Journal of Arid Environments 124 (2016) 13–21

Contents lists available at ScienceDirect

Journal of Arid Environments

journal homepage: www.elsevier.com/locate/jaridenv

The value of time in biological conservation and supplied ecosystem services: A willingness to give up time exercise

Marina García-Llorente [a, b, c, *], Antonio J. Castro [d, e], Cristina Quintas-Soriano [b, d], Iván López [c, f], Hermelindo Castro [d], Carlos Montes [b], Berta Martín-López [b]

[a] Department of Applied Research and Agricultural Extension, Madrid Institute for Rural, Agricultural and Food Research and Development (IMIDRA), Ctra. Madrid-Barcelona (N-II), KM. 38.200, 28802 Alcalá de Henares, Madrid, Spain
[b] Social–Ecological Systems Laboratory, Department of Ecology, Universidad Autónoma de Madrid, 28049, Madrid, Spain
[c] Department of Social Analysis, University Carlos III, 28903, Madrid, Spain
[d] Andalusian Center for the Assessment and Monitoring of Global Change (CAESCG), Department of Biology and Geology, Ctra. Sacramento s/n, La Cañada de San Urbano, Universidad de Almería, 04120 Almería, Spain
[e] Department of Biology, Idaho State University, Pocatello, ID 83209, USA
[f] Faculty of Political Science and Sociology, Complutense University Madrid, 28223 Pozuelo de Alarcón, Madrid, Spain

ARTICLE INFO

Article history:
Received 23 January 2015
Received in revised form
28 June 2015
Accepted 13 July 2015
Available online xxx

Keywords:
Conservation activity
Ecosystem service
Rural area
Semi-arid Spain
Socio-cultural value
Willingness to give up time

ABSTRACT

This study was motivated by the necessity to develop social but not necessarily monetary techniques to characterize the connections between ecological processes and society. Given this goal, we analyzed social support for biodiversity conservation and ecosystem service delivery in semi-arid environments in Spain, based on the willingness to give up time. We took into consideration different types of conservation activities and different ecosystem service categories. In addition, we explored the effect of the respondent's place of residence and gender. Overall, the satisfaction of conserving species continues to be the prominent driving force in engaging public support for conservation programs over ecosystem services. However, we found significant differences by place of residence and gender, with implications for the promotion of social engagement. Urban respondents were particularly interested in allocating time to activities associated with protected-area programs, while rural inhabitants were willing to engage in activities related to cultural services. With respect to gender, women were highly motivated to support activities that enhance rural areas. The results show that the willingness to give up time reflects socio-cultural factors behind consumer preferences. In addition, its application could promote collaborative work and strengthen community values and beliefs.

1. Introduction

The importance of ecosystems and their biodiversity in supporting human well-being through the supply of multiple ecosystem services (ES) on which society depends is now widely recognized (Cardinale et al. 2012). The necessity of measuring these contributions by developing ES assessments is also well established (MA, 2005). Integrated assessments are used to address both sides of the process (Martín-López et al. 2014): ES providers (defined as components of biodiversity or landscape units that deliver a given ES; Harrington et al. 2010) and ES beneficiaries (defined as those who perceive, demand, use, enjoy, or value these types of ES; adapted from Harrington et al. 2010). ES should then be characterized from the demand side, by analyzing the motivations and factors underlying the associated socio-cultural and economic values (Cowling et al. 2008). However, the study of the demand side is usually polarized toward the economic values of ES (Seppelt et al. 2011), masking the socio-cultural values beyond the markets or the willingness to preserve ES (Martín-López et al. 2012). The simplification of social demand in economic metrics could be partially associated with the occidental culture that leads to viewing well-being in terms of economic status (Aguado et al. 2012). Further, it

* Corresponding author. Department of Applied Research and Agricultural Extension, Madrid Institute for Rural, Agricultural and Food Research and Development (IMIDRA), Ctra. Madrid-Barcelona (N-II), KM. 38.200, 28802 Alcalá de Henares, Madrid, Spain.
E-mail addresses: marina.garcia.llorente@madrid.org (M. García-Llorente), acastro@ou.edu (A.J. Castro), cqs572@alboran.ual.es (C. Quintas-Soriano), ivalopez@ucm.es (I. López), hcn068@caescg.org (H. Castro), carlos.montes@uam.es (C. Montes), berta.martin@uam.es (B. Martín-López).

http://dx.doi.org/10.1016/j.jaridenv.2015.07.004
0140-1963/

might be related by the urgent demand of decision makers to asses ES in monetary terms so that they can make more informed decisions on the basis of cost–benefit analyses.

Non-monetary techniques lend visibility to the intangible and incommensurable contributions provided by nature to society, bringing to the table the multiple (i.e. cultural, educational, moral, historical, spiritual or therapeutic) values of ES (Chan et al. 2012; Daniel et al. 2012). Therefore, non-monetary approaches may help in addressing the limitations of traditional economic exercises. For hypothetical markets in contingent valuation (i.e. willingness to pay, WTP), these limitations concern the ability (or inability) to pay and the income constrains, resulting in WTP not being a realistic vehicle of payment. In this sense, it has been stated that willingness to give up time (WTT) should be considered a useful non-monetary technique, particularly in rural areas with economic limitations (Kenter et al. 2011; Higuera et al. 2012). Further, García-Llorente et al. (2011) found that using time allocation as vehicle payment is one of the preferred alternatives to express public support for ES preservation.

The research presented here analyzes social support for biodiversity conservation and ES delivery in semi-arid environments in Spain using stated preference techniques, with the payment vehicle being expressed in working hours rather than monetary units.

Rural areas and its agrarian character are the source of most essential ES demanded by both urban and rural populations, such as provisioning services (e.g. food from crops, genetic materials), regulating services (e.g. mass stabilization and control of erosion rates), and cultural services (e.g. cultural heritage, aesthetic experiences). In the Mediterranean, and, in particular in the semi-arid region, the traditional agriculture carried out by rural inhabitants based on terraces and *acequias* (traditional irrigation ditches) have facilitated the preservation of soils and water flows, respectively. In doing so, they also contribute to the supply of related ES (García-Llorente et al. 2012). However, the semi-arid region has faced significant land cover changes and socio-economic transformations, with rural and farmland abandonment becoming an important driver of biodiversity and ES decline. When abandonment takes place, the scarce and irregular precipitation limits seed germination and plant colonization; with the unique success of some colonizing species creating landscape homogenization and the development of sedimentary crust in soils (Pugnaire et al. 2006; García-Ruiz and Lana Renault, 2011). The depopulation processes, the decline of extensive agriculture, together with the fragility of semi-arid ecosystems jeopardize the capacity of these areas to conserve biodiversity and provide ES (Quintas-Soriano et al. 2014; Otero et al. 2015). Previous studies on this subject have demonstrated the necessity of maintaining both cultural and biological diversity to ensure a wide flow of ES on semi-arid environments (García-Llorente et al. 2012).

This study was motivated by the necessity of developing social but not necessarily monetary techniques for exploring the underlying motivations behind biodiversity conservation and ES delivery, with the latter being understood as a way to revitalize rural areas in semi-arid environments. To deal with this challenge, we specifically addressed the following four objectives: (1) to explore the influence of socio-cultural factors (e.g. visiting protected areas, respondents' available time, education level) on individual decisions in the WTT with respect to contributing to biodiversity conservation (hereafter, WTTB) and the delivery of ES (hereafter, WTTES), (2) to analyze the most important biodiversity conservation and ES activities for which stakeholders are willing to give up time, (3) to examine the effects of the place of residence (i.e. rural vs. urban municipalities) and gender on the WTTB and WTTES, and finally (4) to compare the labor hours stakeholders were willing to allocate to WTTB and WTTES, to distinguish between non-use values (i.e. the existence value, which is defined as the moral satisfaction obtained from biodiversity conservation; Kahneman and Knetsch, 1992) and use values (i.e. the instrumental value related to ES that is derived from the conscious and unconscious use and enjoyment of ES by individuals; Turner et al. 2008).

2. Material and methods

2.1. Study area

The study area comprises the semi-arid ecosystems of the southeastern Iberian Peninsula and covers 1 220 711 ha (Fig. 1). This region is considered the most arid region of continental Europe, with a predominantly Mediterranean warm and dry climate, average annual temperatures between 12 and 15 °C, and average annual rainfall less than 350 mm in most of the region (Armas et al. 2011). This territory is characterized by substantial topographic heterogeneity and an intense altitudinal gradient, ranging from 0 masl at the coastline to a maximum of 2040 masl.

On the socio-economic side, the area includes a total population of 919 405 inhabitants in 2012, distributed between urban areas (areas with a population density >100 inhabitants/km^2 and/or population >30 000 inhabitants), rural areas (areas with a population density <100 inhabitants/km^2 and population <30 000 inhabitants), and rural areas to be revitalized (those municipalities declared by Spanish Law, Law 45/2007 on Rural Development, as high priorities for implementation of actions and plans) located in the Almeria and Granada provinces (Fig. 1). In particular 62% of the total population lives in urban areas, 18% in rural areas, and 20% in rural areas to be revitalized (Fig. 1).

Traditional agriculture (i.e. olive and almond growing), and extensive livestock production are the predominant economic activities in the rural areas in this region, while the urban municipalities located on the coast are mainly associated with intensive agriculture and beach tourism (García-Llorente et al. 2012).

2.2. Survey design and sampling strategy

We structured the questionnaires to address the six following topics: (1) the respondent's relationship with the study area, (2) the respondent's perception of the importance of ES for society in the area, (3) WTT exercises—including WTTB and WTTES, (4) the respondent's allocation of time in a normal day, (5) the respondent's general environmental interest, and (6) socio-demographic information (a detailed description of these variables is presented in Appendix A).

The two valuation questions presented in the third section (WTT exercises) were as follows: *"Recognizing that the current situation in the study area reflects rural abandonment, a decrease in traditional agricultural activities, and erosion of biodiversity, (i) would you be willing to contribute some of your time to a local environmental and cultural organization to promote biodiversity conservation?" (WTTB) and "(ii) considering that some semi-arid areas are characterized by low population densities, a decline in agricultural activity, low levels of income, and geographical isolation, would you be willing to contribute time to a local environmental and cultural organization to support ES delivery as a way to revitalize rural areas?"* (WTTES).

After each WTT question, if a respondent answered "no" to either of the two parts, to differentiate protest answers (i.e. when the elicitation method used provokes a rejection answer) from real zero answers (i.e. when welfare is totally unaffected by the proposal) the respondent was asked for the reasons for not being willing to contribute. If the participant answered "yes," we asked them to state the maximum amount of time that they would be willing to dedicate (hours/week). With respect to the WTTB option,