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The evolution of agrarian practices and its effects on the structure of enclosure landscapes in the Alt Empordà (Catalonia, Spain), 1957–2001

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ABSTRACT

During the last 50 years, mechanisation of the rural environment, and, more recently, the Common Agricultural Policy have led to profound changes in agrarian landscapes throughout Europe, and in particular in the rich and diverse Mediterranean landscapes (Meeus et al., 1990). In the north-east of the Iberian Peninsula, a small area of hedgerow landscape persists as a remnant of what was once an important centre for livestock production. This paper presents the results of a study carried out in this area with the aim of clarifying the relationship between the structural change of this hedgerow landscape and the evolution of farming practices developed by its owners and workers. It also considers these farmers' perceptions of their pastures, of their farms and of the region. Up to 61 statistically significant relationships were found between the physical landscape characteristic variables and the socio-economical variables. Results depict a hedgerow landscape determined by the combination of two management models. Here, and contrary to conclusions reported in similar literature, traditional pasture activity leads to a weaker hedgerow network than a farming model based on crop cultivation. Management guidance required to move from the current situation towards a hedgerow landscape supporting both biodiversity and agrarian activity is discussed.

1. Introduction

One of the cultural landscapes which has attracted much scientific interest is the hedgerow landscape, characterised by the dominant presence of pasture fields typically limited by hedgerows. A hedgerow is defined as a linear feature composed of shrubs and/or trees that forms part of a management unit (Baudry et al., 2000). These margins are not merely agricultural elements or a means of conserving biodiversity; they are also a historical feature which emphasises the cultural dimension of the landscape (Naveh, 1995; Wascher, 2005).

The composition and configuration of the hedgerow landscapes is explained by a varied set of socio-environmental factors. We should first note the influence of environmental factors; this becomes clear when we look at the distinct composition of flora and fauna in similar landscapes when the environmental conditions (climate, lithology, geomorphology, edaphology) are quite different (Söderström et al., 2001; Garbutt and Sparks, 2002).

Secondly, we have the influence of the human factor, although its very complexity makes this considerably more difficult to evaluate. Human activities operate at several organisational levels, from global agriculture policies and markets to the farm and field management (Naveh and Lieberman, 1994). Furthermore, there are two major conceptions in interpreting human-disturbed landscapes. On the one hand there is a more objective view which emphasises the effects of human activity on the natural environment. In the case that concerns us here, these effects are those produced by the activity of farmers on the landscape (Bunce and Howard, 1990; Baudry, 1993; Thenail and Baudry, 2004). So the farmers determine the cultural landscape through their organisation and use of the land. These respond to certain needs and knowledge which have obviously also been of key importance in the definition and evolution of enclosures (Asteraki et al., 1994; Bannister and Watt, 1994; Baudry et al., 1998). On the other hand, the scientific community increasingly recognises the need to incorporate the subjective viewpoint of the landscape, the rational relationships and emotional values, so as to achieve a true complex analysis of the origin, evolution and future perspectives of landscapes (Bailing and Falk, 1982; Oreszczyn, 2000; Oreszczyn and Lane, 2000; Buijs et al., 2006).

The conservation of the landscapes we have inherited cannot be valued on the basis of merely reflecting on former owners, uses of the land and economic activity (Pinto-Correia et al., 2006). The lack of integration of more socio-cultural criteria needs to be overcome,

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especially in those areas with a high historical and cultural value (e.g., the Mediterranean area), since it is also important to bear in mind that landscapes both represent and instill culture (Pinto-Correia and Vos, 2004). Culture modifies landscapes, landscapes which already incorporate the cultural and socio-economic patterns of each moment in history (Antrop, 2005).

Nowadays hedgerow landscapes are widely considered to be an excellent example of the multifunctionality of a traditional cultural landscape. Although they were initially conceived with the sole aim of increasing food production, today are appreciated for their multiple values and functions (Hoskins, 1955; Planhol, 1988; Baudry et al., 2000; Whyte, 2002). According to the classification provided by Marshall and Moonen (2002), these functions can be summarised as follows:

- Agronomic functions: stock fencing and delimiting field areas or ownership. Margins provide shelter for stock in adverse weather and can play an important role as windbreaks to protect adjacent crops. Furthermore, field margins provide habitat for a range of insects, many of which are of agronomic benefit to adjacent arable crops. Hedgerows are also a source of products (wood being the most important) (Oreszczyn and Lane, 2000; Bäckman and Tiainen, 2002; Lagerlöf et al., 2002).
- Environmental functions: hedgerows play a major role in controlling physical, chemical and biological fluxes, such as water, for drainage or irrigation, and soil particles, to diminish erosion or wind (Rodríguez, 1997; Follain et al., 2007; Lazzaro et al., 2008).
- Recreational functions: field margins may have heritage values. They can be used as footpaths and bridleways, providing access to the countryside while leaving the cultivated areas undisturbed. Mowed strips around fields near main roads have improved the aesthetic value of the landscape (Burel and Baudry, 1995; Buijs et al., 2006).
- Aesthetic functions: provide structure and diversity; give shape and enhance views; give perspective to the landscape. Irregular patterns give an area familiarity; provide links with the past; enhance and add beauty to the landscape; are part of our heritage (Oreszczyn, 2000).
- Wildlife functions: in intensively managed lowland landscapes, linear features contain the greatest botanical diversity (Burel et al., 1998; Le Coeur et al., 2002). Thus field margins are refuges for many species. In addition to the flora, field margins may also support a diverse fauna, including invertebrates and birds (Gillings and Fuller, 1998; Maudsley et al., 2002). As linear features, field margins are also thought to act as corridors for the movement of fauna and possibly flora (Burel, 1995).

Over the last few decades, hedgerow landscapes have been severely threatened by the forces of change caused by a progressive reduction in the economic profitability of their productive function in terms of agrarian space. The consequences of this dynamic are illustrated by the fact that according to the European Environment Agency (EEA, 1997), of the 32 habitats in the European Union most threatened by the cessation of human activity, 26 are pastures, 5 are grasslands and only 1 is croplands. The value of cultural landscapes such as the enclosure ones is inherently recognised within the European Landscape Convention, ratified by Spain in late 2007. There is, therefore, a political consensus on the need for protection, management and planning of this type of landscape.

In recent years, geographers, ecologists and conservationists have shown increased interest in hedgerows and enclosure landscapes, at a time when many of them are being removed (Forman and Baudry, 1984; Burel, 1996). On the other hand, the current Common Agricultural Policy is tending to redirect economic aid in rural areas towards an attempt to maintain and promote multifunctionality (Brouwer and van der Straaten, 2002). The advent of multifunctional land-use will improve the viability of marginal rural areas and this can be encouraged by national and international policy decisions. However, it also depends to a great extent on local situations (Naveh, 2001). The will of a number of social, economic and scientific sectors to conserve these cultural landscape structures makes it clear that we need to introduce new principles and develop new socio-cultural methods in the study of landscapes (Nassauer, 1995; Marshall and Moonen, 2002; Pinto-Correia and Vos, 2004; Antrop, 2005; Palang et al., 2005).

Traditionally, landscape ecology has focused on the relationship of landscape structure to ecological function and considered alternative structural patterns (Turner, 1990; Farina, 1993; Forman, 1995). This is not different in regard to hedgerow landscapes and, consequently, several papers can be found that address the relationship between hedgerow characteristics and their value or potential for many different biota groups. Characteristics such as hedgerow width, hedgerow height, vascular plant species density, adjacent land-use, orientation or network fragmentation all seem to share, to a certain extent, a responsibility for species richness and diversity for groups such as herbaceous plant species, arthropods, birds and small mammals (Mauremooto et al., 1995; Fry and Sarlöv-Herlin, 1997; Corbit et al., 1999; Hinsley and Bellamy, 2000; McCollin et al., 2000; de Blois et al., 2002; Maudsley et al., 2002; Vickery et al., 2002; Deckers et al., 2004; Michel et al., 2006; Davies and Pullin, 2007; Gelling et al., 2007). The authors of these contributions, aware that in a cultural landscape all of these variables rely strongly on the needs and will of their managers (farmers in most cases), usually provide guidelines to enhance the landscape structure and favour highly valued or threatened species. Therefore, the value of active management practices in rural landscapes is well recognised within the landscape ecology community (Nassauer, 1995; Antrop, 2005). However, the mechanisms determining how this management transforms the enclosed landscape structure have hardly been explored. Few studies, and most of them located exclusively in the Brittany region (France), specifically address the need to understand how the interaction between farm characteristics, management practices and hedgerow landscape structure operates at different scales (Burel and Baudry, 1995; Baudry et al., 2000; Le Coeur et al., 2002; Thenail, 2002; Thenail and Baudry, 2004). This lack of information makes it risky to implement management policies or recommendations which could produce undesired outcomes on the landscape structure and morphology. On the other hand, understanding the interaction between those elements means having the opportunity to formulate sound advice about obtaining desired landscape characteristics through the modulation of farm structures and management practices. In the end, this information would enable landscape planners and decision-makers to better manage the landscape and its multiple functions and to provide willing farmers with clear, sound and comprehensive good-landscape-practice guidelines.

With the ultimate goal of providing this type of knowledge and associated possibilities, the objective of the research presented in this paper is to search, systematise and quantify eventual relationships between the structure of a landscape enclosed with hedgerows and the farm characteristics and management practices that local farmers have performed on their fields over recent decades in a small area in the north-east of Catalonia.

2. Context and study area

The area studied is at the extreme north-east of the Iberian Peninsula, in the zone known as the Plana de l'Empordà, next to the