

Public attitudes to changing landscapes: implications for biodiversity

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Abstract

The importance of agri-environment schemes in maintaining and restoring biodiversity in agricultural areas is being increasingly recognised. As agri-environment schemes change agricultural practices they also impact on the production of other environmental goods and services (air, water, and landscapes), support the rural communities (maintaining family farming, rural employment), improved food safety and animal welfare. Acceptability of agri-environment schemes can therefore be affected by these other changes. This paper explores the impact on the landscape of agri-environment schemes. Preferences for landscapes are complex, dependent on the characteristics of the landscapes and of the individual observer. This paper reports the preliminary findings of a study exploring the preferences for policy driven landscapes, demonstrating that preferences are influenced by socio-economic and cultural factors of respondents and how they view their relationship with nature.

1. Introduction

Agriculture, in addition to producing food has the potential to deliver wider benefits (or costs) to society, through the production of environmental goods and services (biodiversity, air, water, and landscapes), support the rural communities (maintaining family farming, rural employment), improved food safety and animal welfare. However, agricultural practices which maximise food production have been favoured over those which produce wider societal benefits as a consequence of the emphasis on food production of the pre-1992 Common Agricultural Policy (CAP) in addition to many of the non-food benefits from agriculture being mostly public goods with no market value.

Agri-environment schemes were established in the late 1980s in response to concerns over the growing CAP budget, surplus food and the recognition of the negative impact of agriculture on the environment. These schemes introduced the concept of 'paid stewardship,' where farmers receive payment in return for changing their agricultural practices in order to produce environmental goods and services. Agri-environment schemes have gained increasing importance within agricultural policy, with the introduction of the 'second pillar' of CAP in the Agenda 2000 reforms enabling member states to redirect funding from production support towards the environment and rural development.

The importance of agri-environment schemes in maintaining and restoring biodiversity in agricultural areas is being increasingly recognised, see for example, Kleijn *et al.*, (2006). With Christie *et al.*, (2006) identifying positive values for the biodiversity provided by agri-environment schemes, this is indicative of public support for these schemes in terms of the biodiversity provision. However, while the aim of maintaining and enhance biodiversity are the key drivers of the agri-environment schemes, as they involve a change to farming practice they will also influence the other environmental goods and services produced by agriculture and the rural community. Given the quantity and public nature of funding of these schemes, public acceptability of these schemes is important. Other studies have

demonstrated that the agri-environment schemes provide benefits to society, in particular the visible impact of the landscape. Most studies have focused on the Environmentally Sensitive Areas schemes, including the Mourne Mountains and Slieve Croob of Northern Ireland (Moss and Chilton, 1997); the South Downs and Somerset Levels and Moors in England (Willis *et al.*, 1995)¹; Machair, Breadalbane and Central Southern Uplands of Scotland (Alvarez *et al.*, 1999, Bullock and Kay, 1997). Additionally, an assessment has been made of the Rural Environment Protection Scheme (REPS) - the agri-environment schemes of the Republic of Ireland (Campbell *et al.*, 2006, Campbell, 2007a).

With the findings from these studies indicating that public acceptability exists for agri-environment schemes, this paper reports the preliminary findings (analysis is on-going) of a study exploring the preferences of the general public for one aspect of the impact of the agri-environment schemes - the impact on the landscape, to assist policy makers. By deriving potential landscapes resulting from different policy scenarios including two derived from alternative agri-environment schemes, we explore the cultural, individual, socio-economic characteristics and environmental attitudes and characteristics of the landscapes themselves to assess which if any underlie preferences for landscapes. The rest of the paper is laid out as follows; section 2 provides a brief overview of existing landscape research, primarily from the disciplines of economics, psychology, cultural geography and ecology and the importance of a trans-disciplinary approach, section 3 details the study, section 4 the preliminary results and section 5 contains concluding remarks.

2. Landscape Research

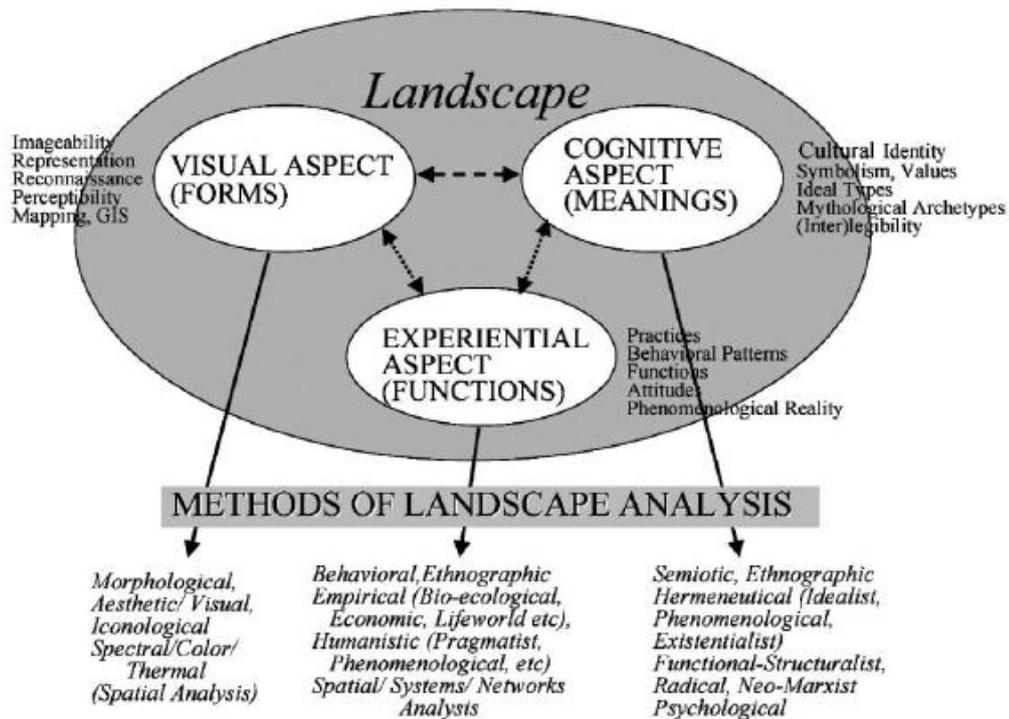
Landscapes are the visual representation of the dynamic interaction of natural and cultural processes acting on the environment. While the land-form and land-cover are created by geological and biological processes, they have been continually modified through the activities of humans, with different land-uses and the land's spatial structure being reorganised in response to changing societal demands (Antrop, 2005).

The importance of landscapes to human well-being and identity has been demonstrated through the provision of a sense of security and health (Appleton, 1975, Kaplan and Kaplan, 1982, Kaplan and Kaplan, 1989) with legal recognition granted through the EU Landscape Convention of 2000 (Council of Europe, 2000).

Much landscape based research has been undertaken independently by the natural sciences, social sciences, humanities, and the arts, resulting in multitude concepts of "landscape" and consequently the development of many methods of analysis (Tress and Tress, 2001). To integrate these diverse aspects of landscape research, Terkenli (2001) developed a conceptual framework which identified three inter-locking aspects of the landscape: the visual, the cognitive and the experiential, see figure 1. This framework highlights the interrelatedness and interactive nature of these components and the need for intrans-disciplinary research into the landscape.

¹ Although as Hodge and McNally (1998) highlight, the benefits identified within this study may relate to a conserved landscape rather than the ESA policy.

Figure 1. Landscape aspects and methods of analysis (taken from Terkenli, 2001)



The EU Landscape Convention requires both the introduction of specific policies to protect, manage and plan landscapes and the integration of the landscape into all policies which may impact directly or indirectly on the landscape. As such, the Convention necessitates an assessment of impacts of any proposed changes to the landscape, thus the impact of the agri-environment schemes on the landscape cannot be ignored.

2.1. Economic research on landscapes

Given the considerable public funding of agri-environment schemes, it is pertinent to consider whether these schemes produce the environmental and economic benefits they promise and whether they are economically efficient i.e. do the benefits exceed the cost. While the costs of the schemes are easily tangible through the payments made through the schemes, many of the environmental and social benefits are public goods, of which landscape is one, for which no market prices exist.

A number of economic valuation studies have been conducted for landscapes estimating the willingness to pay of the public for changes to entire landscapes or features of landscapes, (Hanley *et al.*, 2007, Willis and Garrod, 1993, 1992, Campbell, 2007b). However, these studies have tended to focus on only the visual aspects of the landscape, ignoring the inter-related and interactive nature of the cognitive and experiential facets of landscape identified in the conceptual framework of Terkenli (2001). As Tress *et al.*, (2001) notes, landscapes have a mental, social, and cultural reality in addition to a physical one. Furthermore, the nature of the valuation methods employed within these studies shed little light on how people actually perceive the landscape and the context in which scenes are shown (Swanwick *et al.*, 2007). One exception is Hanley *et al.* (2008), who demonstrated that preferences and values for landscapes in the Lake District in North West England and

the Trossachs in Scotland were affected by both how special respondents thought the landscape was and how long they thought that people had lived and worked in landscape.

With stated valuation methods being survey based, the opportunity exists for further information to be obtained from respondents through careful questionnaire design. For example, Antrop (2003) identifies three main groups of qualities used for evaluating landscapes: natural (biology, ecology), cultural (history, social and econ, religious, symbolic and linguistic), and aesthetic (visual, scenic, sensorial i.e. tranquillity). Thus, this study seeks to inform the preference elicitation process for landscapes though exploring what underlies these preferences drawing from psychological, cultural geography and ecological research, which are detailed below.

2.2. Psychology research on landscapes

An extensive literature exists in the psychological field on landscape preferences, in which a dichotomy exists between expert and perception based approaches. Good summaries on these approaches are given in Aoki (1999), Brown et al. (1986) and Daniel (2001). Within both of these approaches to landscape quality evaluation, the interaction of the physical features of the landscapes and the human perception/experience are fundamental. The quality of the landscape is derived from the relationship between the features of the landscape and the effects of those properties on the observer (Daniel, 2001).

The expert-led approach has dominated the environmental management practice, especially forestry management in Scandinavia e.g. (Silvenninen *et al.*, 2001) and (Pukkala *et al.*, 1988). In this approach, landscapes are transformed into formal design parameters through the classification of landscapes into characteristics which are considered to be important for landscape aesthetics i.e. land and water features and vegetation, colours, and the relationships between these features, variety and vividness. Experts are involved in the selection of characteristics of the landscapes and the rules and guidelines which are used to rank the landscapes in terms of landscape quality. Non-experts are considered only in the selection of viewpoints and the numbers of potential viewers of the landscape and the context in which the landscape is viewed (Daniel, 2001). For example, Pukkala *et al.* (1988) developed models to predict the scenic beauty of Finnish forests based on forestry characteristics including mean tree height, species composition and the number of trees per hectare.

In contrast, the perception based approach has derived indices of landscape quality through the use of psychological scaling methods such as paired comparisons undertaken by human viewers e.g. Kaplan and Herbert (1987), Strumse (1996), Arriaza *et al.* (2004), Gomez-Limon and de Lucío-Fernandez (1999), Tahvanainen *et al.* (2001, 2002). Two paradigms of the landscape quality assessments identified by Zube *et al.* (1982) relate to the perception based approach, firstly psychophysical where non-expert judgements are made over landscape stimuli and objective properties of landscape; and secondly cognitive, where landscapes possess meaning. Daniel (2001) summarises studies which have demonstrated that the biophysical features of the landscape are related to perceived landscape quality. Within the latter approach, the aesthetic qualities of landscapes are related to the informational and functional needs of humans (Brown *et al.*, 1986). Kaplan and Kaplan (1989) propose that landscape quality is determined by people's needs to understand and explore natural landscapes (immediate or inferred), leading to the development of four concepts of *complexity* (variety within the landscape), *mystery* (desire to explore),

legibility (ease of finding your way around) and *coherence* (how well does the landscape fit together).

In comparing the expert and perception based approaches, Brown et al. (1986) highlights three points of contrast, firstly the expert approach determines scenic quality through observation of certain artistic principles, while the (cognitive) perception approach is based on human needs which would be likely to play a role in what makes a landscape aesthetic (i.e. make sense, safe and healthy environment). Secondly, the expert approach is based on professional judgment, while the perception based approach is based on long history of human needs and human nature and finally many of the assumptions underlying the expert approach are not well tested in relation to what the public finds aesthetically pleasing, whereas the perception approach has undergone initial testing and validity seems good. With respect to the latter point, Daniel (2001) confirms that in contrast to the expert judgments, perception-based approaches have generally achieved high levels of reliability.

Whether expert-led or perception based, the emphasis of the psychological based approaches is on the relationship between the physical features of the landscapes and the human perception/experience. The impact of culture, both on the landscape and the cultural background of the person observing that landscape is frequently ignored. As highlighted by (van den Berg and Vlek, 1998), a 'consensus' of landscape preferences is often assumed to exist. With many of the studies on landscape involving the use of student experiments, it may be unsurprising that a 'consensus' of preferences has been reached, as a direct consequence of the homogeneity of the sample used e.g. Herzog and Leverich (2003) and Kaplan and Kaplan (1989). Furthermore, many of the same experiments selected a large number of landscapes deemed to fit the cognitive concept in question and then assessed the preferences of the homogenous sample. In contrast, van den Berg and Vlek (1998) using a sample of the general public identified that preferences for an agricultural landscape varied depending on whether the respondent was a farmer, resident (non-farmer) or a visiting cyclist.

2.3. Cultural geography research on landscapes

In addition the psychological studies assessing the perception of the physical features of landscapes on preferences, landscapes have also been studied by geographers where the emphasis is on the relationship between people and the land, whereby landscape is a perceived segment of the earth's surface, a 'way of seeing' rather than being an area or scene (Terkenli, 2001). All landscapes are assumed to be cultural, created by human activity and reflect the cultural meanings that human attach to physical surroundings which is dependent on their cultural, socio-economic or historic context. Thus, cultural landscapes are always symbolically mediated as the landscapes are shaped through human cognition and representation (Cosgrove, 2003).

Initially, the focus was on how humans influenced the landscape (Sauer, 1925) with the visual and material details of the landscape being documented and explained in terms of technologies and social processes (Jones, 2003). This expanded to assess how socio-cultural processes both shape and acquire shape in the context of the landscape (Terkenli, 2001). For example, Swanwick *et al.* (2007) consider landscape to be more than a matter of scenery and aesthetics; it is an integrating concept, embracing all the physical, natural and social/cultural influences that shape the land together with the ways that people interact with and perceive it to transform land into landscape. Similarly, for Antrop (2005)

landscapes have a holistic and complex character, bridging both natural and cultural aspects.

For cultural geographers, landscape perception is driven by cultural factors, with Antrop (2004) identifying the key drivers as cognition, previous experience and utilitarian assessments, while Ohta (2001) identified that the memories and backgrounds of individuals influence the interpretation of landscapes, with imagination/association, impression, aesthetic judgements, and meaning and attractiveness of nature all having a role to play in the evaluation of landscapes.

The influence of culture on the landscape is recognised by the Landscape Convention, which defines landscapes as:

“an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors” (Council of Europe, 2000, pg 3).

2.4. Ecology research on landscapes

For ecologists, landscape is a concept which recognises the complex interactions of natural processes shaping characteristic land areas and the impact of humans on these natural processes.

Increasing management of ecosystems by humans for their aesthetic qualities potentially leads to conflicts between aesthetic quality and ecological sustainability. Gobster (1999) raised this issue with regard to forestry management, whereby the emphasis of forestry management has become increasingly based on enhancing the visual, dramatic and picturesque aspects of forests, making the forest formal and static at the expense of ecological characteristics such as biodiversity and resilience. He argues for an ‘ecological aesthetic’ whereby aesthetic appreciation of a landscape includes the structure and function of ecosystems brought about through a cultural shift. Thus, this ecological perspective views human aesthetic preferences as being transient and therefore should be changed to become consistent with ecological quality (Daniel, 2001). Irrespective of the ethics of deeming ecological criteria superior to human preferences, a recent study by Hill and Daniel (2008) demonstrated that the provision of ecological information for woodland sites had no impact on scenic beauty and acceptability judgments.

2.5. Landscape preferences - socio-economic, psychological and/or cultural?

In both psychology and cultural geography perspectives, research has emphasised the perception of the landscape whether on the informational or cultural meaning inherent within the landscape. For example, from the perspective of psychology, Daniel (2001) identifies the interaction of the physical features of the environment and the human perception/experience as the basic concept of landscape quality. Here, the quality of the landscape is derived from the relationship between the features of the landscape and the effects of those properties on the observer. However, this does not necessarily exclude the cultural aspects of the landscape unless only one perspective on landscape quality is taken to be the definite perspective. Preferences for landscapes are complex, dependent on the characteristics of the landscapes and of the individual observer. The conceptual framework devised by Terkenli (2001), as shown in figure 1., highlights the interactions between the visual, cognitive and experiential facets of the landscape, bringing together the psychological, cultural and ecological viewpoints of landscape assessment.

If landscape perception is driven by psychological, cultural and ecological factors, these may well have an influence on the public acceptability of landscape change. This is especially pertinent given the shifts which have taken place in society since the industrial revolution, with significant changes in land-use and a more transient population, resulting in many people experiencing many different landscapes over the course of their lifetimes. Thus, landscapes may express a of different aspects of one or many successive cultures affecting a place or region, rather than representing a stable reference point to a given society (Antrop, 2003)

The incorporation of landscape perception within the EU Convention requires an understanding of what drives preferences for landscapes. Is there a consensus of preferences for landscapes? Are preferences determined by the presence of certain landscape features and/or their spatial arrangement or the inherent characteristics of the observer? Furthermore, the Convention, as with most EU legislation, is inclusive of the participation of the general public, local and regional authorities. Thus, it is insufficient to rely on expert opinion.

3. The Study

Recognising that preferences for landscapes are complex, dependent on the characteristics of the landscapes and of the individual observer, this study examines the preferences for rural landscapes in Northern Ireland, assessing whether the inherent characteristics of individuals and their cultural background influence those preferences.

The cultural, individual, socio-economic characteristics and environmental attitudes which underlie preferences for landscapes were explored, in terms of:

- Characteristics of the landscapes
- Characteristics of the people
 - Group characteristics
 - Individual characteristics

The study focuses on potential landscapes that could occur in the Less Favoured Areas (LFA) of Northern Ireland under different policy scenarios.

Four landscapes were developed:

- **Baseline** - how the landscape would to look under current farming practice in the absence of agri-environmental management schemes;
- **Agri-environment (heavy)** - how the landscape would look under the current agri-environmental management schemes;
- **Agri-environment (light)** -- how the landscape would look under components of the current agri-environmental management schemes (primarily the reinstatement and maintenance of field boundaries);
- **Abandonment** - how the landscape would look if no farming took place.

3.1. The Landscapes

In representing these proposed landscapes, we selected one landscape within the designated LFA, with a view-shed that was relatively small i.e. not just one field to enable a variety of changes to be made and not too large so that it comprised too much detail and people would not be able to determine the changes. One photo of the landscape was computer manipulated to represent the landscape under the policy related changes. The landscapes used within this study are shown in Figure 1. All the images contained some degree of manipulation, so that no one image looked like the original image which might influence preferences of the respondents. Using one landscape in combination with computer manipulation, we were able to separate the influence of land-form and land-cover on people's preferences. It has been shown that both land-form and land-cover can influence landscape preferences (Hammita *et al.*, 1994). While human activity can impact on the land-form of a landscape, the impact of policy changes under consideration within the LFAs will affect the land-cover, not the land-form. Within this process of developing the landscapes, consultation took place with ecologists within AFBI, NGOs and policy makers to ensure that the results were believable and representative of the policy-based scenarios.

3.1.1. The Agri-environment scheme landscapes

In Northern Ireland, the Countryside Management Scheme (NICMS) was introduced in 2008 replacing the Environmentally Sensitive Area scheme (ESA) which ran from 1988 within areas designated as Environmentally Sensitive (20% of the agricultural land area) and the Countryside Management Scheme (CMS) which was introduced in 2000 on non-designated land. Under the NICMS the entire farm is placed into the scheme.

The aims of the NICMS are to improve biodiversity; improve water quality; mitigate climate change; improve soil quality and avoid marginalisation and land abandonment. Under the current and proposed monitoring schemes, biodiversity is assessed through the area and condition of habitats subject to the Northern Ireland Biodiversity Action Plans (BAP), together with specific targets for farmland birds, invertebrate species, plants and trees. The impact on landscape of the schemes is assessed through the length and condition of hedgerows and High Nature Value farmland.

In developing landscapes for the study, it was assumed that the current schemes was applied in full for the agri-environmental (heavy) landscape, while the agri-environmental (light) landscape was derived through only applying those measures with direct visual impact i.e. field boundaries.

3.2. The Survey

Within this study the choice based method of paired comparisons was used to determine each individual respondent's preferences for the three landscapes in question. The method involves all possible pairs of landscapes being offered to the respondents who state which of the landscapes they prefer for each pair (Edwards, 1957, David, 1988). This enables the transitivity of the preferences for landscapes to be tested and a scale produced showing the relative strength of the aggregate preferences for each landscape. From the data, it is possible to examine preferences between each pair of landscapes and for the overall ranking of the landscapes.

The transitivity test will shed light on whether people are able to make choices over alternative landscapes (a fundamental assumption in both the methods of Contingent Valuation and Choice Experiments). Our paired comparisons experiment could be considered a simple Choice experiment. If people are unable to do this, which would be reflected in a high level of intransitivity, then it would be highly unlikely the addition of monetary values would improve people's ability to choose.

Following extensive focus group work and piloting of the survey instrument, respondents were first asked to look at all the photos "*....and imagine that you are standing in each of these landscapes*". They were then shown the landscapes in pairs and asked "*For each pair of landscapes, I would like you to tell me which of the two landscapes you most like.*"

In presenting the landscapes to the respondents, both the order in which they were presented to the respondents initially and within the pairs was randomised. No inference was made as to which landscape is the baseline, as previous studies have shown that the knowledge of the status quo landscape affects preferences (van den Berg and Vlek, 1998). For the administration of the survey, it was necessary to label the landscapes, however randomly drawn letters were used to avoid any inference of order on the landscapes. To assess whether there was any status quo effect, respondents were asked to rank the landscapes in response to the question "*which landscape do you think most represents the countryside of Northern Ireland today?*" The labels were as follows: G (Baseline), P (Abandoned), K (agri-environmental (heavy)), and E (agri-environmental light)).

3.3. Socio-economic and cultural factors

This study considers a range of socio-economic and cultural factors to gain an insight into people's preferences for alternative LFA landscapes and identify sources of individual differences. Sources of individual differences may reflect differences in socio-economic characteristics, familiarity with agricultural landscapes and recreational motives:

- a) Socio-economic variables - characteristics that may be expected to be important in the assessment of landscapes include age, income, gender and education.
- b) Cultural variables - people may differ in their familiarity with agricultural landscapes depending upon where they live (countryside/non-countryside) and how they use the countryside for farming and recreation. People differ in terms of recreational motives for visiting the countryside, with individuals visiting the countryside for relaxation purposes, wildlife study or more active pursuits such as cycling and rambling.
- c) Environmental attitudes - previous studies have demonstrated that environmental concern is an important source of individual differences. This is most often captured in terms of membership of environmental organisations. Environmental attitudinal scores, however, provide a more sophisticated means of capturing different aspects of respondent's environmental beliefs. We examined whether the beliefs and perceptions regarding the natural environment influenced landscape preferences, using the New Environmental Paradigm (Dunlap *et al.*, 2000).

3.4. Sample

The survey involving in-person interviews was undertaken in March 2008. A two stage sampling method was used, with an initial random selection of 35 electoral wards across Northern Ireland. Two samples of respondents were drawn at the ward level of 515 and 208 respondents was based on quota controls (age, sex and socio-economic grouping), to ensure the overall quota is representative of the Northern Ireland adult population. The first sample (A) of 515 respondents undertook the survey based on choices between three of the landscapes (baseline, agri-environmental (heavy) and abandoned) while the sample B undertook choices over all of the landscape. This enabled more socio-economic, cultural and environmental factors on landscape preferences to be assessed.

4. Results

4.1. Assessment of Transitivity

In making their choices between the pairs of landscapes, respondents were given the option of stating that they were unable to choose between the landscapes. In total, in sample A 23 respondents (4.5%) were unable to make a choice between one, or more of the pairs and 18 (8.6%) in sample B. For the purpose of this initial analysis of preliminary findings these respondents were excluded from the sample.

Respondents are transitive in their choices when given three objects A, B, C, if object A is preferred to object B and object B is preferred to C, then object A MUST be preferred to object C. This is a core principle of rational choice theory. The presence of transitivity demonstrates that a relationship exists between all of the objects under consideration and this relationship forms the basis of the ranking, from which respondents chose their preferred option. Respondents who were unable to make transitive choices were removed from this study as their preferences cannot be ranked.

The findings for this survey show that respondents exhibited a high level of transitivity, with 83% of respondents in sample A being transitive, and 71% of sample B. This demonstrates, therefore, that the vast majority of the sample can make rational choices over these landscapes, as more landscapes are introduced into the analysis the number of people unable to make rational choices increases.

Table 1. Findings from comparisons between the baseline, abandoned and agri-environmental heavy landscapes

	A	B
Sample size	515	208
Respondents able to chose between ALL pairs	492	190
Transitive respondents (number)	410	135
Transitive respondents (%)	83	71

4.2. Preference Order of the landscapes

Using the transitive respondents (those able to make choices that could be ranked), a preference order of the landscapes was determined and the statistical significance of the differences between the orders was assessed.

As shown in Tables 2a and b, in Sample A the landscape under the current agri-environmental management schemes (agri-environmental (heavy) landscape) was preferred to the baseline landscape, which in turn was preferred to the abandoned landscape, with high levels of statistical significance.

In sample B, the choice between the landscapes produced under the current agri-environmental management scheme (agri-environment (heavy)) and that produced by components of the schemes relating to the reinstatement and maintenance of field boundaries (agri-environmental (light)), the landscape produced under the current comprehensive scheme is preferred.

However, the preferences between the baseline and abandonment landscapes are not so clear cut. While the difference between these landscapes is significant for sample A, it is insignificant for samples B. Further analysis exploring the impact of socio-economic variables on the landscape preferences may be able shed light on this particular finding.

Table 2a Order of preferences for each landscape

	Preference Order Sample A	Preference Order Sample A
Agri-environment Heavy	1	1
Agri-environment light	-	2
Baseline	2	3
Abandoned	3	4

Table 2b Testing for significant differences in the preferences for each landscape

	Sample A	Sample B
Agri-environment Heavy V Agri-environment Light	-	***
Agri-environment Heavy V Baseline	***	***
Agri-environment Heavy V Abandoned	***	***
Agri-environment Light V Baseline	-	***
Agri-environment Light V Abandoned	-	***
Baseline V Abandoned	***	Not Sig difference

*** denotes significance at the 1%

In this paper, we report the preliminary analysis of the factors which underlie the preference choices of individual respondents with respect to the three landscape choices, i.e. agri-environmental (heavy) vs baseline, agri-environmental (heavy) vs abandoned and abandoned vs Baseline, were examined and appropriate statistical tests were applied².

The impact on the landscape preferences of the characteristics of the respondents is explored using statistical tests on each individual characteristic in turn. This is a pre-cursor to on-going work which will develop regression models, in which the significant factors and their interactions will be examined in detail. The analysis is undertaken at the choice level on sample A (analysis on sample B is ongoing) i.e. how do these factors influence the

² Categorical data: Pearson's chi-square test for independence (Fisher's exact test for categories comprising a small number of respondents);
Continuous data: Kruskal Wallis one-way analysis of variance test for equality.

following choices (figures in parenthesis relate to the percentages of respondents preferring each landscape for each choice):

- Choice I Agri-environmental (heavy) (63%) vs Baseline (37%)
- Choice II Agri-environmental (heavy) (62%) vs Abandoned (38%)
- Choice III Baseline (66%) vs Abandoned (34%)

4.3. Socio-economic and cultural factors

We examined the preferences for landscapes with respect to a number of socio-economic and cultural factors. The results of the statistical tests are reported in the following tables. If the test statistic is significant, this indicates that a relationship exists between the explanatory variable and the landscape choice in question. There are three possible consequences of a statistical significant relationship: an increase in magnitude, a decrease in magnitude and a change in the preference choice. For example, consider a choice between x and y, where 75% of the whole sample prefer x and 25% prefer y. Given a significant explanatory variable, the relationship between x and y for the respondents within this group compared to the rest of the sample can be one of the following:

- i) a higher proportion of respondents prefer x over y (e.g. 85:15) - increase in magnitude;
- ii) a smaller proportion of respondents prefer x over y, but x is still preferred (e.g. 60:40) - decrease in magnitude;
- iii) more respondents prefer y over x (e.g. 35:65) - change in preference choice.
- iv)

a) Socio-economic variables

The impact of the socio-economic factors on preference choices are shown in Table 3. Gender and Income were shown not to be significantly related to any of the preference choices.

Table 3: Socio-economic preferences for landscapes compared to the rest of the sample

Choices (total sample preference choices in parenthesis)	Respondent Characteristics			
	Gender vs rest of sample	Age (over 65) vs rest of sample	Household Income vs rest of sample	Education (possess a degree) vs rest of sample
Agri-Environ. (63%) vs Baseline (37%)	NS	NS	NS	** <u>With degree</u> 78% Agri-environ. 22% Baseline
Agri-Environ. (62%) vs Abandoned (38%)	NS	NS	NS	NS
Baseline (66%) vs Abandoned (34%)	NS	* <u>Over 65</u> 56% Baseline 44% Abandoned	NS	NS

Note: * denotes significant at the 10% level, ** denotes significant at the 5% level and NS denotes not significant.

Significant variables for specific choices were:

- Age (over 65) was significantly related to the preference choice between the baseline and abandoned landscapes. A smaller proportion of respondents within the over 65 group preferred baseline over abandoned compared to the rest of the sample. The baseline landscape was still preferred by the over 65s but the majority was much smaller to the extent that it was no longer a clear cut preference.
- Education (possess a degree) was significantly related to the preference choice between the agri-environmental (heavy) and baseline landscapes. A higher proportion of respondents with a degree preferred agri-environmental (heavy) over baseline compared to the rest of the sample, i.e. there was an increase in magnitude for this preference choice.

b) Cultural variables:

In addition to examining the impact of socio-economic factors, this study considers how the background and experience of the respondents shape landscape preferences - the cultural

context. Three cultural factors were considered, namely residential location, farming and recreational activities.

➤ *Residential Location*

The results, shown in Table 4, demonstrate that if the respondents who live in the countryside are taken as one group this masks the differences in preferences that exist between those who have *always* lived in the countryside and those who have *moved* to the countryside³.

Table 4. Residential location preferences for landscapes compared to the rest of the sample

Choices (total sample preference choices in parenthesis)	Respondent Characteristics		
	Live in the Countryside Vs rest of sample	Always live in the Countryside vs rest of sample	Moved to the Countryside vs rest of sample
Agri-Environ. (63%) vs Baseline (37%)	NS	NS	NS
Agri-Environ. (62%) vs Abandoned (38%)	NS	NS	NS
Baseline (66%) vs Abandoned (34%)	NS	NS	** <u>Moved</u> 36% Baseline 64% Abandoned

Note: * denotes significant at the 10% level, ** denotes significant at the 5% level and NS denotes not significant.

- Respondents who live in the countryside did not differ from the rest of the sample in terms of their landscape preferences.
- Respondents who have *always* lived in the countryside did not differ from the rest of the sample in terms of their landscape preferences.
- Respondents who have *moved* to the countryside were significantly related to the preference choice between baseline and abandoned. More respondents who have *moved* to the countryside preferred the abandoned

³ Respondents who currently live in the countryside but grew up elsewhere.

landscape over baseline resulting in a preference change compared to the rest of the sample.

These results support comments made within pre-survey focus groups that people who move to the countryside differ in their appreciation of the role of farming in the countryside to people who have always lived in rural areas.

Farming

Two types of farmers, current and retired with different preferences for the landscapes were distinguished, see Table 5.

Table 5: Farmers preferences for landscapes compared to the rest of the sample

Choices (total sample preference choices in parenthesis)	Respondent Characteristics	
	Current Farmers vs rest of sample	Retired Farmers vs rest of sample
Agri-Environ. (63%) vs Baseline (37%)	NS	NS
Agri-Environ. (62%) vs Abandoned (38%)	NS	NS
Baseline (66%) vs Abandoned (34%)	NS	** <u>Retired farmer</u> 40% Baseline 60% Abandoned

Note: * denotes significant at the 10% level, ** denotes significant at the 5% level and NS denotes not significant.

- Current farmers do not differ from the rest of the sample in terms of their landscape preferences. However, this is likely to be a consequence of the small sample, with only 7 current farmers included within this sample of the general population. From the 120 (transitive) current farmers who took part in the landscape study at an agricultural show⁴ in May 2008, their preference choices were for each choice were as follows:
 - Agri-Environ. (84%) vs Baseline (16%)
 - Agri-Environ. (97%) vs Abandoned (3%)

⁴ The Show of the Royal Ulster Agricultural Society at Balmoral, Belfast.

□ Baseline (90%) vs Abandoned (10%)

This suggests that while current farmers possess the same landscape preferences as the sample of the general population, the magnitude of their preference choices is much greater.

- Retired farmers were significantly related to the preference choice between baseline and abandoned. A higher proportion of retired farmers preferred the abandoned landscape over baseline compared to the rest of the sample. This resulted in a preference change compared to the rest of the sample.

➤ Recreational Factors

A further category of respondents characteristics related to how respondents used the countryside, see Table 6.

Table 6: Recreational users of the countryside preferences for landscapes compared to the rest of the sample

Choices (total sample preference choices in parenthesis)	Respondent Characteristics		
	Relaxing usage vs rest of sample	Active usage vs rest of sample	Wildlife usage vs rest of sample
Agri-Environ. (63%) vs Baseline (37%)	NS	NS	NS
Agri-Environ. (62%) vs Abandoned (38%)	NS	* <u>Active</u> 57% Agri. Environ. 43% Abandoned	NS
Baseline (66%) vs Abandoned (34%)	NS	** <u>Active</u> 60% Baseline 40% Abandoned	NS

Note: * denotes significant at the 10% level, ** denotes significant at the 5% level and NS denotes not significant.

- *Relaxing users of the countryside* (sightseeing/driving/picnicking) were not significantly related to any of the preference choices.

- *Active users of the countryside* (walking/rambling/running/cycling) were significantly related to the preference choices between:
 - agri-environmental (heavy) and abandoned
 - baseline and abandoned.

In both cases, a higher proportion of active users preferred the abandoned landscape compared to the rest of the sample.

- *Wildlife users of countryside* (bird watching/wildlife observation) were not significantly related to any of the preference choices.

4.4. Environmental attitudes

Factor analysis on the responses to the environmental attitude statements identified three factors which represent different environmental beliefs. These factors and the statements which underlie them are detailed below, with the results of appropriate significance tests shown in Table 7. In the statistical tests the equality of the factor scores between each of the preference choices is assessed. If the test statistic is significant, then this implies that the environmental attitude factors are related to the preference choices. The table highlights the landscape preference which is positively related to the factor score.

Table 7 Impact of environmental attitudes on landscape preferences

Choices (total sample preference choices in parenthesis)	Factor 1 (Ecocentrism)	Factor 2 (Technocentrism)	Factor 3 (limits to growth)
Agri-Environ. (63%) vs Baseline (37%)	NS	NS	NS
Agri-Environ. (62%) vs Abandoned (38%)	NS	** Agri-Environ.	NS
Baseline (66%) vs Abandoned (34%)	NS	** Baseline	* Abandoned

Note: * denotes significant at the 10% level, ** denotes significant at the 5% level and NS denotes not significant.

- i. *Factor 1: Ecocentrism* - where humans are subject to nature rather than humans dominating nature.

- The balance of nature is very delicate and easily upset.
- Plants and animals have as much right as humans to exist.
- Ecocentrism has no significant impact on any landscape choice.
- ii. **Factor 2 Technocentrism** - humans control over nature and while environmental problems do exist, they can be solved through science.
 - Human ingenuity will ensure that we do not make the earth uninhabitable.
 - Humans will eventually learn enough about how nature works to be able to control it.
 - The balance of nature is strong enough to cope with the impacts of modern industrial nations.
 - The ecological crisis facing humankind has been greatly exaggerated.
- Expressing a “technocentric” attitude was significantly related to the preference choice between the agri-environmental (heavy) and abandoned landscapes. Respondents who favoured the agri-environmental (heavy) landscape were more likely to have a higher “technocentric” attitude score than those who favoured the abandoned landscape.
- Expressing a “technocentric” attitude was also significantly related to the preference choice between the baseline and abandoned landscapes. Respondents who favoured the baseline landscape were more likely to have a higher “technocentric” attitude score than those who favoured the abandoned landscape.

With 84% of the sample identifying the abandoned landscape as the “landscape in which nature takes its own course,” it may be inferred that this landscape is viewed as having the least degree of human influence. Thus, respondents who expressed a high “technocentric” attitude unsurprisingly favoured the more human influenced landscapes, i.e. the baseline and agri-environmental (heavy) landscapes.

- iii. **Factor 3 Limits of growth**- concerned over the availability of resources
 - We are approaching the limit of the number of people the earth can support.
 - The earth is like a spaceship with very little room and resources.
- Expressing a “limits to growth” attitude was significantly related to the preference choice between baseline and abandoned. Respondents who favoured the abandoned landscape were more likely to be concerned about the availability of resources than those who favoured the baseline landscape.

5. Concluding remarks

The results in this survey of the general population of Northern Ireland showed that overall a statistically significant preference order existed for the LFA landscapes, with the agri-environmental (heavy) landscape being the most preferred by both samples, followed by

baseline and lastly abandoned, agri-environmental (light) was preferred ahead of the baseline and the abandoned landscapes by sample B. The vast majority of the general public surveyed were able to make rational choices between the above four landscapes i.e. able to rank all available options in order of preference and choose the one they most prefer.

Further exploration identified the characteristics of individual respondents which influenced the choices between the landscapes. Each characteristic affected different landscape choices. Specifically, this study demonstrates that landscape preferences of the general public of Northern Ireland are influenced by socio-economic and cultural factors of respondents and how they view their relationship with nature. These sub-groups of respondents and their impact on landscape choices are summarised in the table below.

This study has identified sub-groups of the population which possess different preferences to the rest of the sample. This difference can take the form of a change in the magnitude of the preference, in which the sub-group overall still prefers the same landscape as the overall sample but the proportion of respondents favouring that landscape differs (increases/decreases). Alternatively, the sub-group could prefer the other landscape in the choice under consideration. Of most concern are those sub-groups identified as having opposing preferences to the overall population as this could lead to conflict in determining the acceptability of landscape changes. For example, often people living in the countryside are treated as one homogenous group, which assumes that they hold similar preferences. However, this study has shown that the preferences of respondents who have *always* lived in the countryside do not differ from the rest of the sample, while respondents who have *moved* to the countryside to live have different preferences for the choice between the baseline and the abandoned landscapes.

How respondents view their relationship with nature also influences their landscape preferences, with those with more “technocentric” attitudes tending to favour landscapes which are influenced to a greater extent by humans (baseline and agri-environmental (heavy)), while those who are concerned by “limits to growth” issues tend to favour the abandoned landscape.

Therefore, in determining the public acceptability of schemes which are designed to maintain and enhance biodiversity, in this case agri-environment schemes, the wider impacts of the schemes on society must take into account in addition to the biodiversity objectives. Furthermore, in the case of landscapes, it appears that beauty IS in the eye of the beholder⁵, and thus is affected by their socio-economic, cultural and environmental attitudes.

⁵ This was true, whether considering the general public at large or farmers (those responsible for implementing the agri-environment schemes).

Respondent Characteristics	Landscape Choice	Sub-group Preferences Compared to Rest of Sample ⁶
<i>Socio-economic</i>		
Age (over 65)	Baseline vs abandoned	Baseline is preferred to a lesser extent but baseline still preferred to abandoned
Education (degree)	Agri-environmental vs baseline	Agri-environmental is preferred more
<i>Cultural</i>		
Move to the countryside	Baseline vs abandoned	Change in preference - abandoned preferred to baseline
Current farmers ⁷	All choices	Preference choices the same as the main survey but the chosen landscape in each choice is preferred more
Retired farmers	Baseline vs abandoned	Change in preference - abandoned preferred to baseline
Active user	Agri-environmental vs abandoned	Agri-environmental is preferred to a lesser extent
	Baseline vs abandoned	Baseline is preferred to a lesser extent
<i>Environmental attitudes</i>		
Technocentrism	Agri-environmental vs abandoned	High “technocentric” respondents prefer agri-environmental
Technocentrism	Baseline vs abandoned	High “technocentric” respondents prefer baseline
Limits to nature	Baseline vs abandoned	Respondents concerned about limits to nature prefer abandoned

⁶ Preference choices in the whole sample were as follows: Agri-environmental (heavy) (63%) vs Baseline (37%); Agri-environmental (heavy) (62%) vs Abandoned (38%) and Baseline (66%) vs Abandoned (34%).

⁷ Result from Balmoral survey.

Figure 1. Landscapes used in survey

Figure 1a Baseline landscape



Figure 1b Landscape under agri-environmental management heavy



Figure 1c Landscape under agri-environmental management light



Figure 1d Landscape under abandonment



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