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Visual complexity and the montado do matter: landscape pattern preferences of user groups in Alentejo, Portugal

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Abstract

· **Context** The current paradigms for the sustainable development of forests and agriculture involve territorial organization of these activities as well as the multifunctionality of the related landscapes. Accordingly, the new management strategies need to take into account the suitability of the resulting landscapes to produce the goods and services expected by society.

· **Aims** The aim of the study was to assess the preferred landscape patterns by different groups of users. In focus were the relations between the landscape metrics of preferred patterns and the individual characteristics of respondents.

· **Methods** A regional quantitative survey of both production and different consumption landscape users was conducted in the Alentejo region, southern Portugal. Respondents composed their preferred patterns on a block diagram representing an area of landscape seen from a single view according to the existing topographic conditions in the study area.

· **Results** In general, the visually complex landscape patterns were preferred more than the homogeneous ones. However, the metrics of preferred patterns varied between the user groups. The montado was the only land cover class that was present in the majority of preferred patterns.

· **Conclusion** For landscape users in southern Portugal, the visually complex landscapes including the montado are essential to satisfy their expectations. This may be an important fact to be taken into account for policy and landscape management in the future.

Keywords Landscape preferences · User groups · Amenity services · Landscape metrics · Landscape pattern · Land cover · The montado

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1 Introduction

An overview of the research themes in forest journals shows that the term "landscape" has emerged frequently in recent years. A landscape perspective on forests and agriculture is considered one of the most important issues to be dealt with in order to gain better knowledge for sustainable management (Dobbertin and Nobis 2010).

The multifunctionality paradigm in the quest for sustainable management assumes that rural landscapes can provide a variety of amenities in addition to productive functions, namely, carbon sequestration, watershed protection, biodiversity, recreation, and cultural and societal uses (Andersson et al. 2005; Dobbertin and Nobis 2010). Furthermore, the challenge

of the multifunctional perspective is accepted as an aim for landscape management, both in the scientific community (Marsden and Sonnino 2008; van der Ploeg and Roeg 2003) and in the definition of policy objectives, e.g., the Second Pillar of the Common Agricultural Policy (CAP 2010).

Incorporation of multifunctional management into forest and agricultural sectors requires also a more comprehensive level of understanding of societal issues (Innes 2005) and more socioeconomic and policy-oriented research (Seppälä 2004). Understanding and considering user groups' demands for landscape has become an important issue for the societal acceptability of policy and management (Barroso et al. 2012; Selman 2012).

For the agroforestry systems of southern Iberia, this debate is particularly relevant. These are unique systems, managed extensively for centuries through careful human intervention in the natural ecosystem and a wise respect for the constraints imposed by such a harsh environment. They have therefore developed into highly appreciated and nature-rich landscapes. But nowadays, their production income is low and maintenance of the balance in these systems has long been threatened by both intensification and extensification (Bugalho et al. 2011; Pinto-Correia et al. 2011). The agroforestry system dominant in the region of Alentejo is called the montado. A recent study (Sergio Godinho 2012, personal communication) confirms that its total area has been decreasing for decades through abandonment or replacement by other land uses. In order to maintain the specific landscape produced by this land use system, there is an urgent need to recognize the multiple values of the montado so as to find efficient mechanisms for its support. The new societal demand regarding nature conservation, hunting, recreation, and aesthetic quality, if reflected in new markets or adapted compensation mechanisms, may be one of the ways to help sustain these kinds of valuable land use systems such as the montado.

It is unfeasible to propose effective and efficient policy and management recommendations for landscape services without considering users' preferences. Previous studies show that the landscape visual complexity is an important factor for preferences. In a cognitive theory of landscape preferences (Kaplan and Kaplan 1989), complexity provides content and possibilities for exploration. Research by Bestard and Font (2009) shows that recreational visitors are interested in sites with high landscape fragmentation and uneven land uses. Moreover, higher color contrast in a landscape can increase the visual preference for a specific site (Hands and Brown 2002). Likewise, Scott (2002) also found that from valued landscape features, diversity, color, and contrast were amongst the most important. At the same time, landscape preferences can be influenced by a variety of human factors, such as age, gender, education, profession, cultural background, and recreational activity, as well as by differences between geographical regions (e.g., Edwards et al. 2012; Swanwick 2009; Zandersen

and Tol 2009). Since the 1990s, the body of literature on group differences in landscape preferences has been increasing (Sevenant and Antrop 2010).

Despite the quantity of literature, some gaps in knowledge about landscape preferences still remain, such as, for example, how user groups with different interests in the landscape prefer a complexity of landscape patterns and what kind of land cover classes (LCC) they wish to be present on their preferred landscape pattern.

The aim of the paper was to assess the preferred landscape pattern of different user groups. The results are based on a survey undertaken in the region of Alentejo, where a novel method was applied. Respondents were asked to compose their preferred landscape pattern from the perspective of a particular activity. The patterns were outlined by using photographs of LCC on a block diagram sketch representing a landscape area possible to see in a single view according to specific topographic conditions in the study region.

The sample design went beyond the "general" public perspective, in which the public are treated as a single entity. The particular focus here was to assess the preferences of different user groups including both the production as well as the consumption users. The specific focus of the analysis was on the landscape complexity metrics of preferred patterns and their relation to the individual characteristics of respondents.

The following section focuses on providing a description of the novel methodology applied in the study. Subsequently, the results are presented and discussed. At the final part of the paper, the conclusions depicting the main results as recommendations to landscape policy and management are provided.

2 Material and methods

2.1 Sample design

The study area was representative of the Alentejo NUT II region in southern Portugal, and the survey was conducted in ten municipalities representing the region's variability of land cover patterns and socioeconomic dynamics. The study used an approach based on the Corine Land Cover (CLC) distribution. The municipalities were chosen according to two complementary approaches: automatic and expert-based. The first approach, more automatic and quantitative, was developed through a cluster classification of the CLC distribution across the municipalities. The land covers considered in the study were based on the class distribution in 2006. Subsequently, an expert panel, including members from both research teams and members of the regional development agencies, conducted a qualitative evaluation and selection of the case municipalities, considering the results from the automatic approach, and knowledge about the socioeconomic dynamics in specific municipalities. The figure showing the location of the

ten selected municipalities (Castelo de Vide, Ponte de Sor, Elvas, Montemor-o-Novo, Reguengos de Monsaraz, Grândola, Ferreira do Alentejo, Vidigueira, Serpa, and Almôdovar) where the survey was conducted is published in Carvalho-Ribeiro et al. (2013).

The aim of the sample design was to obtain a sample of production as well as different consumption perspectives of landscape users. Therefore, a purposeful sample (Patton 2002) was collected based on a spatially stratified sample design. Each region has specific characteristics reflected in the variety of ways in which people use the landscape. In the case of the Alentejo region, systematic monitoring of landscape use by society is lacking. Thus, to capture a variety of societal demands, the results of previous studies addressing landscape preferences in the Alentejo region (Pinto-Correia et al. 2010; Surová & Pinto-Correia 2009) were used. Accordingly, five selected groups were distinguished during the survey: inhabitants, frequent visitors, tourists, hunters, and land managers primarily represented by private landowners. Although most of the respondents were Portuguese, the majority of the tourists and some inhabitants were from northwestern Europe.

2.2 Data collection

In each of the ten municipalities, around 100 questionnaires were completed including respondents from each user group. First, a meeting was held with municipal planning officers in order to get contacts for first respondents. Later, a "snowball approach" was used to enlarge the sample. With each respondent, a face-to-face interview was conducted. Seven research team members worked from February through September 2010 to complete the survey. The full questionnaire used in the study area dealt with a variety of issues related to the regional landscape. This paper focuses merely on preferred landscape compositions. In general, the survey was performed in Portuguese. For respondents with little knowledge of the native language, English was used. Each respondent was asked to choose one user group and to respond from that perspective throughout the questionnaire.

The LCC were displayed on 16 photographs. Each photograph represented one LCC within the agricultural areas and within forests and semi-natural areas from level 3 of the CLC nomenclature. The CLC classes considered by the research team to be without significance in the study area were excluded from the survey. Photographs taken in the field were edited with the Adobe Photoshop CS3 graphic editing program. Elements of the photographs inconsistent with the focus of the study, i.e., human artifacts such as roads, electric poles, and walls, were eliminated from the real photographs. Moreover, the same sky and the same level of horizon were applied to each photograph. The photographs used in the survey were published in Carvalho-Ribeiro et al. (2013).

The block diagram (Table 4) used in the survey was adapted to the gentle hilly morphology of Alentejo from a 3D diagram used in a landscape study in France by Michelin et al. (2011). According to the abovementioned study, comparing the appropriateness of different tools for landscape studies, the 3D diagrams, and models are the most relevant for discussions of planning since such representations are more general and are less linked to specific places where private interests or competition can exist. The adapted diagram was divided into five segments of land and represented common land forms in the region, which included a valley (segment 3 shown in Table 4) surrounded by undulating plains (segments 1,2, 4, and 5 shown in Table 4). The number of segments was a compromise between the possibility for expression of preferences for landscape complexity and the ability of respondents to understand and fulfill the questionnaire without exaggerated effort. Furthermore, using more segments increases substantially the complexity of analysis and subsequently the interpretation of results.

The scale of the block diagram was related to an area that could be seen from any viewpoint on terrain with moderate topography in the study region. This corresponded to a horizontal plane of 3.14 km^2 and to an area of 200 ha approximately (Carvalho-Ribeiro et al. 2013). Each segment of the diagram had similar dimensions, which were 20 % of the landscape, in view. Considering this distribution, the results can be adapted to any part of the region with similar land forms. This is undoubtedly a great simplification of the landscape pattern in reality, but it has the strong advantage of allowing the respondents to place themselves without difficulty in the overall landscape pattern they prefer for the activities in which they participate (Barroso et al. 2012). Each respondent was asked to fill in a block diagram, designed in A4 format, according to his/her preferences. For example, hunters were asked to compose their preferred landscape for hunting activity and inhabitants completed the block diagram to represent an ideal landscape to surround the place where they lived. In the final part of the questionnaire, respondents were asked about their individual characteristics like age, gender, education level, childhood and current residence, and farming background.

2.3 Data analysis

The data from the survey were analyzed with analytics software SPSS 18.0 (IBM Corporation, New York, USA) for descriptive statistics. The individual characteristics of respondents were used in the analyses to examine whether there were any differentiating factors affecting preferences for landscape patterns. The binary variables were age (age up to 40 years, age >40 years), gender, education level (university degree, no/ yes), and farming background (no/yes). In the childhood and the current residence variables, different geographical