decisions affecting them. In the European Union context, policy intervention in mountain areas has been justified by their condition of being economically disadvantaged by the difficult topography and climate conditions (NORDREGIO, 2004). Policy interventions were meant to become a major factor of change of European mountain ecosystems, to transform rural space. Policy measures conceived to tackle land abandonment are mainly related to the EU common agricultural policy (CAP) and the measures regarding less favoured areas (LFA/ICHN) such as the Council Directive on mountain and hill farming (75/268/EEC) and a directive to ensure the continuation of farming and compliance with environmental requirements (EC 1257/99) (IEEP, 2006). In mountain areas, these measures were aimed at conserving agricultural practices, regulating the conversion of rural land into urban areas, and improving the local governments' finances (ANEM, 2005). Given that the level of compensatory allowances was set with no reference to farm income but to area payments, these interventions were not directed to maintaining agricultural activity per se, but rather to preserving a specific type of land use.

The results of EU policies targeting conservation of the rural space are controversial. Overall the effects of maintaining agriculture were deemed to be favourable (IEEP, 2006). Yet, case studies suggest that EU agricultural subsidies may in some cases have promoted land use practices that led to land degradation (Lorent et al., 2008). Studies on the French Alpine region suggest that adaptation by pastoralist farmers has caused a policy-induced change in economic activity from meat producers to "producers of landscapes" (Garde et al., 2014, p. 2) and guardians of biodiversity (Legéard, 2004; Lorent et al., 2008; Olsson et al., 2000). An acceleration of rural exodus induced an almost complete abandonment of remaining crop production and a substitution of milk production by ovine meat production in the French Southern Alps (Garde et al., 2014). Some environmental policies appeared to have had negative implications in terms of abandonment of semi-natural grasslands. As Vincent (2011) noted, one of

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