



# A comparative approach to assess the contribution of landscape features to aesthetic and recreational values in agricultural landscapes



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## ABSTRACT

The importance of cultural ecosystem services in agricultural landscapes is increasingly recognized as agricultural scale enlargement and abandonment affect aesthetic and recreational values of agricultural landscapes. Landscape preference studies addressing these type of values often yield context-specific outcomes, limiting the applicability of their outcomes in landscape policy. Our approach measures the relative importance of landscape features across agricultural landscapes. This approach was applied in the agricultural landscapes of Winterswijk, The Netherlands ( $n=191$ ) and the Märkische Schweiz, Germany ( $n=113$ ) among visitors in the agricultural landscape. We set up a parallel designed choice experiment, using regionally specific, photorealistic visualizations of four comparable landscape attributes. In the Dutch landscape visitors highly value hedgerows and tree lines, whereas groups of trees and crop diversity are highly valued in the German landscape. Furthermore, we find that differences in relative preference for landscape attributes are, to some extent, explained by socio-cultural background variables such as education level and affinity with agriculture of the visitors. This approach contributes to a better understanding of the cross-regional variation of aesthetic and recreational values and how these values relate to characteristics of the agricultural landscape, which could support the integration of cultural services in landscape policy.

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## 1. Introduction

Agricultural landscapes provide society with various ecosystem services (de Groot et al., 2010; van Zanten et al., 2014a). Cultural ecosystem services embody the immaterial benefits provided by agricultural landscapes, such as aesthetic values, recreation, inspiration and cultural heritage (Power, 2010; Schaich et al., 2010; Zhang et al., 2007). In many European landscapes, aesthetics and recreation are of increasing importance as a driver of landscape policy (Gobster et al., 2007), as “functions related to recreation, tourism and the landscape as a living place are gaining importance in relation to agricultural production functions” (Primdahl, 2010, pp. 163).

Landscape features that contribute to aesthetic and recreational values (e.g. hedgerows, stone walls or mosaic land cover structures) are being threatened by changing agricultural practices, which are causing scale enlargement or abandonment in

agricultural landscapes around Europe (Klijn, 2004; Meeus, 1993). In response, scholars and policy makers have initiated the protection of the cultural ecosystem services in agricultural landscapes, for instance through the European Landscape Convention (Council of Europe, 2000) and by advocating comprehensive ecosystem services-based landscape management as a part of the European Common Agricultural Policy (CAP) (e.g. Seppelt et al., 2012; Plieninger et al., 2012).

However, the subjective and context-specific nature of aesthetics and other cultural ecosystem services (Daniel et al., 2012), complicates the identification of specific valuable landscape features at higher than local geographic scales and, therefore, the development of effective landscape policy through the CAP (Pouta et al., 2014). As a result, standardized agri-environmental measures can be beneficial for the aesthetic and recreational values of one place, whereas in other places this same measure has negative effects (Pinto-Correia et al., 2006).

The rural development policies that were introduced in the CAP in the 2000s, followed a multi-level approach, which allowed

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member states to coordinate the development of rural development plans that meet regional socio-economic and environmental management priorities (Beckmann et al., 2009). Yet, the level of decentralization and regionalization within RDPs differs across European member states (Beckmann et al., 2009) and a recent empirical study shows that in practice the RDP in Scotland primarily reflect national and EU-level environmental policy priorities (Yang et al., 2015). In the context of the decentralization debate and the increasing importance cultural ecosystem services for rural development, a methodology to compare the contribution of landscape features to the aesthetic and recreational values of agricultural landscapes can assist to set national and EU-level priorities for landscape policies targeting these cultural ecosystem services.

Relations between cultural ecosystem services and specific features of agricultural landscapes are often addressed using stated preference methods (Daniel et al., 2012; van Berkel and Verburg, 2014). Many local or landscape scale case studies found relations between aesthetic and recreational values and landscape features describing the land cover structure and composition, the presence of livestock or the presence of historic buildings (van Zanten et al., 2014b). Although numerous case studies have evaluated these values, estimates are often context specific, which inhibits cross-case comparison of preference estimates (Arriaza et al., 2004; Pinto-Correia and Carvalho-Ribeiro, 2012; Soini et al., 2012). Case studies that address public preferences for agricultural landscapes can be categorized as either holistic or attribute-based (Hynes et al., 2011; Swanwick and Hanley, 2007). Holistic approaches aim at measuring preferences for landscape scenarios as a whole and are therefore inherently context-specific and non-comparable. Attribute-based or analytical approaches do have a potential for upscaling or value transfer, but in practice they often address specific locally relevant landscape features and, therefore, value estimates are also not fit for cross-regional comparison. In addition, comparability of value estimates from case studies is hampered by methodological heterogeneity among case studies – methods range from economic valuation to psychological perception-based techniques – as landscape preferences are addressed by researchers from many different scientific disciplines (Schaich et al., 2010; Swanwick, 2009).

To date, very few comparative landscape preference studies have been conducted. A number of studies have addressed preference heterogeneity for a set of landscape images related to the cultural and ethnic background of sampled populations (Buijs et al., 2009; Kaplan and Herbert, 1987; Lindemann-Matthies et al., 2013; Yang and Kaplan, 1990; Yu, 1995; Zube and Pitt, 1981). However, these group comparisons mostly referred to a single set of landscape images and focused on familiarity and social construction by comparing differences in preference between home and alien landscapes (Eisler et al., 2003).

The objective of this study is to test a method to compare the aesthetic and recreational value of a set of landscape features in two agricultural landscapes: Nature Park Märkische Schweiz in Germany and National Landscape Winterswijk in the Netherlands. We quantify the aesthetic and recreational values by measuring visual landscape preference of visitors. This user group is very important to the regional economy as for visitors an aesthetically valuable landscape often backdrops outdoor recreation (Plieninger et al., 2013). The landscape features in this study represent (1) the presence of livestock, (2) the diversity of agricultural land use, (3) the prevalence of green linear elements and (4) the prevalence of point elements in the agricultural landscape. We aim to measure and compare the contribution of these landscape features to its value using a choice experiment in which the landscape features are visualized in a landscape photo that is representative for the regional agricultural landscape context (Arnberger and Eder, 2011; Lovett et al., 2010). In addition, we explore how preferences

for specific landscape features relate to socio-cultural background characteristics of the respondents.

## 2. Description of case study areas

The Märkische Schweiz and Winterswijk (Fig. 1) are both agricultural landscapes located in North-Western European lowlands (Mücher et al., 2010). Both landscapes are classified as open landscapes (Meeus, 1993) and were shaped by glacial ice sheets, which created a rolling landscape (Scholz, 1962; Wascher and Pérez-Soba, 2004). As a result of impermeable glacial soils, the case study areas are characterized by the abundance of brooks and ponds throughout the landscape. In addition, (parts of the) landscapes in both case study areas are described as mosaic agricultural landscapes, with agricultural plots that are enclosed by hedgerows or tree lines. As for these similarities in terms of geological history, soil formation and presence of landscape elements between the agricultural landscapes, we selected these case study areas for a comparative study.

Despite of the commonalities in terms of geomorphology and soil, there are considerable differences between the landscapes with respect to land use history and the demand for cultural ecosystem services. In the German case, the agricultural landscape has a history of collectivization under the rule of the German Democratic Republic and is dominated by arable land. In Winterswijk pastures are dominant. Moreover, Winterswijk has a well-developed touristic infrastructure and the traditional agricultural landscape is well known for its aesthetic qualities and cultural heritage value (van Berkel and Verburg, 2014). In the Märkische Schweiz, the touristic infrastructure in the agricultural landscape around the nature park is poorly developed and the amount of visitors is significantly lower than in Winterswijk. Additionally, we presume that the type of visitors differ between the case study areas: visitors in the Märkische Schweiz are often high-educated metropolitan-dwellers on a day trip, whereas in Winterswijk visitors are often retirees from rural or sub-urban areas across the Netherlands (van Berkel and Verburg, 2014).

## 3. Research design and methodology

### 3.1. Overview of the methodology

A visual choice experiment has been designed to analyse stated preferences of visitors for a general set of features of landscape management (in the context of the choice experiment referred to as landscape attributes) in the two study areas. In both areas, a spatial analysis was conducted to identify the spatial extent and variation of the landscape attributes in the area to establish representative attribute levels. Subsequently, landscape images were digitally calibrated to visualize different attribute levels in the local landscape context. We compared preferences for a set of landscape attributes across the case study areas as well as the influence of different socio-cultural characteristics on preference estimates was assessed.

### 3.2. Choice experiments and landscape preferences

Choice experiments are increasingly applied to value different policy alternatives aimed at rural landscape management and planning (Campbell, 2007; Dachary-Bernard and Rambonilaza, 2012; Liekens et al., 2013). While some of these studies elicited visual preferences for different landscape scenarios under different policy regimes (Arnberger and Eder, 2011; Rambonilaza and Dachary-Bernard, 2007; Vecchiato and Tempesta, 2013), other studies

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