



Spatial quantification and valuation of cultural ecosystem services in an agricultural landscape

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ARTICLE INFO

Keywords:

Rural development
Participatory Mapping
Stated and Revealed monetary valuation
Photo-realistic montages

ABSTRACT

While the spatial and economic quantification and valuation of ecosystem services is becoming increasingly recognised as a way to communicate the importance of ecosystem conservation, little attention has been given to cultural services of the landscape. Cultural services form an important part of tourism amenities in agricultural landscapes. In this study we present a methodology for quantifying cultural services. To gain understanding of the services valued by cultural service users, a survey was conducted with tourists in the municipality of Winterswijk. The survey collected data on landscape preferences for individual landscape features, and the structure and composition of the landscape as a whole. This was linked to respondent appreciation of the landscape functions of recreation, aesthetic beauty, cultural heritage, spirituality and inspiration. To give a monetary estimate of the value of these services a willingness to pay (WTP) exercise was conducted using photo manipulations depicting likely landscape changes. Increased residential infill, the removal of landscape elements for improved agricultural production and rewilding due to agricultural abandonment were simulated. Complementary to this estimate, a travel cost estimate of the value of landscape service was done based on respondents' travel time to reach the region. The monetary value of the cultural services is placed between €86 (WTP) and €23 (travel cost) per tourist/year. The achieved understanding of the spatial heterogeneity of service provision in the region, as well as, the monetary valuation of the assets delivered by the landscape can help in prioritizing areas, and landscape features and structure for maintenance/restoration, while demonstrating the importance of conserving cultural service delivery.

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1. Introduction

Humans benefit from the numerous services that rural ecosystems deliver whether that is the provision of food, the regulation of clean water or the inspiration invoked by a beautiful landscape (MA, 2003). In Europe, many agricultural landscapes are hot spots of ecosystem service delivery (Pinto-Correia et al., 2006; Solymosi, 2011; Stenseke, 2009). Such agricultural landscapes are often denoted as cultural landscapes, which are typically defined as landscapes managed by traditional agricultural techniques, locally adapted and historic, by family and/or subsistence methods (IEEP, 2007). Often they contribute to a unique aesthetic character and support a co-produced human–ecological system. Yet, due to processes of agricultural intensification, occurring in many parts of Europe, cultural landscape are being transformed in ways

that negatively affect the delivery of cultural ecosystem services (Zimmermann, 2006).

Over the last decades there has been much attention given to maintaining spatial and economic synergies between ecosystem functions in rural areas as part of development planning. This is generally thought to allow local communities to better cope with the various endogenous and exogenous pressures that can threaten livelihoods in these landscapes (Marsden and Sonnino, 2008; Knickel et al., 2004; O'Farrell and Anderson, 2010; Renting et al., 2009; Wilson, 2010). Promotion of tourism and recreation, based on the existing features and traditions, is a preferred rural development option (Van Berkel and Verburg, 2011). It enables income generation outside of agricultural production intensification and promotes the preservation of existing assets (Buijs et al., 2006; Marsden, 1999). Tourism attractions are related to people's awareness and perceived importance of aesthetic beauty, cultural heritage, spirituality and inspiration (Brown, 2006). Such characteristics are non-material benefits related to land management and therefore non-exclusive. Failure to provide enough incentives for the maintenance of cultural landscapes may result in their loss

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and/or degradation (Swinton et al., 2007). The quantification of the cultural services provided by landscapes both in monetary and spatial terms can contribute to understanding options for future development that retain tourism assets.

Major contributions have been made to the understanding of both the monetary costs and benefits of ecosystem service delivery. Studies mapping ecosystem services have offered policymakers insight into priority locations for service delivery (Egoh et al., 2008; Lautenbach et al., 2011; Nedkov and Burkhard, 2011; Nelson et al., 2009; Willemen et al., 2008). These studies are often limited to examining provisioning and regulatory services based on readily available biophysical data. The normative nature of cultural services and the heterogeneity in valuation of societal actors has made their quantification more difficult (Ryan, 2011). Most studies evaluating ecosystem services have been limited to quantifying recreation and tourism, leaving out the intrinsic qualities that are interrelated with tourism in the cultural service category. Still, a number of techniques have been developed for the localisation of services valued by stakeholders, including cultural services, through participatory mapping (Alessa et al., 2008; Brown and Raymond, 2007; Bryan et al., 2010; Dramstad et al., 2006; Raymond et al., 2009; Sherrouse et al., 2011). The identification of locations of high service delivery has been helpful for understanding the spatial determinants of fortuitous ecosystem delivery, and its associated value to society.

One particular challenge for participatory mapping has been describing the monetary value of the identified services, which is the focus of economic valuation of ecosystems. Revealed preference techniques have been useful in estimating the actual and direct uses cost incurred by service users (Geoghegan et al., 1997; Hein, 2011; Ma and Swinton, 2011; Martín-López et al., 2009; Santana-Jiménez et al., 2011). While based on a number of broad assumptions, such techniques avoid respondent bias for instance with warm glow responses (Hanley et al., 2001). Stated preference techniques, including contingent valuation and discrete choice, have been more widely used for valuations of non-use services like biodiversity (Biol et al., 2008). Such studies reveal the societal values placed upon intrinsic characteristics while perhaps overestimating the actual costs that individuals would pay (Hanley et al., 2001). While debates abound regarding the accuracy and reliability of derived prices, results have had major policy impact where ecosystem goods and service are now being considered seriously in ecosystem management (Kinzig et al., 2011).

This study adds to this body of literature by integrating both a spatial quantification and economic valuation of cultural services. We consider both individual landscape features and landscape structure. This is then related to tourist experience and appreciation of recreation, aesthetic beauty, cultural heritage, spirituality and inspiration in the landscape. By characterizing preferences of stakeholders, a spatial localisation and analysis of landscape services is made. In addition, monetary valuation gives an indication of how important these services are for the regional economy itself.

The research is conducted in the Achterhoek region of the Netherlands, which has a well developed tourism industry based on the cultural landscape and nature attractions. The eastern areas have retained much of their preindustrial character due to unique historical circumstances that prevented farmers from reorganising small parcels into large agricultural plots (Wildenbeest, 1989). The landscape is presently characterized by a network of interlinking tree lines and hedgerows called the *coulissen* landscape. Tree shadows created by tree lines reduce agricultural production and are a hindrance for modern farming equipment. This in conjunction with an aging farmer population and the price production squeeze has resulted in some landowners removing landscape elements for agricultural production scale enlargement.

2. Methodology

2.1. Method overview

The main aim of the study is to locate and quantify the cultural services provided by the landscape and provide a monetary valuation of these services. A differentiation of the contribution of individual elements of the landscape and the landscape composition and structure to the provision of these services is made. Empirical data was collected in the eastern most municipalities of the Achterhoek (Fig. 1) by way of a questionnaire survey in the summer of 2011. Statistical analysis was employed to identify groups of respondents with similar appreciation of landscape functioning and to ascertain their preference for landscape features, structure and evolution. Preferences were then translated into maps showing hot spots of cultural service provision. Respondents' willingness to pay (WTP) for landscape maintenance is provided to give an estimate of the potential value of landscape services in the region, under conditions of ongoing change. A travel time/cost estimate is made of the revealed value of these landscape services to complement the WTP estimate.

2.2. Survey

The questionnaire was administered in the municipality of Winterswijk by an experienced survey team. Respondents were interviewed in person at campsites, agri-campsites, recreation areas (lakes, nature areas and popular tourist locations) in both the Dutch and German language. This allowed for targeting the majority of tourists in different locations that contribute to the tourist function of the region. The face to face survey method increased response rates as compared with mail-in surveys which are difficult to administer with tourists that do not reside in the region. In total 115 respondents took part in the survey. The average age of the sample was 53 with many visitors nearing retirement age or retired (50% older than 55). The average net income per respondent's household was near the Dutch national average of 2315€ per month. The mean educational attainment was preparatory and secondary vocational education (*MBO, HBO*). The sample group was comprised of both 'recreants' and 'tourists'. Recreants are defined as those respondents living within a half an hour of their leisure activity ($n = 17$) and tourists are all those living further away ($n = 98$). The average travel time to reach Winterswijk was 1 h 23 min, which is approximately the time needed to reach the destination from the central part of the Netherlands. The total sample size is comparable to other ecosystem service mapping studies (Bryan et al., 2010; Dramstad et al., 2006) while being smaller than national preference surveys employing mail-in questionnaires (Brouwer and Slangen, 1998; Soliva et al., 2010).

2.3. Survey method

The questionnaire consisted of three parts: (1) personal data was collected for analysis of the sample group and application of the travel time/cost method; (2) respondents' appreciation for different landscape features, structure and landscape changes were taken; and (3) a monetary valuation of the current landscape was estimated by asking respondents their WTP for landscape preservation considering likely landscape changes. Preferences were obtained through respondents' evaluations of photos and photo manipulations (Figs. 2 and 3). Photos of individual landscape elements representing different local landscape features (forest, tree lines, recreation facilities, cultural buildings, etc.) and aerial photos of landscape structure and composition were used (representing different amounts and configuration of agricultural, forest and hedgerows/tree lines). A number of studies have

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