



Farmland abandonment in Europe: Identification of drivers and indicators, and development of a composite indicator of risk



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ABSTRACT

Accounting for more than half of the European Union's (EU) territory, agriculture ensures food production, manages important natural resources and supports socio-economic development of rural areas. Moreover, it is estimated that 50% of all plant and animal species (including some of that are listed in the EU Habitat Directive) depend on agricultural practices. The continuation of appropriate agricultural land management is essential to ensure these primary functions. Avoidance of farmland abandonment is therefore an important rationale for the EU's Common Agricultural Policy which requires improved knowledge of this phenomenon at the European level. This study assesses the risk of farmland abandonment in the 27 EU Member States. It summarizes the work performed by an expert panel of European scientists and national representatives which aimed to identify the main drivers of farmland abandonment in Europe, to define indicators for assessing its risk of occurrence and to test the value of European-wide data sources to achieve these aims. Drivers were identified under two rationales: low farm stability and viability, and negative regional context. Indicators were defined using recent socio-economic farm data and geospatial datasets. Some indicators were then combined to make a composite risk indicator. Regions with higher risk of farmland abandonment are located in Portugal, Spain, Italy, Greece, Latvia, Estonia, Finland, Sweden and Ireland. This paper demonstrates the challenges of performing a European-wide assessment of a phenomenon influenced by drivers whose effects vary at local levels. Other problems encountered are data heterogeneity in terms of spatial resolution and quality, as well as access to micro-data (local level data). High spatial resolution European datasets measuring farmland abandonment are needed to validate the defined indicators as well as to benchmark the methodology. Furthermore, such data could be used to establish a weighting system for the drivers.

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1. Background

Accounting for almost half of the European Union's (EU) territory, agriculture plays an important role in the conservation of the EU's environmental resource (EC, 2006). It interacts with a wide range of valuable habitats, and the maintenance of a number of ecosystems that have emerged from agricultural cultivation

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depends on the continuation of appropriate land management practices (Benayas et al., 2007). Even though a cessation of land management can have a positive influence on biodiversity (rewilding), the abandonment of agricultural land may also threaten farmland biodiversity (Sirami et al., 2008; Plieninger et al., 2014; Zakkak et al., 2014), in particular functional diversity (Peco et al., 2012) associated with anthropogenic landscapes of high nature values. The concept of high nature value farming (HNV) recognizes that low-intensity farming systems are crucial for the conservation of biodiversity in some settings (Oppermann et al., 2012).

Besides its influence on biodiversity, land abandonment has a range of consequences for ecosystem functions and the provision of ecosystem services (Benayas et al., 2007). This influence is often context-specific, e.g., wildfire frequency and intensity, nutrient cycling, carbon sequestration, cultural landscape values, and water balance.

Moreover, food security being one of the major challenges for the future, the EU has a justified strategic interest in keeping its agricultural production potential, in view of short and long term needs such as foods, feed, fiber and biomass production (Kastner et al., 2012). Furthermore, agricultural activity underpins important aspects of the rural economy in many parts of the EU (Terluin et al., 2010).

During the past decades, European farming has changed (EC, 2006): specialization, intensification and technological developments have made farming more competitive but have also increased negative impacts on the environment. At the same time, the abandonment of farming is of concern because of negative social, economic and environmental effects (EC, 2006; Moravec and Zemeckis, 2007). Environmental and social problems related to abandonment include: (1) the reduction of landscape heterogeneity and promotion of vegetation homogenization (often associated with increased fire risk); (2) soil erosion and desertification; (3) the reduction of water stocks; (4) biodiversity loss and reduced population of adapted species; and (5) the loss of cultural and aesthetic value (Benayas et al., 2007).

Land abandonment can occur everywhere, even in areas with good yield potential, during satisfying general economic situations (Strijker, 2005) or outside marginal areas (Hatna and Bakker, 2011). In western Europe, the problem of land abandonment tends to be minor, whilst in southern and central Europe it is more important (Moravec and Zemeckis, 2007). In central and eastern European countries the change of political system from 1990 onwards, which triggered land privatization and the dismantling of collective farms, may have led to land abandonment because the conditions for profitable and commercial farming had become difficult (Vranken et al., 2004). This phenomenon can evolve rather quickly, especially in the new EU Member States (Moravec and Zemeckis, 2007). Drivers vary between regions and countries, and this potentially influences the definition or importance given to it (Strijker, 2005).

The abandonment of farmland has long been a contentious issue within Europe (e.g., see Baudry, 1991; Brouwer et al., 1997; Pointereau et al., 2008) in part because this phenomenon is difficult to define and measure (Keenleyside and Tucker, 2010; Moravec and Zemeckis, 2007). In fact, there is no single definition and, depending on the discipline, different interpretations exist (Moravec and Zemeckis, 2007). Despite the acknowledged importance of the phenomenon (e.g., EC, 2006), there is no consistent measurement across the EU and as a consequence the current extent of abandonment is not well known (Pointereau et al., 2008). Several studies have demonstrated the loss of agricultural land in (parts of) the EU through comparison of land use data (Hatna and Bakker, 2011; Keenleyside and Tucker, 2010; Müller et al., 2009) or using farm statistics (Corbelle-Rico et al., 2012; Pointereau et al., 2008). A number of studies have also analyzed the issue under a range of future scenarios (e.g. Elbersen et al., 2013; Helming et al., 2011;

Nowicki et al., 2007; Verburg et al., 2010) and these results suggest that farmland abandonment in Europe will continue over the next 20–30 years. The highest projected levels of abandonment are simulated for scenarios with strong levels of global competition in agriculture and low levels of Common Agricultural Policy (CAP) support for extensive farming (Renwick et al., 2013). Some abandonment is also projected under scenarios with reduced global competitiveness, high levels of support for agriculture and the environment as well as strong regulations. As related by Renwick et al. (2013) there is furthermore a fear that trade reforms will reduce the economic viability of farming in Europe and lead to further abandonment of the more marginal agricultural areas.

Given the importance of the CAP in EU policies and its various objectives, the risk of farmland abandonment was included in the list of 28 agri-environmental indicators that are used to assess the integration of environmental concerns into the CAP (EC, 2006). As the indicator is not fully operational yet and requires conceptual and methodological improvement, a panel of European experts was commissioned with the methodological development of the indicator. This paper summarizes the first results of the panel's work which covered the identification of principal farmland abandonment drivers and the definition of indicators for measuring its risk of occurrence for the EU-27. Further to this thematic objective, this study also aimed to assess the suitability of available European-wide datasets including the identification of gaps and limitations. The work started with the identification of drivers which is summarized in the following Section 2. This was the basis for the definition of indicators in Section 3 and their analysis in Section 4. Conclusions and perspectives for future work on the indicator development are provided in Section 5.

2. Definition and driving forces of farmland abandonment

For this study, farmland abandonment was defined by the expert panel as a cessation of land management which leads to undesirable changes in biodiversity and ecosystem services. As the indicator will be used to assess the integration of environmental concerns into the CAP, the definition was steered towards potential threats to the environment, which in this case are linked to loss of biodiversity (Sirami et al., 2008; Plieninger et al., 2014; Zakkak et al., 2014; Peco et al., 2012) and ecosystem services (Benayas et al., 2007). The indicator to be developed addresses the risk of farmland abandonment (probability of occurrence), not the consequences or the extent to which farmland abandonment actually happens.

The reasons for farmland abandonment are multidimensional, and there is no clear-cut division among drivers as it rather depends on the result of their co-occurrence and interactions (Bethe and Bolsius, 1995; Coppola, 2004). Drivers are usually grouped into either natural constraints, land degradation, socio-economic factors, demographic structure, and the institutional framework (FAO, 2003) or ecological, socio-economic reasons and reasons related to unadapted agricultural systems (Benayas et al., 2007). In this study driving forces are classified into unsuitable environmental conditions, low farm stability and viability, and the regional context.

2.1. Unsuitable environmental conditions

Amongst the biophysical factors often mentioned as unfavorable to agriculture, low soil productivity, poor climate, steep terrain and significant altitude are the main natural constraints to agriculture and may therefore increase the risk of farmland abandonment. There is a large literature analyzing these drivers and their negative impacts on agricultural production, economic profits and land use management opportunities. Mottet et al. (2006), Müller et al. (2009) and Sys et al. (1991) assessed elevation and slope effects

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