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Perspective

Wood-pastures of Europe: Geographic coverage, social–ecological values, conservation management, and policy implications

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ABSTRACT

Wood-pastures are archetypes of High Nature Value Farmlands in Europe and hold exceptional ecological, social, and cultural values. Yet, wood-pastures have been through a sharp decline all over Europe, mainly due to processes of agricultural intensification and abandonment. Recently, wood-pastures have found increasing attention from conservation science and policy across Europe. In this paper we (i) perform the first pan-European assessment of wood-pastures, considering individual countries and biogeographic regions, (ii) present the ecological and social–cultural values of a wide diversity of wood-pasture systems in Europe, (iii) outline management challenges around wood-pastures, and (iv) provide insights for the policy agenda targeting wood-pastures in Europe. We estimate that wood-pastures cover an area of approximately 203,000 km^2 in the European Union (EU). They are distributed across all biogeographical regions, but more abundantly in the Mediterranean and Eastern European countries. Substantial ecological values are revealed in terms of landscape level biodiversity, ecosystem dynamics, and genetic resources. Social–cultural values are related to aesthetic values, cultural heritage, and rich traditional ecological knowledge. We discuss the anthropogenic character of wood-pastures, requiring multifunctional land management, which is a major conservation challenge. Despite increasing societal appreciation of wood-pastures, their integration into effective agricultural and conservation policies has proved to be complicated, because institutional structures are traditionally organized within mono-functional sectors. We offer suggestions as to how these shortcomings might be overcome in the Common Agricultural Policy, including Rural Development policy, and the Habitats Directive of the EU. We conclude that research should be guided by a holistic vision of wood-pastures, which integrates information about ecology, societal values, and institutional arrangements.

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1. Introduction

Protected areas may soon cover 17% of the global land surface (Watson et al., 2014), but there is wide recognition that segregated conservation strategies must be complemented by integrative approaches, especially in landscapes shaped by agriculture and forestry (Fischer et al., 2006). Efforts to realign biodiversity conservation with agricultural production have recently gained momentum, as growing competition for land (Smith et al., 2010), urban land expansion (Seto et al., 2011), and land degradation (Plieninger and Gaertner, 2011) make it increasingly difficult to set aside large areas exclusively for biodiversity conservation. One prominent integrative strategy is High Nature Value (HNV) farming, a conservation approach that links ecology, land use, and public policies and expands conservation from traditional site protection to the scale of managed landscapes (Oppermann et al., 2012). The HNV approach was developed in acknowledgement of the crucial importance of low intensity farming for many elements of biodiversity (Halada et al., 2011).

Wood-pastures – landscapes in which livestock grazing co-occurs with scattered trees and shrubs – are archetypes of High Nature Value farmland and excellent model systems to explore how such farmlands could be incorporated into conservation strategies (Bergmeier et al., 2010). They represent an important part of the European cultural and natural heritage, but are also mirrors of dramatic changes in the relationship between people and their natural environment (Rotherham, 2013). Scientific interest in wood-pastures has recently grown across Europe (e.g. Garbarino et al., 2011; Hartel et al., 2013; Horák and Rébl, 2013; Plieninger, 2012; Plieninger et al., 2015; Vojta and Drhovská, 2012). Studies of wood-pastures have been performed at plot or local scales, often generating insight for wood-pasture conservation at large. However, to inform conservation policy, such local research needs to be complemented by studies acting across regions and continents (Schimel, 2011). Therefore, our paper aims to provide the first European synthesis of the available knowledge about wood-pastures. In particular, we (i) evaluate the extent of wood-pastures in Europe by country and biogeographic region, (ii) present the ecological and social–cultural values of the variety of wood-pasture systems in Europe, (iii) outline the management challenges around wood-pastures, and (iv) suggest relevant insights for the policy agenda in Europe.

2. Extent of wood-pastures in Europe

For the quantification of wood-pastures, we used information from the LUCAS project of the EU, a geo-referenced database of 270,277 points that provides harmonized and comparable statistics on land use and land cover across the whole of the EU's territory in 2012 (EUROSTAT, 2015). The database covers 27 European countries (EU-27 hereafter), and consists of a systematic sample with points spaced 2 km apart (around 1,100,000 points). Each point of the first phase sample was photo-interpreted and assigned to one of the following seven pre-defined land cover strata: arable land, permanent crops, grassland, wooded areas and shrubland, bareland, artificial land, and water. In a second stage, a quarter of the points were visited and interpreted at ground level in 2012. This second stratified sample (with >270,000 points; located every 4 km × 4 km, on average) was selected according to the proportion of each of the seven main land uses in every European region (NUTS2 level). A scheme maximizing the distance of the points, both in the same and in different strata (region × land use), was designed as a sample selection method, producing a quasi-regular grid of points (Martino et al., 2009). Nevertheless, for logistic limitations, points above 1500 metres of altitude and those far from the road network were considered inaccessible and excluded (Eurostat, 2015). The presence of trees in the observational point was assessed considering a 20 m radius. On the basis of the LUCAS data, we defined wood-pastures as those sampled points that show a combination of a tree cover (density of tree-crown >5%) with a pasture cover (grassland communities with clear evidences of grazing, coded as land use U111 in the LUCAS database). We mapped three categories of wood-pastures: (1) pastures in open woodlands, including those points with woodland (density of tree-crown >10%) as the primary land cover (coded as C10 to C33), and with grassland as the secondary land cover (coded as E10 and E30); (2) pastures with sparse trees (density of tree-crown between 5% and 10%), directly defined in the LUCAS database as a specific land cover class (coded as E10); and (3) pastures with cultivated trees (coded as B71 to B81) with recorded grazing land use, i.e. excluding points that are ungrazed permanent croplands rather than fully-fledged wood-pastures (see Fig. 1 for examples). As a result, we found that the LUCAS database contains 12,772 points that we considered wood-pastures. Given the comprehensive sampling grid that was included in LUCAS, the set of points can be viewed as representative of the land cover at EU but for the larger countries also at national scales (Table 1). Hence, in order to estimate the extent of wood-pastures, we multiplied the proportion of points defined as wood-pasture in each country by the surface of the country divided by the overall number of LUCAS points in this country. As sample density varied between 3 and 12 points per 100 km^2, an alternative approach based on Thiessen proximal polygons was generated for every sample point (i.e. the lower the sample density is, the bigger are