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Trails or Timber? A Contingent Behaviour Model of Recreational Facilities in Irish Forestry

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ABSTRACT

This research utilises a contingent behaviour valuation technique to value a number of improvements to recreational facilities in small-scale forests in Ireland. Willingness–to-pay estimates have previously been made for Coillte (Ireland's state-owned forestry company) trails and forests. The total non-market value of Irish forests has also been examined. This paper adds to the literature by being the first to estimate the consumer surplus associated with recreational enhancements to Irish small-scale forest resources. The results presented indicate that community owned small-scale forestry can contribute enormously to the wellbeing of nearby urban residents, through the provision of outdoor recreational services.

Keywords: contingent behaviour, travel cost, consumer surplus, forest recreation, Ireland.

JEL Classiciation: Q0

INTRODUCTION

Along with the growth of forestry, Ireland has seen huge growth in outdoor recreation participation throughout the 1990s and early 2000s. The widely documented 'Celtic Tiger' brought increased wealth and disposable income to a greater proportion of the Irish population, which gave rise to increased car ownership and extended leisure time, enabling people to partake in a host of outdoor recreation activities (Fitzpatrick and Associates, 2005). Forests throughout the country are key destinations for many of these activities. Clinch (1999) estimated that there were 8.5 M visits to Irish forests in 1999. Bacon and Associates (2004) estimated annual forest visitations to be 11 M in 2004, while Fitzpatrick and Associates (2005) estimated the approximate usage of Irish forests to be 18 M visitors per year in 2005.

Forest users place a value on the availability of forests for their recreational use but these recreational values do not have a market price and therefore are difficult to estimate. Without the non-market values being accounted for, forests would be greatly undervalued in economic evaluations. An important question for forest managers therefore, relating to the future investment in forest recreation, is what types of recreation facilities generate the greatest welfare gains to forest users. Most current research has simply valued forest recreation either in a generic sense (e.g. Clinch, 1999) or as a single attribute of wider forest values (Willis and Garrod, 1992; Hanley and Ruffell, 1993).

To date, few studies have examined the economic value of increasing specific forest recreation amenities, nor does any current research rigorously explore whether community-owned small-scale forestry could contribute to the wellbeing of nearby urban residents, through the provision of outdoor recreational services. This research aims to fill the gap in the literature by estimating the consumer surplus associated with two enhancements to forest resources in terms of recreational facilities at two small-scale community owned forests in County Galway, Ireland.

These forest locations are in close proximity to urban areas. The following section examines previous economic studies relating to the non-market goods provision in Irish forestry, and explains both stated and revealed preference techniques used to value non-market goods (e.g. forest recreation). Case study sites and survey design are then discussed. The contingent behaviour methodology is then outlined and the results of the analysis presented. The paper concludes with a discussion of the value of small-scale forestry as a recreational resource.

VALUATION TECHNIQUES AND THE VALUATION OF PUBIC GOOD PROVISION IN IRISH FORESTRY

Economic valuation techniques usually fall into two distinct categories, stated preference (SP) techniques and revealed preference (RP) techniques. SP methods ask users directly to state their willingness-to-pay (WTP) for the opportunity to use an environmental amenity (Hanley *et al*., 2002). On the other hand, RP approaches utilise consumer behaviour towards the consumption of specific goods (and services), in order to estimate the demand for non-market goods. Goods that have an active market price mechanism are used to estimate the value of non-market public goods.

There have been numerous valuation studies undertaken on Irish forestry using both of these methods but none related specifically to non-market goods provision in small-scale forestry. A detailed valuation study was undertaken by Ni Dhubhain *et al*. (1994) as part of a study to determine the social and economic impacts of forestry on rural development in the Republic of Ireland, Northern Ireland and Scotland. In their study, forest recreation was valued using both the travel cost method (TCM) and the Contingent Valuation Method (CVM). They estimated that the willingness to pay (WTP) for a single day-visit to a forest was between €1.02 and €2.73 (1992 prices), with an aggregate value of recreational activities associated with forests of €15.9 M annually.

Clinch (1999) also carried out a public goods valuation study on Irish forestry. He estimated that there are 8.5 M visits made to Irish forests annually. A CVM methodology was used here, to account for the willingness-to-pay for the landscape, wildlife and recreational benefits from Irish Forests. He found that in 1999 the net present value of Irish forests (in terms of a non–market good) amounted to £129 M (€197 M). Bacon and Associates (2004) updated Clinch's visitor estimates, presuming a growth rate of 3% per year, indicating a total of 11 M visitors in 2004. Adopting a model used in the UK, Bacon and Associates (2004) were able to calibrate a model for Irish forests and estimate a willingness-to-pay of €3.34 per visit in 2003 prices.

In a more recent Coillte report, Fitzpatrick and Associates (2005) used primary data from 640 on-site interviews and a survey completed by 3,000 households, in a contingent valuation study, to measure the non-market value of forest recreation in Ireland. The non-market value was estimated at €97 M per year, much larger than the estimate of €16 M in 1990 when Coillte carried out a similar valuation of Irish forestry (Fitzpatrick and Associates, 2005). In another study, Scarpa *et al*. (2000) used the CVM approach to estimate the WTP by recreationalists for forest attributes in Irish forests. They found that the presence of a nature reserve in a forest increased visitors' WTP (at a 5% significance level). Using a random utility model, forests in the Republic of Ireland with new nature reserves were found to generate on average almost €0.57 of additional consumer surplus per person per visit. Thus, investment in forest attributes and facilities have been shown to dramatically increase the welfare to visitors from forest sites. In an alternative study (Mill *et al*. 2007), the authors calculated the personal and social mean willingness-to-pay (MWTP) for conservation of an Irish forest. They found a statistically significant positive correlation between the personal MWTP for various forest attributes and the rankings of these attributes by forest managers, suggesting that public-use forest managers have similar attribute tastes to forest recreationalists.

Stated and revealed preference techniques have both strengths and weaknesses relative to each other. To utilise the strengths of both techniques, a combined approach can be employed. Mathis *et al*. (2003) stated that to improve the accuracy of non-market valuation, researchers should combine these different techniques. Contingent behaviour models have developed in order to implicitly combine revealed and stated preference methods within one modelling framework. The intended behaviour of respondents is measured in some contingent market, as opposed to actual behaviour in an actual market. This information from the contingent behaviour can then be combined with data from revealed preference observations from the same individuals. In an early use of this method, Englin and Cameron (1996) examined actual fishing trips and hypothetical trips that would be taken if travel costs increased by 25, 50 or 100%. Price and quantity estimates, both real and hypothetical, were made for each respondent. It emerged that revealed preference data alone gave lower welfare estimates per angler than did the results from the combination of the revealed and stated preference data. The combination of the revealed preferences and hypothetical data was found to improve the precision of WTP estimates.

In another study, by Hanley *et al*. (2002), the contingent behaviour model was used to assess changes in trip frequency by beach users in relation to changes in environmental quality. The welfare benefit of improving all beaches in the study to a hypothetical state where all respondents would rate the water quality as "very good" was estimated to be £5.81 (€8.57) per person per year. The authors concluded that contingent behaviour models do not suffer from the hypothetical market bias often associated with contingent valuation and also offer the scope to study welfare effects of environmental changes beyond the range of existing data. There are only a limited number of cases where the contingent behaviour model has been used in a forestry setting.

The economic impacts of timber harvesting operations on the quality of outdoor recreation experiences have been examined by Morton et al. (1995) in a study that employed the contingent behaviour model to measure the changes in the value of road access, game populations, hunter congestion, and travel costs for big game hunters due to timber harvesting activities. The model was applied to a Forest Management License Area in north-western Canada. The authors proposed that this information could contribute to the development of integrated resource management plans that consider societal benefits. This study indicated that in some cases, positive changes in hunting attributes were overshadowed by the presence of forestry operations. The marginal value of access for deer hunters as calculated using the results of the contingent behaviour model was \$7.93 (€5.15), while the value for moose hunters was \$32.15 (€20.88).

In a more recent forestry study Starbuck et al. (2006) examined the linkages between fire and fuels management activities to changes in forest recreation demand using the contingent behaviour methodology. Using available survey data collected in New Mexico (United States) during the summer of 2001, a pooled travel cost and contingent behaviour model of forest recreation demand was developed. An endogenously stratified truncated Poisson model was used to estimate consumer surplus and predict changes in recreation visits under three alternative fire and fuels management scenarios. Using the econometric results on the predicted changes in recreation demand, the authors then employed regional Input–Output models, at both the state (New Mexico) and local (south-western New Mexico) level to simulate the varying regional economic impacts of the fire and fuels management scenarios.

This paper is the first to use the contingent behaviour method to value public good provision in small-scale community owned forestry. This paper also adds to the forestry literature by using a panel data specification of the contingent behaviour model as opposed to the pooled specification used in the studies of Morton et al. (1995) and Starbuck et al. (2006). It is also the first use of this model to examine the added value of wildlife hides and sculpture gardens in particular in a forest setting.

SELECTED FOREST SITES AND THE SURVEY INSTRUMENT

Data for this research was collected using on-site, in-person interviews between June and August 2006. Interviews were undertaken at two community owned small-scale forest sites in Ireland; namely Barna Wood and Renville forest. Both forest sites are managed by Galway County Council. Barna Wood is located in the western suburbs of Galway city, covering 10.5 ha, and Renville Forest Park is located in the outskirts of Galway City, approximately 3 km from Oranmore village with a forested area of 18.5 ha. Barna wood, just 4.5 km miles from the centre of the city boasts the last natural growing oak forest in the west of Ireland. This mature wood provides walks, trails and picnic facilities. Renville Park has amenities for visitors and locals alike, with walks, a playground and picnic and barbeque facilities on site.

These two forest sites were chosen because the objective of this study was to assess whether small-scale community-owned forestry contributes to the wellbeing of nearby urban populations, through the provision of outdoor recreational services. Both of the chosen forest sites are not tourist destinations in their own right but nevertheless are used heavily by the local urban communities as recreational amenities. The forests cater for a wide range of uses; a breakdown of the main activities pursued in the forests by the sample of users in the study is presented in Table 1.

Table 1. Forest recreational activities undertaken by sample at both small-scale forest sites

Main activity	Number of participants	Relative frequency (%)
Exercise walking	160	59.48
Running	2	0.74
Dog walking	54	20.07
Nature walking	4	1.49
Cycling	7	2.6
Picnic/BBQ	15	5.58
Photography	1	0.37
Other	26	9.67
Total	269	100

As part of this study, 269 personal interviews were carried out in Barna Wood and Renville Forest Park. Walking was the main activity of 60% of all respondents. Also, it is notable that 62% of respondents were female, 64% were in full-time employment and 60% had been educated up to degree level. Individuals interviewed in Renville Forest accounted for 75% of the sample.

In the survey of forest recreationalists, on-site interviews were conducted on both week days and weekends, during all daylight hours.[1] The questionnaire solicited information on trips taken to the forest, activities undertaken, personal demographics, income, employment status, education, social relations and obligation free time. Each interview took approximately 10 minutes. Respondents were provided with background information on the study and were then asked to outline how they used the forests for recreation. Next, they were presented with information on how the forest (where they were sampled) might be improved for recreation. Respondents were next presented with two contingent behaviour scenarios (as listed in Table 2) and asked to identify the extent to which their number of planned trips to the forest in the next 12 months would change if the stated improvements were made (the actual questions used in the survey in relation to the impact of a change in forest facilities are presented in Appendix 1). Finally, attitudinal data was also collected from the respondents.

[1] Usage of the small-scale forest sites by the local communities is highest during the summer months although according to the local authority in charge of the two sites, usage remains high even in winter due mainly to the close proximity of the small-scale forest sites to the urban areas.

RESEARCH METHOD

In the contingent behaviour model, the visitation variable is an integer for a before and after scenario. Thus, application of the standard distributional assumptions (e.g., normality) is inappropriate because the dependent variable in the contingent behaviour model cannot take on a continuous range of values. Following the work of Creel and Loomis (1990), the current model was estimated under the assumption that the observed number of trips can be described by a count data model. A negative binomial specification is used to account for over-dispersion of the data, that is, where the conditional variance is greater than the conditional mean. This is a generalisation of the Poisson model (Hynes and Hanley, 2006). To take account of the panel nature of the data, a random effects specification is utilised.[2]

Given that the data are derived from an on-site survey, they are subject to the problem of endogenous stratification. Endogenous stratification means that the likelihood of being sampled depends on the frequency with which an individual visits the forest. Frequent visitors are overrepresented in the sample, and hence the estimate of the mean annual number of visits is upwards biased. In order to avoid this problem, the individual observations in the sample are weighted by 1/(individual number of visits per year). It should also be noted that since the sample was collected on-site it is not possible to model the decision to take a trip by those who currently do not visit the site. Therefore, the welfare estimates presented in this paper relate only to those who currently visit the two forest sites in the survey.

[2] A more thorough development of random effects models can be found in Hausman, Hall, and Griliches (1984).

Table 2. Scenarios used in contingent behaviour study

IMPACT OF A CHANGE IN FOREST FACILITIES A
Suppose that NEXT YEAR a new WILDLIFE VIEWING HIDE is built at a central location within THIS FOREST.

It is expected that you would be able to see a variety of birds and some large mammals from the hide. Active wildlife management (including the use of feeding stations) would be used to attract the wildlife to the hide.

How would these new facilities affect your use of THIS FOREST?

IMPACT OF A CHANGE IN FOREST FACILITIES B
Suppose that NEXT YEAR a new ART / SCULPTURE GARDEN was built within THIS FOREST.
The Art / Sculpture Garden would be approximately 1 acre in size. The art / sculpture exhibits would depict images of the forest / countryside and be built with material that blends in with the forest (i.e. wood, stone).

How would these new facilities affect your use of THIS FOREST?

In the contingent behaviour modelling framework, each person *i* in each data set yields two responses. The first is the number of trips (V_{ij}) they make to a given forest *j* per year, as a function of travel costs to the forest ($TCij$), travel costs to other, substitute sites ($TC_{sub\ ij}$), income (Y_i), the gender, age and education level of the respondent (S_i, A_i, E_i), and a vector of dummy variables representing unobserved quality differences for each site in the sample (D_1, D_2). The second observation is how many extra trips (if any) the person says they would make if a specified improvement in recreational facilities at the site occurs.

To estimate the recreational benefits from the two suggested facility improvements, one must firstly predict trips under current and under hypothetical conditions, in order to predict the change in the number of trips. Next, the travel cost coefficient estimate from the negative binomial panel model is used to value the increase in trips in monetary terms. For consumer utility maximization subject to an income constraint, and where the number of trips are a nonnegative integer, Hellerstein and Mendelsohn (1993) showed that the expected value of consumer surplus, $E(CS_i)$ derived from count models can be calculated as $E(CS_i) = E(T_i|X_i)/\beta_p = \hat{\lambda}_i/(\beta_p)$ where

T_i is the number of trips to the forest for individual *i*, and λ_i is some underlying rate at which the number of trips occur, such that one would expect some number of trips in a particular year, i.e. λ_i is the mean of the random variable T_i. The vector X_i represents the set of explanatory variables reported for each individual *i* and $ß_p$ is the price (*i.e.* travel cost) coefficient. The per-trip *E*(*CS*) is simply equal to $1/-ß_p$. The change in the consumer surplus resulting from an improvement in the forest amenities is then given by

$$\Delta E(CS_i) = \Delta E(T_i | x_i) / \beta_p = (\hat{\lambda}_i^* / \beta_p) - (\hat{\lambda}_i / \beta_p) \quad (1)$$

where $\hat{\lambda}_i$ is the expected number of trips before any improvements are made to the forest amenities and $\hat{\lambda}_i^*$ is the expected number of trips after improvements are made to the forest amenities. This suggests that the change in consumer surplus for individual *i* can be calculated by dividing the change in the predicted number of trips to the forests by the coefficient of the travel cost variable. It is important to state that the relevant comparison in welfare terms is between the number of predicted trips at the current level of forest amenity provision and the predicted number of trips at the improved level. Also, one cannot disaggregate benefit estimates into additional utility from those who take no extra trips to the forest and additional utility from those who visit most frequently.

RESULTS OF THE CONTINGENT BEHAVIOUR ANALYSIS

The mean annual number of visits to the forest for the sample was 68.34 (range 1 – 365). The mean one-way distance travelled to the forest was 8.64 km. The mean time spent at the forest site was just under an hour (53 minutes). The short average distance travelled and the high average frequency of visits is an indication of the use that local residents in particular make of the two case-study forest sites. Indeed, the furthest anyone in the sample travelled to visit the forest sites was only 90 miles. Having said that, the mean annual number of visits to the forest is probably an overestimate of the true population figure due to the issue of endogenous stratification referred to in the previous section.

Given the contingent behaviour scenarios described in Table 2, there are two models to estimate. In each case, one is interested in (i) whether the travel cost parameter is significant (if not, then no welfare estimates can be made), and (ii) whether the coefficient for the dummy variable for the change in site quality is significant (if not, no prediction of the change in visitor numbers can be made). As noted above, the econometric approach taken is to use a panel data estimator because it takes into account the correlation in the errors between each person's two choices – actual and intended behaviour. A random effects rather than a fixed effects specification is used, since the number of respondents is far larger than the of time periods in the sample. If there was a limited number of respondents over many time periods then a fixed effects specification may be more appropriate. Finally, since the dependent variable is a 'count' variable, one must test whether a poisson or negative binomial panel estimator is appropriate. All models were estimated using the software package Stata.

Both poisson and negative binomial versions of each of the two models were initially fitted. In all cases, tests on the over-dispersion parameter showed that the negative binomial was preferred over the poisson. In both, the chosen truncated negative binomial models' α, the over-dispersion parameter, was found to be positive and significant indicating that the data were over-dispersed. A likelihood ratio-test was performed to test the hypothesis that $\alpha = 0$ (and therefore that the Poisson model would be more appropriate). In both cases the χ^2 value indicated that the probability that one would observe these data conditional on $\alpha = 0$ is virtually zero, i.e., conditional on the process being Poisson. This indicated that the negative binomial distribution was the more appropriate one to use.

Whether a panel specification was preferred to a pooled specification in each case was also tested, and the Likelihood Ratio test statistics in all cases confirmed the need for a panel rather than pooled regression. Table 3 reports the coefficient obtained from fitting the two recreational amenity contingent behaviour models, but only for the negative binomial random effects panel specification. (Results of the pooled and poisson analysis are available from authors upon request). Variables used were travel cost[3], travel cost to the nearest substitute forest site, income, gender, age, education, site dummies for each of the forests sampled, minus one; and a Contingent Behaviour (CB) variable, which is a dummy variable representing whether the visits are actual, with current facilities, or hypothetical, with improved facilities.

In the two preferred negative binomial contingent behaviour models (results of which are shown in Table 3), the travel cost coefficients are significant at the 1% level and have negative signs. This indicates that, on average, as the cost of travelling to a forest site decreased, the number of trips made to the site increased. The contingent behaviour coefficient is significant and positive for both scenarios. This indicates that the hypothetical improvements in facilities have a positive effect on the number of planned trips. The Wald χ^2 statistic shows that taken jointly, the coefficients in both of the preferred negative binomial contingent behaviour models are significant at the 1% level.

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[3] TC_{ij}, estimated as 2* (distance * €0.25), is the travel cost of individual i to forest site j. The distance variable is multiplied by 2 to obtain the two-way trip distance, which was then multiplied by the average petrol cost per mile (the Automobile Association of Ireland's calculations of €0.25/mile). This is used as a proxy for the monetary travel cost (equation 5.1). These implicit prices relate to per person trip values for visiting a forest that has specified facilities relative to not visiting the forest (i.e. staying at home). The opportunity cost of travel time is not included in the travel cost in this study. It is the authors' judgement that trips made to the forests are made outside work hours. There is no evidence of substitution or a trade-off between going to work and partaking in recreational activities at the forest site. Indeed, Ward and Beal (2000) also considered that using a zero cost of travel time is appropriate. They considered the opportunity cost of time to be zero because individuals were assumed to travel for leisure and recreation during their holidays when there is no loss of income.

Table 3. Estimated contingent behaviour models

Explanatory variables	Wildlife viewing hide	Art / sculpture garden
Travel cost	-0.13 (8.19)**	-0.128 (8.61)**
TC to substitute site	-0.134 (4.16)**	-0.178 (4.97)**
Income[a]	-2.86e-7 (-0.42)	-1.27e-6 (-0.53)
Gender	0.188 (1.43)	0.075 (0.59)
Forest code (1= Barna Wood)	-0.415 (2.71)**	-0.374 (2.47)*
Age	0.209 (3.23)**	0.237 (3.73)**
Contingent behaviour	0.712 (5.45)**	0.31 (2.48)*
Constant	0.982 (4.07)**	0.978 (4.28)**
Number of respondents	269	269
Wald χ^2	75.36**	22.86**
Log likelihood	-335.56	-309.43
Log likelihood ratio versus pooled model	109.30**	123.19**

Robust z statistics in parentheses, * significant at 5%; ** significant at 1%

a. Respondents were asked in the survey to state which of 11 income bands best represented their household's approximate income before tax.

The coefficient for travel cost to a substitute site is significant at the 1% level but has a negative sign. This suggests, counter intuitively, that on average, if the cost of travelling to a substitute site increases, people will increase their trips to the substitute site. The substitute site is where the respondents most frequently partake in their main activity, as indicated in their survey. This result seems strange, but with habitual preferences taken into account and the relatively small costs at the margin, it might make sense that people will visit their preferred site even if there is an increase in the cost to do so. The age coefficient is positive and significant, thus confirming that older individuals are on average more likely to visit the forest site.

To estimate the recreation benefits from the recreational amenity improvements, the steps outlined in the previous section are followed. Prior to any improvements in the forest amenities the consumer surplus per trip is estimated to be €7.69. The population estimate of per-trip consumer surplus is estimated with 95% confidence to be between €6.22 and €10.22. The estimated average number of trips per year in the 269-person sample was 4.5. Total consumer surplus per visitor per year is average annual trips multiplied by surplus per trip which amounts to €34.60 per year. Table 4 summarizes the change in predicted number of trips and the change in consumer surplus per visitor per year when of the recreation facility improvements in the forests are taken into account.

Table 4. Welfare estimates for forest amenity improvements

Improvement scenario	Predicted change in number of trips over base number (%)	Increase in annual consumer surplus (€/year/person)[a]
Wildlife viewing hide	204%	36 (29.16, 47.58)
Art / sculpture garden	184%	29.53 (23.92, 39.27)

a. Confidence intervals in parentheses.

The greatest proportional change in consumer welfare comes from implementation of scenario A, the investment in a wildlife viewing hide in the forest, where visits increase from 4.5 to a predicted 9.18 per person per year. This corresponds to an increase in consumer surplus of €36 per person per year. Scenario B, the creation of a sculpture garden, results in an increase in visits from a predicted 4.5 to 8.32 per person per annum. This gives an increase in consumer surplus per recreationalist of €29.53 per year. As can be seen from Table 4, both of the hypothetical changes in forest recreational facilities result in significant increases (at the 5% level) in the value of the forest as a recreational resource to the local community.

Comparing the above results to findings of other non-market Irish forest valuations, we see that this study's results are similar (but slightly larger) to other analyses of individual WTP for a forest visit. Bacon and Associates (2004), using figures from Clinch (1999), estimated a willingness to pay of €3.34 per person per forest visit in 2003 prices (or 3.53 in 2005 prices). This is approximately half the estimated figure in this paper of €7.69 per person per visit. More recently, Fitzpatrick and Associates (2005) based on their on-site survey estimated that the typical value placed by a user on a visit to a trail or forest site was €5.42. Their estimate is slightly lower than the estimate in this paper of €7.69, and accounts for trail usage as well as forest site usage. Fitzpatrick and Associates (2005) estimated that there are approximately 18 M visits to Irish forest annually, giving an estimate of €97 M for the total non-market annual value of forest and trail recreation on the Coillte estate[4].

In terms of the value of the additional facilities in the forest the estimates in this paper are similar in magnitude to those of Morton (1995) who found that the marginal value of access for moose hunters was €20.88. The estimates for additional facilities derived here are however considerably higher than the Scarpa et al. (2000) estimates where new nature reserves were found to generate on average only €0.57 of additional consumer surplus per person per visit. However, such simple comparisons are difficult to interpret, because methodology and context vary greatly between studies. Nevertheless, it may be argued that in the absence of other outdoor recreational pursuits small-scale forests on the edge of urban communities could be expected to generate higher welfare estimates for facility improvements that those in larger forests not frequented as often by local residents but instead by the passing tourist trade.

CONCLUSION AND RECOMMENDATIONS

To date, a number of studies have calculated the non-market value of forest recreation to forest users in Ireland. This paper adds to the literature by being the first to assess the non-market value of additional recreational facilities in small-scale community-owned forestry and by exploring whether community-owned forestry contributes to the wellbeing of nearby urban populations, through the provision of outdoor recreational services. In order to maximise the benefits from small-scale forests appropriate management policies must be in place. Local authorities and private forest owners can also contribute to delivering non-market benefits to the public by

[4] This study was unable to estimate the total annual usage of the forest sites in question, so it is not possible to calculate a total annual non-market recreational value, for comparison with that of Fitzpatrick (2005).

providing public access to their forests, as well as providing adequate recreational facilities. These provisions do not necessarily have a negative trade-off with the optimisation of the forest value from timber production but private owners in particular will only deliver these non-market benefits if the incentives available make economic sense.

It is evident from the results presented in this paper that the two forestry sites examined contribute enormously to the wellbeing of the local communities, through the provision of outdoor recreational services. It was also found that additional amenities in the form of wildlife viewing hides and sculpture gardens would be highly valued by the individuals frequenting these sites. It could be argued that facility improvements aimed at general forest users (e.g. nature watching facilities or sculpture gardens) may be most appropriate in forests close to urban areas. Specialist facilities (e.g. mountain biking or horse riding trails), could be installed in more remote sites, where a single activity for the site may be more appropriate and the needs of the specialist group can more easily be catered for. As Hynes *et al*. (2006) pointed out; individuals may have a negative willingness to pay for multi-purpose trails, so there may be a case for specialist recreational groups to be given dedicated areas for their activities.

Investment in facilities on rural small-scale forest sites would not only benefit forest users, but would also provide benefits to the local rural economy by providing increased niche tourism and increased local expenditure. Local authorities and private forest owners have a large part to play in maximising the public benefits from small-scale forest and must be given incentives to provide these valuable public services. This research has produced information on the non-market value of small-scale local forests and the value to the local community of investing in additional forest facilities. The study demonstrates that Irish residents continue to derive considerable benefit from harvesting the resources of community-owned forests. Taking today, this may no longer mean harvesting the timber in the local forest but rather harvesting the pleasures and benefits given through recreational pursuits.

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Appendix 1

IMPACT OF A CHANGE IN FOREST FACILITIES

Q. 8 Impact of change in forest facilities.

I would now like to ask you how your use of THIS FOREST might change if new facilities were created next year. The proposed changes are described in **Card 1** in your booklet.

a) Suppose that next year, the changes described on this card were implemented in this forest, would you change the number of trips you would take to this forest over the next 12 months? When answering this question, you should consider the number of trips that you made to this forest last year (i.e. the number of trips you stated in Q. 5 above).

No change in number of trips ☐ (0) (skip to next question)

More trips ☐ (1) (go to (b) then skip to next question)

Fewer trips ☐ (2) (go to (c))

b) How many *more* trips would you take to this forest? ___ more trips

c) How many *fewer* trips would you take to this forest?

___ fewer trips