SOCIAL PREFERENCES FOR MANAGEMENT OF RURAL FORESTS IN THE IBERIAN ATLANTIC REGION [1]

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ABSTRACT

This article presents results from an experiment into attribute perception and relevant levels for management of woodland and mountain areas typical of the Iberian Peninsula's Atlantic region. The aim, which the authors argue has been robustly reached, was to identify those aspects of forestry policy clearly perceived by citizens. This is useful for defining enlargement of areas protected under Natura 2000 Network. Results show clear preference for an increase in woodland to over half the current surface area, with replanting of traditional trees, in woodlands of low density and trees of different age and, preferably in irregular shaped plots.

Keywords: Landscape preference; Visual quality; Non-market goods; Preference models; Economic valuation; Landscape Management.

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1. Introduction

Agro-environmental measures accompanying CAP reform have been applied in various EU countries since 1996. This has allowed numerous advantages of a global approach to rural landscape system conservation to be identified, as recommended by the fifth conclusion of the measures assessment document (COMMISSION, 1998). Also, *the Dobris Assessment* (Stanners and Bourdeau, 1998) regarding Europe's environment devotes a chapter to landscapes[2], pointing out that "a pragmatic approach to future biological conservation should include the landscape as a whole within a rural framework for land use".

However, in the analysis of landscape elements and systems for EU rural spaces, we must distinguish between territories with large areas of forest and those with mainly farmland since "wooded areas are unequally spread within the EU. They take up more than 50% of Finland and almost all the territory of Sweden, as in the Pyrenees and some Mediterranean and Atlantic areas of Spain" (COMMISSION, 1999). Thus, it is justified that analysis in this study is focused on non-farming areas that will be the most relevant in the Iberian Peninsula's Atlantic regions (Chart 1). Our aim is to know social preferences for conservation and management of these areas.

Chart 1: Non agricultural surface area over total (%) (EU15 = 58)

Above average		**Below average**	
Galicia (Spain)	69	Ireland	37
Cantabria (Spain)	70	United Kingdom	30
North (Portugal)	67	Brittany (France)	33
Finland	94	Centre (Spain)	42
Sweden	93	Germany	51

Source: Drawn up by the authors from Eurostat (1999) NewCronos data.

In Galicia, the rural landscape depends decisively on the two million hectares of woodland, almost 70% of all land, which according to *Corine Land Cover* (CLC-GISCO) are included in group 3: wooded (deciduous, evergreen or mixed), open wooded or pasture land and non-productive land ... where it is important[3] "that timber forms an integral part of rural development and that, therefore, forestry measures must be included in the funding regime for such development".

In this context, we have decided to centre our empirical work, in the interest of territorial and ecosystem homogeneity, on Natura 2000 Network proposals[4] for predominantly forest land areas that, although less than half in number (only 24 from a total of 53 proposed areas), nevertheless come to 86% of the proposed 280,000 ha. in Galicia. This is not unusual, as we are dealing with an Atlantic region where woodland is predominant (Chart 1). In addition the *Estrategia Forestal Española* (Spanish Woodland Strategy) indicates[5], when referring to Natura 2000 Network, that "... a large part of the land earmarked for inclusion in

[2] Op. Cit. pp. 172-189 and 221.
[3] Quote from Reg. (CE) 1257/1999 (DOCE 26.6.1999).
[4] Directive 92/73/CEE, Real Decreto 1997/1995, Orden Autonómica 28.10.1999 (DOG 9.11.1999).
[5] MMA (1999), pp. 30 and 49.

Natura 2000 Network will be classified as uncultivated ... Natura 2000 Network not only includes Old Growth Forest and Ancient Forest, …"

The current situation of these forest or mountain areas[6] could be characterised by regressing autochthonous, deciduous woodland (common oak, *quercus robur*; sweet chestnut, *castanea sativa*; cork oak, *quercus suber*; Pyrenean oak, *quercus pyrenaica*; ash, *fraxinus excelsior*; sycamore maple, *acer pseudoplatanus*; willow, *salix sp.*; black alder, *alnus glutinosa*; European white birch, *betula pendula*; sweet cherry, *prunus avium*; English walnut, *juglans regia*) of hardly 300,000 ha.; abandoned scrub such as treeless uncultivated land of about 800,000 ha. and afforestation with planted production forests (320,000 ha. of eucalyptus, *e. globulus* and over 500,000 ha. of maritime pine**,** *p. pinaster*).

In this context of profound changes, it follows that evaluation should be made of the social preferences associated with the effects of intensive timber farming with forest plantations, with former agricultural land left as scrubland and with regression – also through neglect in management – of Atlantic deciduous woodland. It would appear that intensification and abandonment affects over 50% of rural landscape nowadays and has a negative impact compared to the alternative of Atlantic natural woodland[7]. This negative impact is associated to the fact that; in plantation forests (STANNERS and BOURDEAU, 1998: 467) there are clumps of evergreens with well-defined limits, which simplify shape, colour and texture in the landscape; the intensification associated with monocultural exotic species means loss of biodiversity; and handling, site preparation, new diseases propagation, and so on, associated with these crops generate environmental impacts. To these arguments must be added numerous forest fires, loss of biodiversity, etc., clear examples of opportunity cost (negative externalities) inasmuch as woodland plays a vital role in the conservation of the natural environment, that is, water, soil and air (COMMISSION, 1999b).

Our aim is to know the preferences of individuals for management aspects for the different mountain landscapes included in the RN2000 proposal and thus determine which landscape attributes are the most socially significant (and to what degree). This is usually quantified in the literature by means of an *Aesthetic Valuation Index* (TINDALL, 2001) (TEMPESTA, 1993 and 1998) (FALINI and CIARDINI, 1985) or *Average Preference Index* (HERZOG, 1984) or *Scenic Beauty Estimation* (HULL, 1984) for the attributes in question and for other potentially explicative variables and their corresponding levels. These are all measurement methods for scenic quality based on psychophysical methods[8] used repeatedly since the 1970s.

In the next section we describe the approach used for the elicitation of preferences. Then results from a *Perception Test* for characteristics of these areas are presented and discussed. Finally, we summarize the main conclusions and point out directions of future research, related to cost-benefit analysis.

[6] About 2,100,00 ha altogether.
[7] Atlantic oak woodland (Santos, 1999).
[8] The seminal work (THURSTONE, 1927) is transferred to landscape issues (SHAFER, 1969).

2. Material and methods

In order to estimate the benefits or impacts associated with woodland management in Atlantic mountain areas, it does not seem appropriate to restrict ourselves to the valuation of direct recreational use by visitors to affected areas. It is, therefore, necessary to estimate values for both active use and for conservation: values that citizens in general (visitors, local residents and the rest) state concerning possible increases in size and number of protected areas.

It becomes necessary to forsake, simultaneously, both valuation related merely to recreation and that limited to a single space, by widening the exercise in two directions: to non-recreational services (landscape, biodiversity, etc.), and to as yet unprotected spaces (Natura 2000 Network rural-agrarian environment) where active recreational use is scattered and agreement with farmers for adequate management is voluntary. Both are issues of interest, not only for applying economic-environmental analysis to so far untouched territory, but also for defining efficient instruments for economic policy (CAP and Agenda 2000).

Total value[9] associated with the proposed changes could be estimated and expressed in monetary units by means of direct methods based on surveys (ADAMOWICZ et al., 1999) (GONZALEZ and PRADA, 1997). These methods generally begin by creating a hypothetical market presented through a questionnaire. In the usual format - dichotomous contingent valuation - a change is described and a price is proposed. Individuals may accept these or not, and reveal a preference above or below the offered price if they accept. There are alternative direct methods such as choice experiments, which take into account the multidimensional nature of the good or proposed changes. In this latter format, the individual is offered different intervention alternatives, described according to characteristics or attributes and their levels, and each combination of attributes and levels is associated with a price. The individual, when interviewed, must choose one from a set of proposed alternatives. Seen in this way the traditional dichotomous format would be a simple choice experiment with two attributes: the proposed change and the price.

The initial inventory of attributes and levels chosen to illustrate the specific context whose context is to be valuated is shown in Chart 2 (KAPLAN and KAPLAN, 1989) (HANLEY, 1993) and comes from a review of previous studies[10], from which those characteristics most suitable for mountain areas of Atlantic region have been selected: tree covered area, deciduous share[11], plantation area[12], mass density, mean height, height diversity, outline shape, etc.

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[9] Economic value of natural heritage (MMA, 1998).

[10] For forest landscape attributes (HANLEY, 1991, 1992, 1998), (BENSON 1992), (GARROD, 1992) can be reviewed, among others.

[11] Definition (MMA-DGCONA, 1999:18 and 47): “Forests formed by tree species of natural or artificial origin whose characteristics (structure, species composition, biological diversity) approach complex ecosystems. If there are forms of use, they make the protecting and regulating function (water, soil, biodiversity, landscape) compatible with timber production.”.

[12] Definition (MMA-DGCONA, 1999:18): "Artificially originated tree mass whose raw material productive end conditions its simplified structure and composition, as well as scarce biological diversity. The basic objective of maximum productivity and profitability involves application of intensive forest management far removed from natural ecosystem dynamics." Cites as typical species: eucalyptus, pinaster, radiata, pseudotsuga, ... calling them "forest plantations" (p.26) and informs that they take up 12% of Spanish woodland (over 70% in Galicia).

Chart 2: Attributes and levels chosen

Attributes	Levels
Wooded cover	(0: scarce; 1: medium; 2: total)
Deciduous	(1: yes ; 0: no)
Plantation	(1: yes ; 0: no)
Undefined vegetation	(if 2 and 3 zeros, value 1;value 0: if 2 or 3 take value 1)
Neglected open woodland	(1: yes; 0: no)
Active scrub land management	(1:yes; 0:no)
Undefined management	(if 5 and 6 are zero, value 1; 0: if 5 or 6 take value 1)
Paths	(1: yes; 0: no)
Firebreaks	(1: yes; 0: no)
Marked edges	(1: yes; 0: no) (regulars / irregulars)
Heights	(0: homogeneous; 1: non contemporary)
Age	(0: latizal; 1: medium; 2: woods)
Density	(0: low; 1: high)
Morphology	(0: neutral: 1: slopes)
Perspective	(0: mid; 1: birdseye)
Photo quality	(0: low; 1: normal)
Luminosity	(1: normal-high; 0: low)

The attributes and levels were selected from among the potentially most relevant in the preferences of the individuals. However, others were excluded (presence of water, seasonal colouring, and, above all, manmade constructions) that, because of their well-known incidence in works on landscape preferences (WHERRETT, 2000 and 2001) (KAPLAN, 1998) (HULL, 1989), would blur (as they did when introduced into WHERRET, 2000) the central role that the vegetation cover must play in our analysis. This selection makes it possible to specify and detail which factors turn woods and wooded areas into more appreciated and valued landscapes (TEMPESTA, 1998).

A personal survey was then designed in which individuals had to choose and rank, according to their preferences, various alternative landscapes shown in 46 photos including all the attributes and their levels. In the literature reviewed (KAPLAN and KAPLAN, 1989) (TEMPESTA, 1993) (FALINI and CIARDINI, 1985), about 50 is considered to be a manageable number of photos for interviewees, 200 a sufficient number of questionnaires and values from 0 to 5 an adequate preference scale for each picture.

Thus, our study typifies 46 photographs (two for each attribute and level)[13] which were given in a shuffled deck that had to be first sorted by interviewees into five groups, not necessarily equal in number, from greatest to least preferred (DEARDEN, 1984). This procedure is preferable to comparing pairs of photos (HULL, 1984) (TAHVANAINEN et al., 2001), which is more tiring for the interviewee and more costly. Furthermore, using colour photos has been the norm for decades (HULL, 1984) and is as efficient – and much cheaper – that obtaining preferences *in situ*, above all if there are a great number of landscape types (STAMPS, 1990). It is also always preferable to verbal description (TAHVANAINEN, 2001). In a second stage of the questionnaire, interviewees were asked to order photos sequentially with different levels for each attribute. In neither case was additional non-visual information provided.

[13] Distributed randomly in pairs and matching numbers (Appendix B and C). This was an attempt to avoid that results were affected by visual aspects of the specific picture chosen. Attributes of both water and seasonal colour variation were excluded from all photos.

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APPENDIX A: CODIFICATION MATRIX : 46 photos x 17 variables

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	0	0	1	0	0	1	0	0	0	0	2	1	1	1	1	0
2	0	0	1	0	0	1	0	0	0	0	1	1	1	1	1	1
1	0	0	1	1	0	0	0	0	0	1	2	1	1	1	1	1
1	0	0	1	0	0	1	0	0	1	1	0	1	1	1	0	0
1	0	0	1	1	0	0	0	0	0	1	2	1	1	1	0	1
1	0	1	0	1	0	0	0	0	1	1	1	0	1	1	0	0
1	0	0	1	0	0	1	0	0	0	1	0	0	1	1	1	1
0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	1
0	0	0	1	0	0	1	0	1	0	0	1	0	1	1	1	1
0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	1	1
2	0	1	0	0	1	0	0	0	1	0	1	1	0	0	1	1
2	0	1	0	0	1	0	0	0	0	1	1	0	0	0	1	1
2	0	1	0	1	0	0	0	0	0	0	1	1	1	0	1	1
2	0	1	0	1	0	0	0	0	0	0	2	1	0	1	1	1
1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0
2	1	0	0	1	0	0	0	0	0	0	2	1	1	1	1	1
2	1	0	0	1	0	0	0	0	0	0	2	1	1	1	1	1
2	1	0	0	1	0	0	0	0	0	1	2	1	1	0	1	0
0	0	0	1	0	0	1	0	0	0	0	1	0	1	1	1	0
0	0	0	1	0	0	1	1	0	0	0	0	0	1	0	1	1
0	0	0	1	1	0	0	0	0	0	1	1	1	0	0	1	1
0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	1	0
1	0	0	1	1	0	0	0	0	0	1	1	1	0	0	1	0
0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0
1	1	0	0	0	0	1	0	0	1	0	1	1	1	1	1	0
1	1	0	0	0	1	0	0	0	1	0	1	0	1	1	1	1
1	0	0	1	0	1	0	1	1	1	0	1	1	1	1	1	1
1	0	0	1	0	1	0	1	1	1	0	1	1	1	1	1	1
1	0	1	0	0	1	0	1	0	1	0	1	1	1	0	1	1
0	0	0	1	0	0	1	1	0	0	0	1	0	1	0	1	1
1	0	1	0	0	0	1	1	0	0	0	1	0	1	1	1	1
2	0	1	0	1	0	0	0	0	0	1	1	1	0	0	1	0
2	0	1	0	0	1	0	0	0	0	0	2	0	0	0	1	0
2	0	1	0	0	1	0	0	0	0	0	2	0	0	0	1	1
1	0	1	0	0	0	1	0	0	0	1	1	0	1	0	0	0
1	0	0	1	1	0	0	0	0	0	1	0	0	1	0	1	0
2	0	1	0	1	0	0	0	0	0	0	1	1	0	0	1	1
2	0	1	0	0	1	0	1	0	0	1	0	1	1	1	0	1
2	1	0	0	1	0	0	0	0	0	0	2	1	0	0	1	0
2	1	0	0	0	0	1	0	0	0	0	2	1	0	1	1	1
1	1	0	0	0	1	0	0	0	1	1	0	0	0	0	1	1
1	1	0	0	0	1	0	0	0	0	0	2	0	1	0	1	1
2	1	0	0	0	1	0	0	0	1	0	2	0	0	0	1	0
1	1	0	0	0	0	1	0	0	0	1	2	0	0	1	1	1
2	1	0	0	1	0	0	0	0	0	1	1	1	0	0	1	0
2	1	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0

APPENDIX B
Perception Test Results
Landscape Preference Index (scale of 1 to 5)
Over the Total Number of Images

Photo nº	Attributes and levels	Preferences over Total	
		Odd	Even
	i. FRACTION OF WOOD COVER AND SCRUB		
1,2	Total tree cover of area. Undefined in panoramic view	**2.87**	**3.25**
3,4	Trees on 75% and the rest with scrub and thicket	**3.12**	**2.73**
5,6	Similar areas for both uses	**3.33**	**2.55**
7,8	25% woodland and the rest open countryside	**3.09**	**1.96**
9,10	Absence of woodland but with total scrub cover	**2.44**	**3.50**
	ii. TREE COVER TYPE		
11, 12	Conifer plantations	**3.10**	**3.09**
13, 14	Eucalyptus plantations	**2.80**	**2.95**
15,16	Traditional replanted woods (single-species)	**3.91**	**3.82**
17,18	Seminatural traditional woods (multi-species)	**3.00**	**3.32**
	iii. LOCATION AND MANAGEMENT OF SCRUB LAND		
19,20	Actively managed scrub land	**2.44**	**2.00**
21,22	Abandoned highland scrub land	**3.15**	**2.40**
23,24	Woody Abandoned scrub land	**2.32**	**2.43**
	iv. VISUAL MANAGEMENT ASPECTS		
25,26	As nº 5-6 with no tracks or firebreaks and with irregular edges	**2.69**	**2.78**
27,28	As nº 5-6 with regular paths, firebreaks and edges	**2.98**	**1.72**
29,30	As nº 5-6 with all elements, but irregular ones	**3.47**	**3.20**
	v. AGE, HEIGHT AND DENSITY		
	v.i. Conifers		
31,32	As photos nº 11-12 but of similar age and dense	**2.67**	**3.13**
33,34	As photos nº 11-12 but of similar age and not dense	**3.95**	**3.49**
35,36	As photos nº 11-12 not of similar age and not dense	**2.75**	**3.29**
37,38	As photos nº 11-12 not of similar age and dense	**3.15**	**3.12**
	v.ii. Traditional woodlands		
39,40	As photos nº 15-16 but of similar age and dense	**3.91**	**3.52**
41,42	As photos nº 15-16 but of similar age and not dense	**4.03**	**4.42**
43,44	As photos nº 15-16 not of similar age and not dense	**4.41**	**3.22**
45,46	As photos nº 15- not of similar age and dense	**4.09**	**3.36**

N=200, average LPI.

APPENDIX C
Perception Test Results
Landscape Preference Index (scale of 1 to 5)
Over Images of Each Attribute

Photo nº	Attributes and levels	Preferences over Attribute	
		Odd	Even
	i. FRACTION OF WOOD COVER AND SCRUB		
1,2	Total tree cover of area. Undefined in panoramic view	**2.84**	**3.17**
3,4	Trees on 75% and the rest with scrub and thicket	**3.18**	**2.66**
5,6	Similar areas for both uses	**3.15**	**2.69**
7,8	25% woodland and the rest open countryside	**3.01**	**1.69**
9,10	Absence of woodland but with total scrub cover	**2.12**	**3.04**
	ii. TREE COVER TYPE		
11, 12	Conifer plantations	**2.60**	**2.90**
13, 14	Eucalyptus plantations	**2.39**	**2.27**
15,16	Traditional replanted woods (single-species)	**3.89**	**3.90**
17,18	Seminatural traditional woods (multi-species)	**3.03**	**3.05**
	iii. LOCATION AND MANAGEMENT OF SCRUB LAND		
19,20	Actively managed scrub land	**2.98**	**2.63**
21,22	Abandoned highland scrub land	**3.81**	**3.00**
23,24	Woody Abandoned scrub land	**2.72**	**2.88**
	iv. VISUAL MANAGEMENT ASPECTS		
25,26	As nº 5-6 with no tracks or firebreaks and with irregular edges	**2.94**	**3.11**
27,28	As nº 5-6 with regular paths, firebreaks and edges	**3.14**	**1.78**
29,30	As nº 5-6 with all elements, but irregular ones	**3.72**	**3.32**
	v. AGE, HEIGHT AND DENSITY		
	v.i. Conifers		
31,32	As photos nº 11-12 but of similar age and dense	**2.69**	**2.79**
33,34	As photos nº 11-12 but of similar age and not dense	**3.92**	**3.64**
35,36	As photos nº 11-12 not of similar age and not dense	**2.63**	**3.08**
37,38	As photos nº 11-12 not of similar age and dense	**2.65**	**2.65**
	v.ii. Traditional woodlands		
39,40	As photos nº 15-16 but of similar age and dense	**2.84**	**2.63**
41,42	As photos nº 15-16 but of similar age and not dense	**2.91**	**4.05**
43,44	As photos nº 15-16 not of similar age and not dense	**4.20**	**2.01**
45,46	As photos nº 15- not of similar age and dense	**3.24**	**2.15**

N=200, average LPI.