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How do policy options modify landscape amenities? An assessment approach based on public expressed preferences

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ABSTRACT

Facing the changes in the agricultural sector as well as new growing demands from society in relation to the European countryside, new questions emerge as to the management of the agricultural landscapes. The multiple combination of production with the support of multiple functions is a challenge for present day management. Tools are needed that make it possible to assess how a certain landscape can support in particular cultural and amenity functions, those that directly depend on the public preferences. The objective of this paper is to describe the proposed Landscape Amenity Model (LAM), a landscape amenities evaluation tool developed within the framework of the Integrated Project SEAMLESS. The LAM is based on the calculation of the Index of Function Suitability (IFS) for a given landscape, based on the distance between that landscape and the preferred landscape, as expressed by different users. The paper goes further in applying IFS namely by examining two different approaches for deriving land cover pattern preferences by users, either gathered from questionnaire surveys or expert panels in two case-studies, one in Portugal and another in France, respectively.

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1. Introduction

What is the role of farming in providing suitable landscapes for amenity and cultural uses? This is a challenging question for the agricultural sector, especially in Europe, as European citizens increasingly search for public goods and services in the countryside (Sayadi et al., 2009; Sevenant and Antrop, 2010). This is particularly important because many farming systems in Europe face the risk of not being able to survive in a globalized market context, thus, European strategies for rural areas increasingly stress the importance of the territorial role of agriculture which goes far beyond producing food and fibre (Brouwer and van der Heide, 2009; Primdahl and Swaffield, 2010; Robinson, 2008). As a result, policy makers need to better understand how different landscapes in Europe are valued by multiple user groups which are increasingly searching for an array of cultural and amenity functions in the European countryside.

The cultural and amenity functions hereby considered are those related to the aesthetical and cultural dimensions, those stretching from leisure, recreation and hunting, to weekend house setting and identity (de Groot and Hein, 2007; Fleskens et al., 2009; Hein et al., 2006; Stephenson, 2008; Willemen et al.,

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2008). These different social demands depend strictly on the users preferences and options, and therefore can only be assessed by surveys to these users (Caspersen and Olafsson, 2010; Dramstad et al., 2006). Work previously developed on landscape preferences shows that people are able to express their preferences for landscape patterns, those preferences strongly depending on the land cover pattern composition (Bell, 2001; Dramstad et al., 2006; Gulinck et al., 2001; Gustafson, 1998; Lewis, 2008; Petrosillo et al., 2007; Tress and Tress, 2003; Willemen et al., 2010, 2008). Therefore, the capacity of the landscape to provide different goods and services is a function of the landscape pattern composition.

As the agricultural landscape is transformed everyday by agricultural practices, changes in this sector lead to changes in the landscape composition, and thus to changes in the way they are valued by people for other functions than production (Antrop, 2005; de Groot, 2006; Soliva et al., 2008; Wiggering et al., 2006). Those amenity functions are also those on which there is still a widespread lack of data and lack of knowledge (Alkan Olsson et al., 2009; Sevenant and Antrop, 2010; Verburg et al., 2009). Other public goods and services not directly related to the public social demand are as well relevant, but they can be assessed in other ways, as the other papers on this Special Issue show.

Considering the social demand for amenity functions what is still needed is to assess these public preferences relating to the full range of diverse and complex landscapes throughout Europe (Alkomany, 1999; Dramstad et al., 2006). It is also important to acknowledge the differences in preference distributions by different groups of users, in connection to the functional relation users establish with the landscape (Fairweather and Swaffield, 2001; Stephenson, 2007, 2008; Surova and Pinto-Correia, 2008) Acknowledging the differences of contrasting groups of users in different landscapes would make it possible to identify landscape quality objectives (ELC, 2000) and thus to assess how farming may either contribute or hinder these amenity objectives in different regions (Potter, 2010).

Furthermore, progress in the sense of integrating the knowledge about preferences on decision making for agricultural landscapes is required (Alkan Olsson et al., 2009; Parachinni et al., 2009; Pinto-Correia and Primdahl, 2009; Vanslembrouck and Van Huylenbroeck, 2005). The possibility of combining data on public preferences with the increasing number of models assessing the impacts of policy options is expected to be a step further.

Following the considerations above, the objective of this paper is to describe the proposed Landscape Amenity Model (LAM), a landscape amenities evaluation tool, and its application based on different types of data collection. This tool was developed within SEAMLESS, a research project delivering an integrated model chain for the ex-ante assessment of the impact of agricultural policy on the economic, ecological and social dimensions of rural areas in Europe (Brouwer and van Ittersum, 2010). The need emerged to produce a tool that could integrate the landscape amenity and cultural value in the ex-ante assessment of land use and land cover change (Pinto-Correia et al., 2009). The LAM is based on the Index of Function Suitability, developed by Pinto-Correia and others (Pinto-Correia and Carvalho-Ribeiro, 2012; Pinto-Correia et al., 2009). It aims at measuring the landscape capacity to provide the cultural and amenity functions, seldom measured so far through spatially related indicators (Caspersen and Olafsson, 2010; Parachinni et al., 2009) such as leisure, recreation, hunting, weekend house setting and identity. The development of this tool was based on the identification of preferred landscape compositions through questionnaire surveys to user groups. These questionnaire surveys are both time consuming and financially demanding. So this paper aims at discussing the use of surveys but also other, less demanding, methodological approaches for collecting data namely through expert panels.

This paper is structured as follows: after this Section 1, Section 2 demonstrates the calculation steps based on two test surveys, one applied in a case study in Portugal and another in France; Section 3 deals with the reflections issued from the results obtained in these experimental calculations of the IFS; and finally Section 4 include the conclusions, that mainly are focused on required improvements.

2. Proposed methodological approach

The Landscape Amenity Model has been developed as standalone component in the SEAMLESS framework. The integration in the SEAMLESS model chain has been limited due to the dilemma of simultaneous model development, model integration and technical integration (van Ittersum et al., 2008). The work has been developed on standalone versions, that afterwards were linked into a model chain through data flows carefully assessed and incorporated. The modelling component is beyond the purpose of this paper. What is explained next is the set of procedures required in order to ascertain the value of a given landscape concerning amenity and cultural functions either when respondents are elicited by users through questionnaire surveys or from expert knowledge through expert panels.

2.1. *The Index of Function Suitability (IFS)*

The Index of Function Suitability (IFS) measures the adaptability of a landscape to provide a cultural or amenity function (Pinto-Correia and Carvalho-Ribeiro, 2012). The differences between the preferred land cover patterns and the land cover patterns likely to occur in different scenario storylines is gauged through a set of land cover related indicators (Fig. 1). The IFS shows the difference between the different situations, for the same area, at a given scale and, as such, it indicates how much a given landscape suits one specific or a set of amenity functions.

The differences between the patterns (preferred and others) is measured calculating the partial gaps, for each one of the indicators considered. Each partial gap corresponds to the algebraic difference between the indicator's preferred value and the same indicator's value for the landscape pattern in analysis. Thus, there will be as many partial gaps as indicators selected.

The sum of all the partial gaps is the distance separating a given land cover pattern from the preferred pattern, for a given function. The Index of Function Suitability corresponds to the

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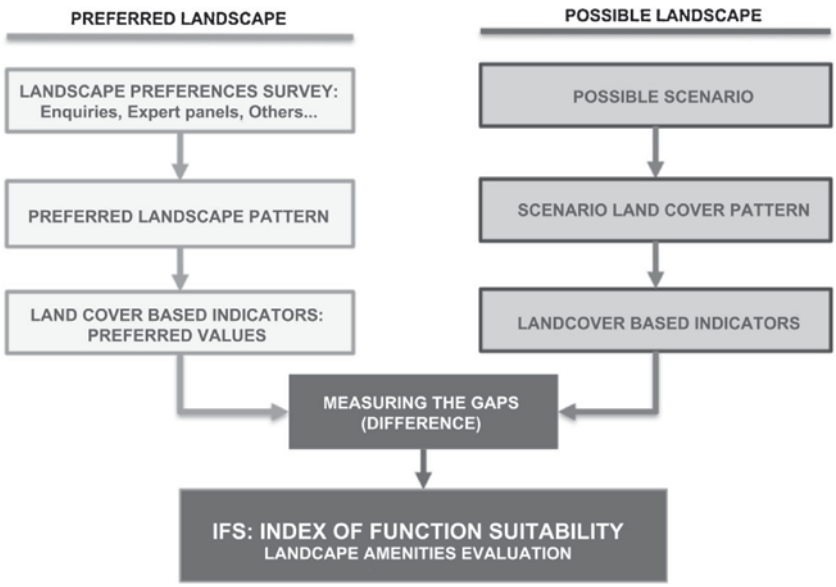

Fig. 1 – The Index of Function Suitability, on which the Landscape Amenity Evaluation is based, is calculated measuring the distance gap the preferred landscape (denominated as preferred landscape) to develop a given non-commodity function, and the landscape being tested.

inverse of that gap. The highest gap between a real or a virtual landscape, and the preferred landscape, results in a lower IFS value and thus a lower suitability to the considered function. The IFS is thus IFS = 1/average $\sum$GAP or IFS = 1/$\sum$GAP, depending on whether there is a range or only one preferred pattern(s) (Pinto-Correia and Carvalho-Ribeiro, 2012).

Considering the variations in European landscapes in what concerns the scale of landscape organization and the most significant components, the indicators should be selected according to the region. In the test cases hereby presented, the indicators selected derive from the SEAMLESS-IF outcomes. A list was produced of more than 200 indicators, covering the three sustainable development dimensions, and different geographical levels (Alkan Olsson et al., 2009). The indicators selected for the IFS are the Land Cover Diversity, Intensity and Specialization. Table 1 shows how these indicators were integrated in the IFS concept. To assure that the indicators would reflect the specificity of the regions considered, the land cover diversity and land cover specialization were adapted (Table 1).

2.2. *Identifying the preferred landscape patterns for different cultural and amenity functions*

Due to the specific characteristics of each landscape at regional level, the proposed tool is based on regional assessments of landscape preferences by groups of landscape users, related to the functions considered. In order to progress in the use of this tool, landscape types may be identified, at regional scale, and the data base on preferred values to be produced is to be organized by these regional types.

The approach developed focuses on human factors and follows the ''subjective'' paradigm. Landscape visual aesthetic quality is considered to be a product of the visible features of the landscape interacting with personal cultural background of the observer (Bell, 2001). Landscape quality, for what concerns its cultural and amenity functions (de Groot and Hein, 2007), is consequently ''in the eyes of the beholders''.

It is acknowledged that the landscape and the way people see it depend strongly on changes on the land cover pattern (Gulinck et al., 2001; Gustafson, 1998; Lewis, 2008; Petrosillo et al., 2007; Willemen et al., 2010, 2008). Therefore, and in order to be able to link public preferences to land use change models, the land cover and its organization and structure is used as the dimension of the landscape to be assessed by users.

The preferred pattern is considered to be the land cover pattern preferred by users as support of the cultural or amenity function they look for in a region. Users in different places will value differently a specific land cover pattern (Stephenson, 2007), as well as, different stakeholders and users value differently each landscape function (Fairweather and Swaffield, 2001; Hein et al., 2006; Pinto-Correia et al., 2010). There may be one preferred pattern or a range of preferred patterns, considering a range of preferences. This last option may be more realistic considering the range of preferences normally expressed by different people. But, on the other hand, it is also more difficult to deal with in the calculations.

Thus, in a given region, it is possible to identify at least as many preferred land cover patterns as the groups of users considered, related to the functions selected. The preferred values are the concrete values in which the preferred pattern is translated to, through the use of indicators, related to selected characteristics of the land cover, as diversity, intensity, specialization, or dominance of one or another land cover class.

The preferences for land cover pattern compositions can be accessed through questionnaire surveys, expert panels or other approaches. Landscape visualization tools can also be