Using a discrete choice experiment for landscape management under the European Landscape Convention

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Abstract

Like many landscapes throughout the world, the landscapes of Llanada Alavesa (Basque Country, Spain) are suffering from human and natural alterations, necessitating urgent management. We apply a Discrete Choice Experiment (DCE) to assess the social preferences for the key attributes that form the landscapes of a specific area (Llanada Alavesa). The DCE is motivated by the need to provide policymakers with useful information related to landscape protection, management and planning in the context of the European Landscape Convention (ELC). A Random Parameter Logit (RPL) model was used since we observed large variations in the values placed by individuals on landscape features that could not be explained fully on the basis of the socio-economic differences between the respondents. According to our welfare analysis, citizens seem to support the protection, management and planning programme when this promotes organic farming and native forests which, in turn was found to be strongly culturally dependent. This study concludes that the DCE valuation method may be an appropriate tool to protect, manage and plan landscapes in accordance with the principles and objectives of the ELC.

Key words: European landscape convention; discrete choice experiment; Llanada Alavesa; random parameter logit; willingness to pay; welfare measure

1. Introduction

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Over the last years, human activities have brought about major changes to the world’s landscapes. Actually, landscapes change continuously because they are the expression of the dynamic interaction between natural and cultural forces in the environment and more specifically, due to population growth, changes in lifestyle, competing demands for land for local and global food and fuel security as well as natural disasters. Moreover, the current changes are increasingly regarded as a threat because they are often characterised by the loss of diversity, coherence and identity of the existing landscapes (Balej et al., 2010). These rapid changes and sometimes chaotic landscape dynamics produce the need to preserve, manage and develop landscapes based on a balanced and harmonious relationship between social needs, economic activity and the environment.

This is the case for European landscapes, which are an appreciated resource subjected to a high level of transformation. The approval of the European Landscape Convention (ELC) (Council of Europe, 2000) initiated more research and action programmes related to the landscape in most European countries than ever before. A significant difference from older regulations regarding landscape protection is that all kinds of landscapes are involved and not just especially valuable sites, such as natural protected sites. Moreover, it is recognised that European landscapes are a basic component of the European natural and cultural heritage and that they constitute a resource that is favourable to economic activity (e.g. they can create jobs).

The ELC also introduces a series of formal landscape definitions as well as a series of recommendations. The aim of the ELC is to promote landscape protection, management and planning and to organise European co-operation on landscape issues. The general public is set as the main information source to guide the protection, management and planning processes of the landscapes. Although general and specific measures are proposed, the ELC is not explicit regarding how to proceed and gives the freedom to determine how the agreement is implemented (Déjeant-Pons, 2006). What it is clear is that the competent public authorities are responsible for organising the public’s participation, by collecting their aspirations and translating them into policy actions.

Opened for signature on 20 October 2000, the Convention entered into force on 1 March 2004, after 10 member states had ratified it. More belatedly, Spain signed and ratified the Convention in 2008 and the Basque Country officially adhered to it in 2009. Therefore, with the adherence of the Basque Country to the ELC, the Basque authorities made a commitment to promote the ELC principles and a landscape law. However, due to the public good character (i.e. the landscape itself is non-excludable and non-rival in nature), complex definition and holistic
nature of landscapes, effective governance is often complex and challenging (for different interpretations and connotations of the term “landscape” see van der Heide and Heijman, 2013, p. 4). The challenge for policy-makers is to find a way to quantify the value of landscapes to the local residents and to incorporate these values into their landscape protection, management and planning decisions (Johnston and Duke, 2007).

In this context, the Discrete Choice Experiment (DCE) valuation technique can enrich the process of landscape decision-making mainly due to its flexibility and ability to take into account the multidimensional nature of landscapes and to provide detailed information about marginal changes in landscapes as well as trade-offs between the landscape attributes themselves and between the landscape attributes and money (Adamowicz et al., 1998; Bennett and Blamey, 2001; Bateman et al., 2002). In addition, as DCE allows the definition of the landscape in terms of its attributes or features, it could also become an important reference for landscape architects in designing rural and urban landscapes. DCE has been argued to be ideally suited to informing both the election and the design of multidimensional policies (Hanley et al., 2001; Horne et al., 2005) and seems to be an appropriate valuation method to achieve the objective of protecting, managing and planning landscapes under the ELC framework, especially given the emphasis it puts on the general public's preferences as the main information source to guide it.

This paper provides an application of the DCE methodology to landscape valuation under the ELC in the Basque Country. The DCE methodology may be especially suited to the ELC because: (1) it is a tool for public consultation and (2) it offers an insight into what individuals are willing to pay for the key attributes of multidimensional landscapes. Additionally, this application provides local policy-makers with valuable information on the social desirability of potential future landscape protection, management and planning programmes.

The paper is structured as follows. The following Section 2 describes the case study area. Section 3 is devoted to the DCE methodology, concerning the survey design, data collection and econometric specification. Section 4 presents a detailed analysis of the results and Section 5 provides a discussion and some concluding remarks.

2. Case study description

The DCE involves the landscapes of a specific area known as Llanada Alavesa. This area is located in the province of Araba, one of the three provinces that form the Basque Autonomous Community (BAC) in Spain (see Figure 1). Llanada Alavesa is a wide plain extending in the
central and north-eastern part of Araba and encompasses 256868 people according to Basque Statistic Office (EUSTAT), almost 80% of the population of the province of Araba. Different types of landscapes, natural habitats and human activities live together in this area such as, farming, forests, industry, services, infrastructures and swamps.

Figure 1. Location of the area of Llanada Alavesa in the Basque Autonomous Community (Spain)

Given its topography, 45% of the area is devoted to farming, which produces mainly potatoes, cereal and beetroot. Approximately 29% of the agricultural surface is devoted to intensive farming, which employs chemical fertilisers and pesticides as well as making high use of machinery to achieve a higher level of production. The remaining 16% is covered by organic farming, which does not use non-natural synthetic products or genetically modified organisms and makes more limited use of machinery, resulting in environment-friendly and high-quality production. The landscapes of Llanada Alavesa exhibit great richness of flora, fauna and habitat diversity. Its native forests take up 39% of the surface of Llanada Alavesa and support centenary and even millenary trees, such as oaks (*Quercus robur*) and gall oaks (*Quercus faginea*). However, both tree species have been severely affected by human actions (e.g. coal, firewood and planking). Moreover, these forests are home to threatened, vulnerable and rare animals, such as otters (*Lutra lutra*) or European minks (*mustela vitrelola*), and plant species, such as *Pentaglottis sempervirens* or *Littorella uniflora* plants.

Urban and industrial sites in addition to infrastructures are also present. Companies working in the automotive industry, wind generation and machine tools are located in the area of Llanada Alavesa largely due to its good communications. It is estimated that currently 14% of the area of Llanada Alavesa is occupied by urban, industrial and economic activity sites as well as by infrastructures. Henceforth, this landscape attribute definition will be referred to as cemented surface (i.e. 14% is cemented surface). Recreation areas are also common in this area, such as the *Ullibarri* and *Urrunaga* reservoirs. These swamps constitute the largest Basque wetland and a unique leisure location where fishing, canoeing, cycling and hiking are
possible. Llanada Alavesa also presents a large cultural heritage. Romanesque chapels and churches, megalithic monuments, medieval towns, typical Basque farms (baserri) or a branch of the way of St James are located in this historical area. In addition, many of the villages of Llanada Alavesa hold ancient rural traditions.

The maximum transformation of the landscapes of this area has always come from the hands of the primary sector, basically from agriculture. The most radical changes in the landscapes of the area have been represented by the plots' concentration of the 1960s (plots became larger and field boundaries and bank vegetation largely disappeared) and to a lesser extent by the agricultural mechanisation and the intensive farming usages. Nowadays, the biggest changes come from infrastructure, urban and non-residential land development projects. In addition, the Partial Territorial Plan of Central Araba and General Urban Planning Plans are also leading to landscape transformation processes of great territorial magnitude. In the last 30 years, the cemented surface of Llanada Alavesa has approximately tripled, largely due to different regional, town and sectoral planning measures.

The persistent changes in landscapes have raised concerns about the sustainability of development based on social needs, economic activity and the environment. With the adherence of the Basque Country to the ELC, the Basque authorities ought to adopt measures to protect, manage and plan the different landscapes so that their quality is preserved and improved. Compiling information on how much people are willing to pay for landscape protection, management and planning, particularly regarding the types of these landscapes’ attributes, may help to guide the development of effective programmes. This section has described the main characteristics of the landscapes under study, representing the economic, ecological, social and cultural values (intensive and organic agricultural land, native forests, cemented surface, recreation areas and cultural heritage).

3. The discrete choice experiment for landscape valuation

The methodology we used to evaluate the social preferences for the key attributes of the landscapes of Llanada Alavesa is DCE. In recent years, various DCEs have been applied to the economic valuation of landscape changes in Europe. To our knowledge, the first European DCE study was reported by Bergland (1997) and attempted to measure the value of certain attributes (hedgerows, creeks, fences, vegetation islands and paths) of the agricultural landscape in Norway. A year later, Bullock et al. (1998), Hanley et al. (1998a) and Hanley et al. (1998b) estimated the willingness to pay (WTP) for different attributes of the deer stalking
experience in the Scottish highlands, for the conservation and landscape benefits of environmentally sensitive areas in Scotland and for changes in landscape elements in the UK’s public forests, respectively.

Since then, a growing number of DCE studies have been published in Europe. For example, Rambonilaza and Dachary-Bernard (2007) used the DCE method to examine public preferences for three landscape features (hedgerows, farm buildings and scrubland) in the Monts d’Arrèe region in Brittany (France). More recently, Grammatikopoulou et al. (2012) employed a DCE to evaluate a management programme that provides certain landscape attributes (proportion of uncultivated land, number of plant species, grazing animals, water protection zones and state of production buildings) in the southern Finnish agricultural landscape. Another recent DCE application was conducted by Liekens et al. (2013) to evaluate the public preferences associated with land use changes from agricultural land to different types of nature in the Flemish region in Belgium.

Spain also presents widespread use of DCE valuation methods concerning landscape valuation. For instance, Kallas et al. (2007) applied this stated preference method for valuing the multifunctionality of the agricultural landscape of Tierra de Campos in Castile and Leon. Similarly, Arriaza et al. (2008) estimated the social demand for agricultural multifunctionality from mountain olive groves of Andalusia. Another Spanish example is the DCE conducted by Domínguez-Torreiro and Soliño (2011), which estimated the welfare change associated with multifunctional rural development programmes in Cantabria. In the Basque Country, it is possible to find DCE applications focused on the economic valuation of the Basque forests (Pascual, 2007), the natural area of Mount Jaizkibel (Hoyos et al., 2009) and a regional Natura 2000 network site (Hoyos et al., 2012). The present study is the first one to value changes in landscapes to help policy-makers design policies aimed at protecting, managing and planning landscapes in the context of the ELC in the Basque Country.

There are three main stages when undertaking a DCE, which will be addressed in the next sub-sections for the present DCE application. The first stage focuses on the survey design of the DCE, which in turn involves four steps: (i) the definition of attributes, levels of provision and payment vehicle; (ii) the experimental design; (iii) the questionnaire development; and (iv) the data collection. The second stage is devoted to the econometric analysis of the choice data in order to estimate the preferences of the individuals, while the third stage obtains welfare measures and policy analysis based on the model resulting from the second stage (Hoyos, 2010)
3.1 Survey design

A valuation survey was conducted in Araba to determine the non-market values of the main attributes of the landscapes of Llanada Alavesa. The beginning of the questionnaire contained the information on the case study and the objective of the valuation study. The respondents were informed about the current situation of the landscapes of Llanada Alavesa and the need for a policy for the protection, planning and management of these landscapes. Further on in the questionnaire, the attributes to be valued and their levels of provision were described.

The definition of attributes and their levels is a crucial aspect of any DCE, given that only information about preferences given by respondents takes the form of choices between the proposed alternatives (Hensher, 2007). For the definition of the landscape attributes and levels of provision in our study, we carried out an extensive literature review on European DCEs valuing landscapes, investigated the landscape features of Llanada Alavesa and considered expert advice obtained from bio-geographers and economists as well as conducting a focus group discussion. The focus group was led by a professional in October 2012 to test the appropriateness of the landscape attributes (and their levels), photographic materials, valuation context and payment vehicle.

The attributes and levels considered in the final version of the questionnaire were (see Table 1): (1) intensive farming, represented by the percentage of the land of Llanada Alavesa devoted to intensive farming; (2) organic farming, measured by the percentage of the land of Llanada Alvesa taken up by organic farming; (3) native forests, represented by the percentage of the land covered by native forests; (4) cemented surface, represented by the percentage of the surface occupied by urban, industrial and economic activity sites as well as by infrastructures; and (5) recreation areas, measured by the level of conservation and protection of both the recreation areas and the cultural heritage. All these attributes were specified on four different levels, the first of which corresponded to the current situation (status quo), whereas the remaining three assumed hypothesised changes in the protection, management and planning of the landscapes. Note that the hypothesised future levels of the attributes were calculated and provided by experts in this field and these were found to be both credible and understandable by the focus group participants.

Furthermore, a monetary attribute was included, which was required to estimate welfare changes. The proposed payment vehicle was an annual payment through a new tax to be paid by the citizens of Araba to an organisation exclusively dedicated to coordinating the
protection, management and planning actions. The usual reminder of the budget constraint was incorporated. An annual payment through a new tax was preferred to voluntary donations since respondents may have incentives to free-ride with the latter (Whitehead, 2006). The payment vehicle employed and the cost levels (ranging from €0 to €50 per person) were found to be reasonable and acceptable by focus groups participants.

Table 1. Attributes and levels considered in the DCE

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensive Farming (IF)</strong></td>
<td>29%* 20% 15% 35%</td>
</tr>
<tr>
<td><strong>Organic Farming (OF)</strong></td>
<td>16%* 25% 30% 8%</td>
</tr>
<tr>
<td><strong>Native Forests (NF)</strong></td>
<td>39%* 45% 50% 30%</td>
</tr>
<tr>
<td><strong>Cemented Surface (CS)</strong></td>
<td>14%* 16% 20% 25%</td>
</tr>
<tr>
<td><strong>Recreation Areas (RA)</strong></td>
<td>Medium* Very high High Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost</th>
<th>Annual payment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€0* €5 €15 €30 €50</td>
</tr>
</tbody>
</table>

* Levels with an asterisk represent the status quo scenario.

The six attributes and their varying levels allowed a large number of alternatives to be constructed \(4^5 \times 5^1\). In order to reduce the number of alternatives and choice sets, we applied a \(D\)-efficient main-effects fractional factorial design that attempted to minimise the variances of the parameter estimates obtained for each of the attribute coefficients included in the utility specification and used fixed prior information on the parameter values (Scarpa and Rose, 2008). The design was also constrained so that the sum of the land devoted to the first four attributes considered would not exceed the total land percentage in the current situation (98%). As a result, 120 versions of the choice sets were constructed from the design and these were randomly divided into 20 blocks.

Figure 2 shows an example of a choice set used in the questionnaire. Each respondent was presented with six choice sets and asked to choose one from option A (the status quo defined
by the current attribute levels) and the two alternative options B and C (defined by varying levels of the attributes) for each choice card. As can be seen in Figure 2, the choice set included some pictures of the attributes considered and a graphical representation of their levels to facilitate the choice task understanding. The questionnaire also tested the understanding of the choice task by including an additional “rationality” choice set in which respondents faced the same attribute levels as in option A (status quo) but with a higher cost, so we expected respondents always to choose the status quo.

Figure 2. Example of a choice set (translated into English)

Apart from the choice tasks, questions concerning the relation of the respondents to the case study area, questions related to the attributes considered (warm-up questions) and an evaluative perception exercise of various landscape elements were included in the final survey. Furthermore, data on the respondents’ social and economic characteristics in addition to their environmental attitudes were collected.

3.2 Data collection and final number of observations

The questionnaire was administered through face-to-face interviews. Although face-to-face interviews are more time-consuming and expensive than web-based surveys, we considered them advantageous in encouraging participation and offering respondents the
largest response scope for the detailed questions, pictures and answers. The relevant population considered was that of the Basque province of Araba, accounting for 266014 residents aged at least 18 (EUSTAT). The pilot survey was conducted in November 2012 with 60 individuals, and showed that the survey instruments were broadly understood and that the attributes and levels, including the price vector, had been appropriately defined. The final survey was undertaken between December 2012 and January 2013. A stratified random sample of 521 individuals was selected from the relevant population. The strata used included the age, gender and size of the town of residence, following official statistical information provided by EUSTAT. In each of the townships of Araba, the questionnaire was distributed using random survey routes.

It is important to analyse the valid responses we obtained from the choice sets for the further analysis of welfare measures. Out of the 521 survey respondents, everyone understood the objective of contributing or not to the proposed initiative. However, a total of 317 respondents chose option A (status quo) in the first choice card. Status quo responses may be categorised into two types (Meyerhoff and Liebe, 2008 and 2009): (1) the status quo choice may truly indicate that the respondent does not place any value on the proposed alternatives based on landscape changes, hence expressing a real preference for the current situation (known as true zero bids or non-protest responses) and (2) the status quo choice may hide some kind of protest attitude, whereby the respondent reports a zero WTP even though her/his true value for the landscape programme in question is positive (known as false zeros or protest responses).

We used a set of follow-up questions to analyse the reason that led the individual to choose the status quo and determine whether s/he was a protest respondent (i.e. that individual was not willing to state his/her true or real WTP for changes in the level of landscape protection, management and planning regardless of the alternatives presented in the choice card in question). For the selection of protest and non-protest, we followed the state of practice in environmental valuation with stated preference (SP) methods (e.g. Hanley et al., 2007; Lindberg et al., 2009; Jacobsen et al., 2011; Martin-Ortega et al., 2011; Schaafsma et al., 2012).

278 failed to enter into the market (protest respondents), of whom most stated that they already paid too much tax followed by the opinion that this initiative should be financed entirely by the Government. We devote this high presence of protest responses to the adverse economic situation at the time the survey was conducted. In order to obtain reliable and
unbiased welfare estimates, we excluded protest responses from the sample, as is the common practice in the literature (e.g. Glenk et al., 2011; Martin-Ortega et al., 2011; Liekens et al., 2013).

The next step in obtaining the final number of observations was to delete from the sample those respondents who failed to pass the rationality test (25 respondents). All in all, the data analysis used 218 completed questionnaires, yielding 1308 observations as each respondent faced six choice sets. Although slightly more than half of the respondents were dropped from the final analysis, we consider that the results are more robust in terms of their reliability. The benefit of higher reliability of the results comes at the expense of slightly reducing the representativeness of the sample, which has been the case in many DCE studies (e.g. Glenk and Colombo, 2011; Glenk et al., 2011; Jacobsen et al., 2011; Hoyos et al., 2012).

The DCE literature does not provide many details about the sample size calculation. Louviere et al. (2000) and Hensher et al. (2005) offered a brief guide to calculating the minimum sample size, which in DCEs is determined by the desired level of accuracy of the choice proportion of a particular alternative. If we aim to estimate the true choice proportion $p$ with accuracy $a$ (percentage of allowable deviation from the true proportion) and probability $\alpha$, then the minimum sample $n$ should satisfy:

$$n \geq \frac{1 - p}{p \cdot a^2} \Phi^{-1}\left(1 + \frac{\alpha}{2}\right),$$

where $\Phi^{-1}(\cdot)$ is the inverse cumulative distribution function of a standard normal and $r$ is the number of responses per individual.

**Table 2. Sample size**

<table>
<thead>
<tr>
<th>$a$</th>
<th>$p$</th>
<th>Min. number of responses</th>
<th>Min. number of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.10</td>
<td>7056.00</td>
<td>1176.00</td>
</tr>
<tr>
<td></td>
<td>0.20</td>
<td>3136.00</td>
<td>522.67</td>
</tr>
<tr>
<td></td>
<td>0.30</td>
<td>1829.33</td>
<td>304.89</td>
</tr>
<tr>
<td></td>
<td>0.40</td>
<td>1176.00</td>
<td>196.00</td>
</tr>
</tbody>
</table>

Table 2 presents the minimum sample size for our case of 6 responses per individual corresponding to the 5%, 8% and 10% precision levels and with 95% probability. The true proportions of the relevant population are not known, but the sample proportions associated
with the status quo (option A), option B and option C are 0.40, 0.31 and 0.28, respectively. If we assume that the true proportion is 0.2, which seems to be a conservative decision given the sample proportions, then our sample of 218 individuals guarantees the 8% precision level ($\alpha = 0.08$) with 95% probability ($\alpha = 0.95$). Further, the total number of observations is comparable with other European DCE studies for landscape valuation (e.g. Campbell, 2007; Colombo and Hanley, 2008; Elsasser et al., 2010; Domínguez-Torreiro and Soliño, 2011; Hoyos et al., 2012; Olschewski et al., 2012).

### 3.3 Econometric specification

In order to convert the individual choice responses into estimated parameters, the DCE employs the behavioural framework of the Random Utility Theory (RUT) developed by McFadden (1974). The utility function for individual $i$ choosing alternative $j$ on choice occasion $t$ is given by:

$$U_{it,j} = V_{it,j} + \varepsilon_{it,j},$$

(2)

where $V_{it,j}$ is the deterministic part of the latent utility that contains factors observable by the analyst and $\varepsilon_{it,j}$ is an error term. The presence of this unobserved error term is the key element that enables probabilistic inference to be made on individuals’ preferences (Ben-Akiva and Lerman, 1985).

In order to analyse the data, a Random Parameter Logit (RPL) model was applied, which assumes that $\varepsilon_{it,j}$ is independent and identically distributed (i.i.d.) as extreme value type I (Greene and Hensher, 2003; Hensher and Greene, 2003; Hensher et al., 2005). In the field of landscape valuation, this model has recently been used in investigating preferences for the environmental benefits associated with agri-environment schemes (Garrod et al., 2013), in examining individual preferences for river restoration (Bliem et al., 2012) or in assessing the WTP for improvements in ecosystem services in a lake district (Schaafsma et al., 2012).

In contrast to the traditional Multinomial Logit (MNL) model (McFadden, 1974; Louviere et al., 2000), the RPL specification is not subject to the undesirable Independence of Irrelevant Alternatives (IIA); it accounts for unobserved heterogeneity by allowing (some of) the parameters of the utility function to vary according to some distributions as well as considering that a respondent makes choices in more than one choice situation (Train, 2003; Siikamäki and Layton, 2007). Hess and Rose (2012) showed that an RPL with correlated parameters could
even represent scale heterogeneity and, therefore, more complex specifications such as the Generalised Multinomial Logit (G-MNL) model might not be necessary (Fiebig et al., 2010).

In the RPL model, the probability that individual $i$ chooses alternative $j$ in choice situation $t$ is:

$$P_{i,t,j} = \frac{\exp(x_{i,t,j}' \beta_i)}{\sum_{j'=1}^{J_t} \exp(x_{i,t,j}' \beta_i)},$$

(3)

where $x_{i,t,j}$ is a $(K \times 1)$ vector of the attribute levels of alternative $j$ (from a total of $J_t$ alternatives) for individual $i$ (from a total of $N$ individuals) in choice card $t$ (from a total of $T_i$ choice cards). In our application, the full vector of $K$ parameters is continuously distributed across individuals with:

$$\beta_i = \beta + \Delta z_i + \Gamma v_i,$$

(4)

where $\beta$ is a parameter vector representing the fixed means of the random parameter distribution, $z_i$ is the vector of observed individual-specific characteristics and $\Delta$ is the associated parameter matrix. The random unobserved taste variation is represented by $v_i$, a vector of uncorrelated random variables characterised by:

$$E(v_i) = 0, \quad \text{Var}(v_i) = \Sigma = \text{diag}[\sigma_1, \sigma_2, ..., \sigma_K].$$

(5)

The variances and covariances of the joint distribution of $\beta_i$ are parametrised in the unknown lower triangular matrix $\Gamma$ that is to be estimated. Then, the full variance-covariance matrix of the random parameters is:

$$\text{Var}(\beta_i) = \Gamma \Sigma \Gamma'.$$

(6)

The estimation procedure by maximising the simulated log-likelihood function is described in Greene and Hensher (2003), Hensher and Greene (2003) and Train (2003):

4. Results

4.1 Basic statistics

More than half of the sample respondents (54.59%) live and work or study in Llanada Alavesa. Moreover, we found that almost 57% of the respondents appreciate quite or a great deal that products are protected under a quality label (certificate of origin, organic farming, Basque label ...); almost 58% of the respondents are very concerned about biodiversity loss...
and approximately 57% about landscape quality loss. Table 3 shows the descriptive statistics of some socio-economic variables obtained in this application.

Table 3. Socio-economic variables and summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std Dev.</th>
<th>Min.</th>
<th>Max.</th>
<th>Respondents</th>
<th>Did not answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>42.28</td>
<td>14.68</td>
<td>18</td>
<td>76</td>
<td>218</td>
<td>0</td>
</tr>
<tr>
<td>Gender</td>
<td>1.49</td>
<td>0.50</td>
<td>1</td>
<td>2</td>
<td>218</td>
<td>0</td>
</tr>
<tr>
<td>Personal income</td>
<td>2.67</td>
<td>1.08</td>
<td>1</td>
<td>5</td>
<td>211</td>
<td>7</td>
</tr>
<tr>
<td>Employment</td>
<td>3.96</td>
<td>1.75</td>
<td>1</td>
<td>8</td>
<td>217</td>
<td>1</td>
</tr>
<tr>
<td>Llanada</td>
<td>0.76</td>
<td>0.43</td>
<td>0</td>
<td>1</td>
<td>218</td>
<td>0</td>
</tr>
<tr>
<td>Basque identity</td>
<td>0.16</td>
<td>0.36</td>
<td>0</td>
<td>1</td>
<td>217</td>
<td>1</td>
</tr>
<tr>
<td>Low income</td>
<td>0.29</td>
<td>0.46</td>
<td>0</td>
<td>1</td>
<td>218</td>
<td>0</td>
</tr>
<tr>
<td>High frequency</td>
<td>0.47</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
<td>218</td>
<td>0</td>
</tr>
</tbody>
</table>

The mean age (42.28 years) and gender decomposition (50.46% male and 49.54% female) of the respondents analysed are in consonance with the average age (42.2 years) and gender decomposition (49.8% male and 50.2% female) of the population of Araba according to EUSTAT. Regarding the personal disposable income in €/month, we found that among those who revealed their income range, 24.64% have no income; 6.16% have an income less than 500; 47.39% earn between 500 and 1500; 21.33% have an income between 1500 and 2500; and only 0.47% earn between 2500 and 5000.

Moreover, Table 3 presents the dummy variables created for the socio-economic variables considered in the model estimation stage: Llanada (taking the value 1 if the respondent lives in a township of Llanada Alavesa and 0 otherwise), Basque identity (taking the value 1 if the respondent considers himself/herself as having a Basque cultural identity at an above average level and 0 otherwise), low income (for respondents’ net monthly disposable income lower than €500 or respondents with no income at present and 0 otherwise) and high frequency (taking the value 1 if the respondent uses the recreation areas of Llanada Alavesa frequently or very frequently and 0 otherwise).

4.2 Model specifications and estimation results

The data obtained in the experiment were examined using the NLOGIT version 4.0 software (Greene, 2007). Table 4 shows the estimations corresponding to the MNL and different RPL model specifications. In all the utility specifications, we included an alternative-specific constant (ASC) in the equations for the non-status quo options (ASC1 and ASC2). Their significant and positive coefficients under all the estimated models suggest that all else being
equal, respondents tend to favour moving away from the current situation to a situation with change.

The MNL was first estimated in order to obtain a first insight into the data. The MNL estimation results indicate that respondents’ utility increases if the percentage of the land area devoted to organic farming and/or to native forests increases. Similarly, the utility increases if there is an improvement in the level of protection and conservation of the cultural heritage and recreation areas of Llanada Alavesa. The negative coefficient associated with the cost attribute indicates, as expected, that the probability of accepting an annual tax for protecting, managing and planning the landscapes of Llanada Alavesa decreases as the level of the payment increases. Finally, changes in intensive farming and the cemented surface do not affect individuals’ utility on average.

Three different RPL specifications are presented in the last three columns of Table 4 (RPL-1, RPL-2 and RPL-3). The general indirect utility function used for the RPL specifications was the following:

\[ V_{it,j} = ASC_j + \beta_{IFi} \text{Intensive Farming}_{it,j} + \beta_{OFi} \text{Organic Farming}_{it,j} + \beta_{NFi} \text{Native Forests}_{it,j} + \beta_{CSI} \text{Cemented Surface}_{it,j} + \beta_{RAi} \text{Recreation Areas}_{it,j} + \beta_{Cost} \text{Cost}_{it,j}, \]

where \( ASC_j \) is the alternative-specific constant under options B and C, \( \beta_{IFi}, \ldots, \beta_{Cost} \) are the attribute parameters defined according to (4) and \( \text{Intensive Farming}, \ldots, \text{Cost} \) are the attribute levels described in Table 1.

For the RPL estimations, first, the possible randomness of the attribute parameters was tested using the Lagrange Multiplier (LM) test proposed by McFadden and Train (2000) which presents correct empirical size (Mariel et al., 2013). According to this procedure, the coefficients associated with the native forests, cemented surface and cost attributes are random.

### Table 4. Estimated models

<table>
<thead>
<tr>
<th>Variable</th>
<th>MNL Coef. (Std Error)</th>
<th>RPL-1 Coef. (Std Error)</th>
<th>RPL-2 Coef. (Std Error)</th>
<th>RPL-3 Coef. (Std Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive farming</td>
<td>0.01614 (0.01242)</td>
<td>0.01412 (0.01599)</td>
<td>0.06774 (0.02299)</td>
<td>0.06817 (0.02282)</td>
</tr>
<tr>
<td>Organic farming</td>
<td>0.05560 (0.01295)</td>
<td>***</td>
<td>0.07217 (0.01619)</td>
<td>***</td>
</tr>
<tr>
<td>Native forests</td>
<td>0.03568 (0.01294)</td>
<td>***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cemented surface</td>
<td>0.00821</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

15
The next step was to choose a distribution for the assumed random parameters. Given the uncertainty in picking an appropriate analytical distribution for the random parameters, we applied the empirical approach proposed by Hensher and Greene (2003) to describe
graphically the empirical distributions for the random parameters. Figure 3 shows the empirical shape of each distribution. The graph for native forests and cemented surface resembles the normal pdf, in contrast to the graph for the cost parameter, which resembles the pdf of lognormal distribution. Therefore, under the RPL specifications, the parameters associated with the native forests and cemented surface attributes were assumed to be normally distributed, while the lognormal distribution was chosen for the cost attribute parameter. Moreover, the lognormal distribution (with a sign change) for the cost parameter assures finite moments for the distributions of WTPs (Daly et al., 2012). Finally, we estimated the RPL specifications over a range of draws and confirmed the stability and precision of each and every model when using 2000 Halton draws (Hensher and Greene, 2003).

<table>
<thead>
<tr>
<th>Parameter of native forests</th>
<th>Parameter of cemented surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean = 0; standard deviation = 0.0008; min. = -0.0020; max. = 0.0023</td>
<td>Mean = 0; standard deviation = 0.0011; min. = -0.0038; max. = 0.0033</td>
</tr>
<tr>
<td>Parameter of cost</td>
<td>Parameter of cost</td>
</tr>
<tr>
<td>Mean = 0; standard deviation = 0.0003; min. = -0.0005; max. = 0.0018</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Empirical distributions for 218 individuals derived non-parametrically for three random parameters

In the first RPL specification (RPL-1), individual preference heterogeneity is covered by unobserved influences affecting respondents’ utility. As expected given the results of the LM test for selecting random parameters, the standard deviations of the assumed random parameters are significant, suggesting the presence of unobserved heterogeneity in the
preferences for changes in the levels of the native forests, cemented surface and cost attributes. As a further step, we explored possible factors explaining the preference heterogeneity by estimating the RPL-2 model including the socio-economic variables affecting the parameters’ mean. Under this RPL-2 specification, all the estimated coefficients associated with landscape attributes are on average significant and positive (i.e. the respondents’ utility increases if their level increases) except the coefficient for the cemented surface attribute, which on average is insignificant. However, the standard deviation of its random parameter is significant, which suggests that this attribute is controversial with positive and negative preferences toward percentage increases in it.

Furthermore, the significant coefficient estimates of the interactions between socio-economic and attribute variables means that, all else being equal, (i) living in a township of Llanada Alavesa results in a utility decrease toward increases in land covered by intensive farming, (ii) having Basque cultural identity increases the utility regarding increases in land devoted to organic farming and/or native forests, (iii) earning less than €500 per month or having no income decreases the utility with regard to an increase in the level of conservation and protection of recreation areas and (iv) using recreation areas frequently or very frequently results in a utility increase concerning an improvement in the level of conservation and protection of recreation areas. Explaining the individual preference heterogeneity by both socio-economic characteristics and other unobserved influences improves the log-likelihood, AIC and BIC (see Table 4). Moreover, we allowed for free correlation between random parameters (RPL-3 specification) but as no significant correlations were found, we used the RPL-2 specification for welfare analysis.

4.3 Welfare measures

The welfare change, either positive or negative, related to a hypothetical choice scenario can be estimated by using the compensating surplus (CS), which in the presence of a linearly additive indirect utility function can be obtained from Small and Rosen (1981) and Hanemann (1984):

$$CS = -\frac{1}{\mu} \left[ \ln \left( \sum_{j=1}^{J} \exp (x_{ij}^0 \lambda_j) \right) - \ln \left( \sum_{j=1}^{J} \exp (x_{ij}^1 \lambda_j) \right) \right],$$

where $\mu$ is the marginal utility of income (usually represented by the coefficient of the cost attribute, $\beta_{\text{Cost}}$), $\lambda$ represents the vector of parameters corresponding to landscape attributes and $x_{ij}^0$ and $x_{ij}^1$ correspond to the vector of landscape attributes before and after
the change under consideration. Thus, the Hicksian CS measures a change in the expected utility due to a change in the level of provision of the attribute(s) by weighting this change by the marginal utility of income. Simplifying the above equation, the marginal value of a change in one attribute with respect to another is measured through the ratio of their corresponding coefficients. Therefore, the WTP for a marginal change in the level of provision of each landscape attribute is obtained by dividing the coefficient of the landscape attribute by the coefficient of the cost attribute. A positive/negative WTP measure is the amount that the individual would pay to initiate/prevent the proposed change (Haab and McConnell, 2002).

In this section, we present the unconditional simulation of the WTP results derived from out-of-sample populations by randomly sampling each individual from the full distribution (Krinsky and Robb, 1986). Table 5 reports the simulated WTPs for the RPL-2 model with the tenth and ninetieth percentile points from the resulting distribution of each WTP because its distribution is non-standard (Daly et al., 2012).

In the presence of the RPL-2 model specification, WTP calculations should take into account both the effect of socio-economic variables and the possible randomness of the parameter. A baseline scenario was first specified with all the socio-economic dummy variables equated to zero. By setting the dummies of the socio-economic variables to one, their effect can be examined (see Table 5). Hence, for example, the WTP for a 1% increase in the native forests attribute, with its parameter distributed as normal and the cost attribute parameter as lognormal, when the respondent has Basque cultural identity at an above average level (Basque identity = 1) was specified as:

$$WTP_{NF} = -\left(\hat{\beta}_{NF} + \hat{\delta}_{BI} \cdot 1 + \hat{\sigma}_{\beta_{NF}} \cdot \nu\right) - \exp\left(\hat{\beta}_{Cost} + \hat{\sigma}_{\beta_{Cost}} \cdot \nu\right),$$

where $\hat{\beta}_{NF}$ and $\hat{\beta}_{Cost}$ are the estimated means of the native forests and cost attribute parameters, respectively, $\hat{\delta}_{\beta_{NF}}$ and $\hat{\delta}_{\beta_{Cost}}$ are their corresponding estimated standard deviations, $\hat{\delta}_{BI}$ is the estimate associated with having Basque cultural identity and $\nu \sim N(0,1)$. In order to calculate the WTP means (reported in the last row of Table 5), we used weights corresponding to the proportion of each group in the population.
Table 5. Simulated WTP based on RPL-2 with unobserved and observed heterogeneity (€ 2013/person/year)

<table>
<thead>
<tr>
<th>Group</th>
<th>Intensive farming</th>
<th>Organic farming</th>
<th>Native forests</th>
<th>Cemented surface</th>
<th>Recreation areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline scenario</td>
<td>1.45</td>
<td>1.33</td>
<td>0.71</td>
<td>0</td>
<td>6.30</td>
</tr>
<tr>
<td></td>
<td>(0.20, 3.23)</td>
<td>(0.18, 2.96)</td>
<td>(-0.61, 2.45)</td>
<td>(-4.17, 4.10)</td>
<td>(0.86, 13.98)</td>
</tr>
<tr>
<td>Llanada = 1</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.004, 0.07)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basque identity = 1</td>
<td></td>
<td>3.32</td>
<td>2.58</td>
<td></td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.45, 7.37)</td>
<td>(0.20, 6.01)</td>
<td></td>
<td>(0.14, 2.35)</td>
</tr>
<tr>
<td>Low income = 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.44, 23.53)</td>
</tr>
<tr>
<td>High frequency = 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.37</td>
<td>1.64</td>
<td>1.00</td>
<td>0</td>
<td>6.75</td>
</tr>
<tr>
<td>€/person/year</td>
<td>(0.05, 0.82)</td>
<td>(0.23, 3.65)</td>
<td>(-0.37, 2.94)</td>
<td>(-4.17, 4.10)</td>
<td>(1.55, 13.84)</td>
</tr>
</tbody>
</table>

Note: The tenth and ninetieth percentile points of the WTP distributions are in brackets.

The mean annual WTP for a 1% increase in the land area covered by native forests is estimated at €1.00 per person, in 2013 values. The WTP increases to €2.58 if the respondent’s cultural identity is Basque. Similarly, the mean annual WTP for a 1% increase in the land devoted to organic farming is estimated at €1.64, but the WTP increases to €3.32 if the individual again has Basque cultural identity. The important role that Basque cultural identity plays in this economic valuation study is in line with previous DCE studies conducted in the Basque Country (Hoyos et al., 2009; Hoyos et al., 2012).

The mean annual WTP for a 1% increase in the land area devoted to intensive farming is estimated at €0.37. However, the respondents living in one of the municipalities of Llanada Alavesa have on average almost a null annual WTP (€0.03). Although the mean WTP to increase the cemented surface in Llanada Alavesa is zero on average, from its distribution we can observe that there are people who are willing to pay for increases in the cemented surface and there are other people who are willing to prevent this increase, leading therefore to a compensated effect. Eventually, the annual WTP to improve the level of conservation and protection of the recreation areas and cultural heritage is estimated at €6.75. In this case, the preferences also differ among the population: respondents with an income less than €500/month or no income have a WTP of €1.06 while the WTP of respondents using the recreation areas frequently or very frequently is estimated at €10.57.
4.4 Compensating surplus for alternative landscape protection, management and planning scenarios

The welfare measures obtained by estimating the mean marginal WTP in the previous section also allow us to estimate the changes in the welfare of the population of Araba associated with different landscape protection, management and planning options. In order to estimate the CS for different options of interest, we proposed three different future scenarios, altering the attribute levels and taking into account feasible land use changes: (1) Promotion of intensive and artificial landscapes; (2) Promotion of organic and native landscapes and (3) Promotion of cultural heritage and recreation areas. Table 6 presents the changes proposed in relation to the status quo by showing the attribute levels corresponding to each of these three scenarios. Note that the levels we used to construct the different scenarios are those provided by experts and used in the DCE sets.

Table 6. Alternative planning, protection and management scenarios for the landscapes of Llanada Alavesa

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Status quo</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Promotion of intensive and artificial landscapes</td>
<td>Promotion of organic and native landscapes</td>
<td>Promotion of cultural heritage and recreation areas</td>
<td></td>
</tr>
<tr>
<td>Intensive farming</td>
<td>29%</td>
<td>35% (↑)</td>
<td>15% (↓)</td>
<td>29% (=)</td>
</tr>
<tr>
<td>Organic farming</td>
<td>16%</td>
<td>8% (↓)</td>
<td>25% (↑)</td>
<td>16% (=)</td>
</tr>
<tr>
<td>Native forests</td>
<td>39%</td>
<td>30% (↓)</td>
<td>45% (↑)</td>
<td>39% (=)</td>
</tr>
<tr>
<td>Cemented surface</td>
<td>14%</td>
<td>25% (↑)</td>
<td>14% (=)</td>
<td>14% (=)</td>
</tr>
<tr>
<td>Recreation areas</td>
<td>Medium</td>
<td>Medium (=)</td>
<td>Medium (=)</td>
<td>Very high (↑)</td>
</tr>
<tr>
<td>TOTAL surface</td>
<td>98%</td>
<td>98%</td>
<td>99%</td>
<td>98%</td>
</tr>
</tbody>
</table>

Note: ↑/↓: increase/decrease compared with the status quo level; =: equal level.

Table 7 shows the estimated annual CS (i.e. the estimated social benefits) for each scenario proposed using equation (11). Concerning scenario 1, although an increase from 29% to 35% in the land area devoted to intensive farming would not produce negative social benefits, the consequence of this more intensive and artificial scenario (i.e. an 8% and 9% decrease in the land covered by organic farming and by native forests, respectively) would entail negative welfare. Thus, scenario 1, which may be associated with the economic values of the landscapes of Llanada Alavesa, would entail on average a social loss estimated at €6.46 million for the citizens of Araba.
Table 7. Social benefits per year under different scenarios (million €, 2013)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Promotion of intensive and artificial landscapes</td>
<td>Promotion of organic and native landscapes</td>
<td>Promotion of cultural heritage and recreation areas</td>
</tr>
<tr>
<td>Intensive farming</td>
<td>0.715</td>
<td>-1.670</td>
<td>-6.46</td>
</tr>
<tr>
<td></td>
<td>(0.711, 0.722)</td>
<td>(-1.684, -1.658)</td>
<td>(-6.51, -6.41)</td>
</tr>
<tr>
<td>Organic farming</td>
<td>-4.225</td>
<td>4.753</td>
<td>5.05</td>
</tr>
<tr>
<td></td>
<td>(-4.247, -4.204)</td>
<td>(4.729, 4.778)</td>
<td>(5.03, 5.07)</td>
</tr>
<tr>
<td>Native forests</td>
<td>-2.948</td>
<td>1.965</td>
<td>4.35</td>
</tr>
<tr>
<td></td>
<td>(-2.967, -2.928)</td>
<td>(1.952, 1.978)</td>
<td>(4.33, 4.37)</td>
</tr>
<tr>
<td>Cemented surface</td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.054, 0.039)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL (million €)</td>
<td>-6.46</td>
<td>5.05</td>
<td>4.35</td>
</tr>
<tr>
<td></td>
<td>(-6.51, -6.41)</td>
<td>(5.03, 5.07)</td>
<td>(4.33, 4.37)</td>
</tr>
</tbody>
</table>

Note: The tenth and ninetieth percentile points of the overall WTP distributions are in brackets.

Under scenario 2, which promotes organic and native landscapes, negative benefits would be obtained when decreasing from 29% to 15% the land covered by intensive farming. However, the social benefits derived from a 9% increase in the surface covered by organic farming and a 6% increase in the area of native forests would be higher, so that in total the welfare benefits for the population of Araba are estimated at €5.05 million. Finally, with scenario 3, which enhances the cultural heritage and recreation areas, keeping the rest of the landscape attributes at their current levels, the citizens of Araba would experience on average a social benefit estimated at €4.35 million.

5. Discussion and conclusions

Landscapes, which are a key element of individual and social well-being, continuously change and evolve through natural and human-induced processes and activities. The ELC highlights that the protection, management and planning of landscapes can provide a range of benefits in the cultural, ecological, environmental and social fields as well as contributing to job creation. In order to aid the optimal design of landscape protection, management and planning, policy-makers need a proper means of accounting for all these benefits in the public preferences for the policy intervention. This paper estimates the public preferences for landscape protection, management and planning under the ELC using the DCE valuation method as a case study of the Basque area of Llanada Alavesa.
For the purpose of policy, this study presents useful information to help policy-makers resolve the issue of disaggregating protection, management and planning policies into suitable landscape attributes and levels. Taking into account the social preferences of the population of Araba, the annual per capita mean marginal WTP to increase the land area of Llanada Alavesa under organic farming and native forests is estimated at €1.64 and €1.00, respectively, compared with €0.37 for the land area under intensive farming. Further, we found a null median marginal WTP for percentage increases in the cemented surface. Finally, we estimated the mean marginal WTP to improve the level of conservation and protection of the recreation areas by €6.75 per person and year.

In the face of landscape protection, management and planning, we found different and sometimes opposite landscape preferences. We applied the RPL flexible model in order to investigate and explain the preference heterogeneity, which is of great relevance specifically when valuing subjective as well as mental and social construct goods such as landscapes. We identified unobserved influences affecting respondents’ utility for changes in the levels of the native forests, cemented surface and cost attributes. A further exploration of the heterogeneity through an RPL model with relevant socio-economic variables helped to allocate the WTP values among the population. This model identified a strong Basque cultural identity as a main explanatory variable for higher values regarding organic farming and native forests. Interestingly, local residents appear to have a lower annual WTP for increases in the land devoted to intensive farming. The mean annual WTP for cultural heritage and recreation areas’ conservation seems to be higher for high-frequency users of the recreation areas, but as expected by economic theory, this is lower for individuals with low income or no income. Finally, we found cemented surface to be a controversial attribute.

The welfare benefits in monetary terms of a selection of landscape programmes are useful for facilitating future cost–benefit examinations. Among the three different hypothetical scenarios proposed, we found that the promotion of organic and native landscapes and the development of recreation areas and cultural heritage would bring on average welfare benefits estimated at €5.05 and €4.35 million per year, respectively. In contrast, the specified promotion of intensive and artificial landscapes would entail on average an annual social loss estimated at €6.46 million. Therefore, according to the social preferences of Araba, policymakers might attempt to enhance the ecological values of the landscapes that could be compatible with an improvement in the conservation level of the recreation areas and cultural heritage as long as there are enough economic resources available. Note that the costs of
implementing a given landscape programme would have to be considered to evaluate whether that programme would succeed in a cost–benefit analysis.

Policy-makers put in charge of protecting, managing and planning the landscapes should also bear in mind the economic and cultural context in which the policies will be implemented as well as the potential landscape use conflicts. On the one hand, this study has been developed in a context of economic recession, which was partly reflected in the high number of protest responses. Given that the unemployment rate in the first quarter of 2013 was around 16% in Araba and in the Basque Country and about 27% in Spain (National Institute of Statistics, INE), the society might be more concerned about unemployment and social assistance while environmental issues seem to be in the background in times of economic crisis.

On the other hand, given that the natural environment plays a central role in the Basque cultural tradition and that a matriarchal culture such as that of the Basques feels close attachment to the land, cultural identity is found to be a key factor explaining the social benefits related to ecological features of the landscapes of Llanada Alavesa. The positive influence of Basque cultural identity on native forests is in line with other DCEs conducted in the Basque Country (Hoyos et al., 2009), while that on organic farming is found first in this study. In fact, people who support organic farming production may do so for health reasons or just because they want to protect the environment. Thus, considering and understanding the cultural values that predominate in a specific area, region or country could help in implementing landscape-related policies.

Eventually, since designers and policy-makers have to make choices between different and usually competing uses of landscapes, they should be aware of the preferences of different segments of the population to reduce the potential conflicts that may arise through the landscape changes proposed. For example, the funds for landscape protection, management and planning could be transferred not only to invest in the corresponding landscape programme, but also to compensate for the losses that local farmers could experience if the proposed landscape programme significantly affects their activity.

Moreover, some local intensive farmers might need support in terms of information and economic incentives to move from intensive farming to organic farming. In fact, nowadays, both at the European level through the Common Agricultural Policy (see European Commission, 2013) and at the Spanish Autonomous Communities level, there are different programmes that motivate farmers to introduce organic farming. In the Basque Country, the
Rural Development Plan (2007–2013) specifies different aids that provide financial support depending on the organic area, livestock and socio-economic characteristics of the farmers.

This study concludes that the DCE may be a useful tool for establishing the principles and objectives of the ELC since (i) it supports public participation; (ii) it considers the multidimensional character of landscapes by disaggregating them into different landscape attributes and levels; (iii) it takes into account the heterogeneous preferences of the population; and (iv) it provides well-informed advice in terms of the welfare benefits derived from landscape protection, management and planning programmes. The present study has shown that useful and reliable results can be successfully obtained from a carefully designed DCE in a specific European landscape.

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References


