



Public Preferences and Values for Afforestation in Ireland

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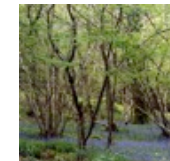
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BACKGROUND

- Forests in Ireland
- Attitudes towards forests
- Afforestation scheme and SFM

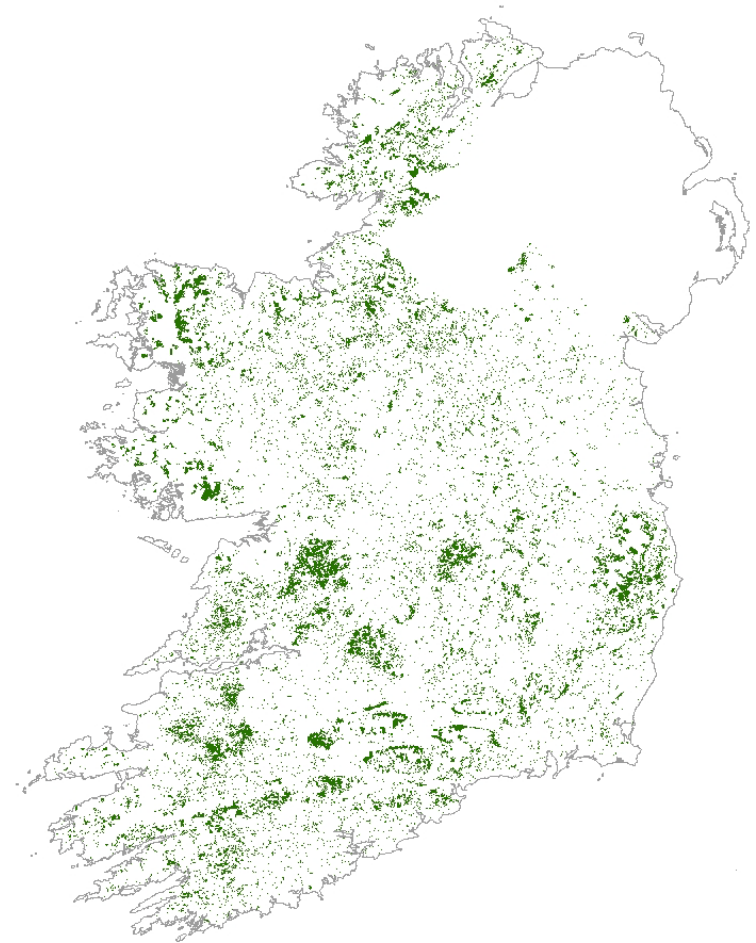


Background

- Forest Cover – 10.8% (2010)
- Early 1900s c. 1% - State afforestation
 - Limited land available
- 1980s – Increase in private afforestation
 - EU funding for “disadvantage areas”

National Forest Inventory (2007)

- c.10% Forest Cover (679,485 ha)
 - c.75% Conifer
 - c.45% Monoculture
 - c.43% Private
 - c.40% Planted since 1980



Background

- “Growing for the Future” (1996) - Target of increasing forest cover from 8.5% to 17% by 2030 through supporting private afforestation
 - “to develop forestry to a scale and in a manner which *maximises* its contribution to *national economics and social well-being* on a sustainable basis and which is compatible with the protection of the environment.”
 - Adoption of Sustainable Forest Management - Recognition of non-market benefits and need to encourage public participation in forest management
 - 2008/9 – Afforestation Scheme funded under National Development Plan not EU Rural Development Plan

Background - Previous Qualitative, Quantitative and Valuation Research

- General support for afforestation but influenced by;
 - Management – particularly species
 - Existing forest cover
 - Relationship with forests e.g. recreation
 - Agricultural communities – tradition, competition
- Clinch (1999) –DC CV of afforestation plan (conifers only)
 - Annual household WTP - €18.41 (1999) - 18% had negative WTP
 - Separate survey - Broadleaves instead of conifers - €13.27 (1999)
- Hutchinson and Chilton (1999) – OE CV of forest expansion (10 or 20%) assuming 90% conifer (8% preferred no afforestation)
- Mill et al. (2007) DC CV of forest visitors to replace SS stand
 - Consumer individual WTP - “natural” broadleaf forest (€147.74), mixed forest (€136.31), Scots pine (€52.02)

Background

- Need for data on public preferences and values for forest management in relation to afforestation plan;
 - Incorporating public preferences and values into forest policy
 - Balancing benefits and costs of scheme planning
 - “... *maximises* its contribution to *national economics and social well-being...*”
 - Little public awareness of target and schemes

METHODOLOGY

- SP and DCE
- Choice models - MNL and RPL
- Survey design and implementation

	Location	Tree Type	Reserve Area	Harvesting	Trails	Cost
Row 1						€10
Row 2						€40
Row 3						€40
Row 4	No New Forests Planted					€0

Methodology – Theory

- Stated Preference Valuation Methods
 - Future resource and non-use values
 - Survey based methods of attaining WTP
- Discrete Choice Experiments
 - Alternative options described through attributes
 - Trade-offs
 - Multiple values
- DCEs
 - Lancaster (1966) characteristic theory
 - Random utility theory (RUT) (McFadden, 1974)

$$U_{ni} = V_{ni} + \varepsilon_{ni}$$

Methodology – Multinomial and Random Parameter Logit

- Specifying the random term as type I extreme value (Gumbel) distributed leads to MNL;

$$P_{ni} = \frac{\exp(V_{ni})}{\sum_{j=1}^J \exp(V_{nj})}$$

- V is normally assumed to be linear in parameters;

$$U_{ni} = \beta'x_{ni} + \varepsilon_{ni}$$

- Including cost attribute facilitates trade-off between attribute and cost

$$mWTP = -\frac{\beta_{Attribute}}{\beta_{Cost}}$$

- Specify random parameters and continuous distribution – RPL (avoid limitations of MNL);

$$P_{ni} = \int \left(\frac{\exp(\beta'x_{ni})}{\sum_{j=1}^J \exp(\beta'x_{nj})} \right) f(\beta) d(\beta) \quad U_{ni} = \beta'_n x_{ni} + \varepsilon_{ni}$$

- Parameter mean with standard deviation and choice invariant characteristics;

$$\beta_{kn} = \beta_k + \delta_k z_n + \sigma_k v_{kn}$$

Methodology – DCE design


- DCE and survey prepared in established manner
 - Literature Review and Interviews
 - Focus Groups held in rural and urban setting
 - Identification of attributes
 - Testing material
 - Diverse interest and knowledge levels
 - Pilot of 50 respondents

Methodology – DCE Design

- Description of afforestation alternatives - Five attributes selected
 - Tree type – Conifer, Broadleaf, Mixed
 - Animal and Plant Reserve Area – None, 15%, 30%
 - Harvesting – Block Clearfell, Individual Tree Harvesting
 - Access – None, Single Trail, Trail and facilities
 - Cost – Individual Annual Cost as increase in taxation
- Alternatives labeled with Location
 - Close to cities/towns, wider countryside, remote and upland areas

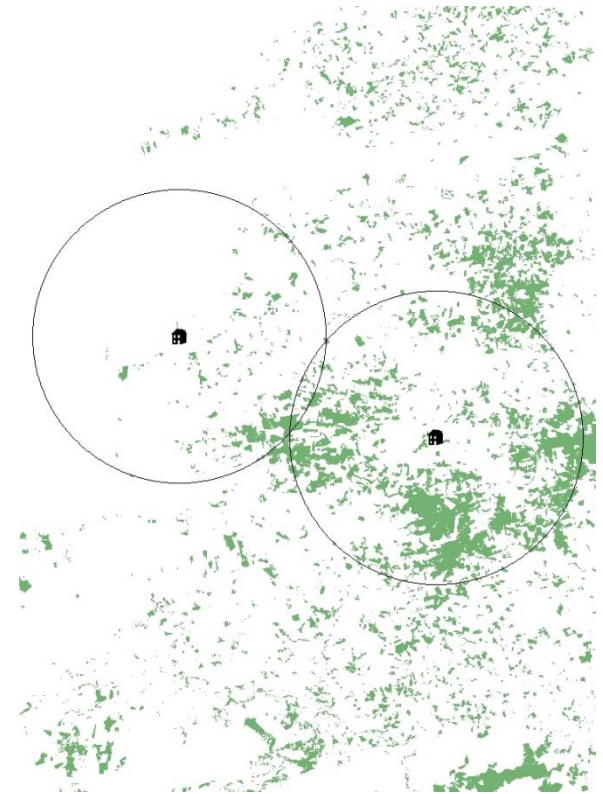
Methodology – Sample Choice Set

- Bayesian Efficient Design based on MNL model and weak parameter assumptions (Ngene)
- 72 Choice sets in 12 groups (6 per respondent)
- 11-page booklet describing afforestation scheme and attributes

	Location	Tree Type	Reserve Area	Harvesting	Trails	Cost
Row 1						€10
Row 2						€40
Row 3						€40
Row 4	No New Forests Planted					€0

Methodology – Survey

- Face to face, household, CAPI survey conducted Feb. - June 2010 by a professional marketing company
- Stratified random sampling with quota based on gender, age and working status - 996 respondents
- Questions on attitudes, recreational use and socio-demographics
- Coordinate data for each household collected with permission from householder
- Shapefile “Forestry07” supplied by Irish Forest Service - forest cover in a 5km radius around each household calculated



RESULTS

- MNL models
- RPL models
- WTP

$$P_{ni} = \frac{\exp(V_{ni})}{\sum_{j=1}^J \exp(V_{nj})}$$

$$P_{ni} = \int \left(\frac{\exp(\beta' x_{ni})}{\sum_{j=1}^J \exp(\beta' x_{nj})} \right) f(\beta) d(\beta)$$

$$mWTP = - \frac{\beta_{Attribute}}{\beta_{Cost}}$$

Results – MNL models

Variable	Level	Model 1			Model 2		
		Estimate	Stand. Error	Sig. ^a	Estimate	Stand. Error	Sig. ^a
Forest type (Base – Conifer)	Mixed	0.336	0.043	***	0.336	0.043	***
	Broadleaf	0.239	0.045	***	0.239	0.045	***
Reserve area (Base – None)	15%	0.271	0.044	***	0.272	0.044	***
	30%	0.442	0.047	***	0.442	0.047	***
Harvest (Base – Clearfell)	Individual	0.515	0.035	***	0.516	0.035	***
Access (Base – No Access)	Trail	0.961	0.045	***	0.960	0.045	***
	Trail+	1.262	0.045	***	1.262	0.045	***
Location ASCs (Base-No new forests)	City/Town	1.705	0.103	***	1.396	0.186	***
	Country	1.685	0.103	***	1.375	0.186	***
	Remote	1.372	0.104	***	1.062	0.187	***
Cost (€)		-0.013	0.001	***	-0.013	0.001	***
Forest Cover ('00ha)					-0.090	0.018	***
Farm					-0.540	0.258	**
Income ('000)					0.015	0.007	**
Visit (>2)					1.117	0.200	***
		N	5976		N	5976	
		No. Par	11		No. Par	15	
		LL	-6261.941		LL	-6224.713	
		Pseudo-R	0.24		Pseudo-R	0.25	

^a Significance level * 10%, ** 5%, *** 1%

Results - RPL Models

Variable	Level		Model 3		
			Estimate	St. Error	Sig. ^a
Forest type (Base – Conifer)	Mixed	μ	0.432	0.055	***
		σ	0.638	0.088	***
	Broadleaf	μ	0.305	0.057	***
		σ	0.481	0.108	***
Reserve area (Base – None)	15%	μ	0.337	0.053	***
		σ	0.489	0.102	***
	30%	μ	0.510	0.061	***
		σ	0.740	0.107	***
Harvest (Base – Clearfell)	Individual	μ	0.636	0.055	***
		σ	1.039	0.071	***
Access (Base – No Access)	Trail	μ	1.100	0.063	***
		σ	0.932	0.081	***
	Trail+	μ	1.504	0.066	***
		σ	0.962	0.083	***
Non-random parameters					
Location (Base-No new forests)	City/Town		1.901	0.116	***
	Country		1.888	0.115	***
	Remote		1.474	0.115	***
Cost (€)			-0.016	0.001	***
			N	5976	
			No. Par	18	
			LL	-6118.43	
			Pseudo-R	0.26	

^a Significance level * 10%, ** 5%, *** 1%

Results – marginal WTP figures

$$mWTP = - \frac{\beta_{Attribute}}{\beta_{Cost}}$$

Willingness to Pay per Individual (€)			
Attribute change	Model 1 MNL	Model 2 MNL + Characteristics	Model 3 RPL
Conifer to Mixed	25.64	25.63	26.37
Conifer to Broadleaf	18.26	18.24	18.60
No reserve to 15%	20.71	20.75	20.55
No reserve to 30%	33.71	33.71	31.07
Clearfell to individual	39.31	39.36	38.80
No Access to Trail	73.32	73.31	67.09
No Access to Trail+	96.32	96.32	91.72

Results – RPL with characteristics in distributions

$$\beta_{kn} = \beta_k + \delta_k z_n + \sigma_k v_{kn}$$

Variable	Level		Model 4		
			Estimate	St. Error	Sig.
Forest type (Base – Conifer)	Mixed	μ	0.251	0.119	**
		σ	0.627	0.090	***
	Broadleaf	μ	0.224	0.123	*
		σ	0.465	0.113	***
Reserve area (Base – None)	15%	μ	0.228	0.117	**
		σ	0.470	0.105	***
	30%	μ	0.528	0.133	***
		σ	0.726	0.108	***
Harvest (Base – Clearfell)	Individual	μ	0.622	0.119	***
		σ	1.009	0.071	***
Access (Base – No Access)	Trail	μ	0.905	0.132	***
		σ	0.909	0.082	***
	Trail+	μ	1.202	0.137	***
		σ	0.930	0.083	***
Non-random parameters					
Location ASCs (Base-No new forests)	City/Town		1.930	0.116	***
	Country		1.913	0.116	***
	Remote		1.504	0.116	***
Cost (€)			-0.016	0.001	***

Results – RPL with characteristics in distributions cont.

Random Par.	Covariate	Estimate	St. Error	Sig.
Mixed	Farm	-0.033	0.234	
Mixed	Income	0.006	0.004	
Mixed	Visit	0.041	0.109	
Mixed	Forest cover	0.013	0.017	
Broadleaf	Farm	-0.405	0.232	*
Broadleaf	Income	0.003	0.004	
Broadleaf	Visit	0.035	0.112	
Broadleaf	Forest cover	0.009	0.017	
Reserve 15%	Farm	0.286	0.221	
Reserve 15%	Income	0.006	0.004	*
Reserve 15%	Visit	0.130	0.105	
Reserve 15%	Forest cover	-0.034	0.016	**
Reserve 30%	Farm	-0.086	0.254	
Reserve 30%	Income	0.001	0.004	
Reserve 30%	Visit	0.111	0.121	
Reserve 30%	Forest cover	-0.033	0.018	*
Individual	Farm	-0.092	0.232	
Individual	Income	0.005	0.004	
Individual	Visit	0.059	0.108	
Individual	Forest cover	-0.040	0.017	**
Trail	Farm	-0.529	0.254	**
Trail	Income	-0.003	0.004	
Trail	Visit	0.505	0.121	***
Trail	Forest cover	0.025	0.019	
Trails+	Farm	-0.484	0.253	*
Trails+	Income	0.001	0.004	
Trails+	Visit	0.610	0.123	***
Trails+	Forest cover	0.014	0.019	
		N	5976	
		No. Par	46	
		LL	-6080.741	
		Pseudo-R	0.27	

DISCUSSION

- Afforestation preferences
- Forest preferences and values
- Conclusion



Discussion – Forest Attributes

Strong overall support for afforestation scheme – Positive ASCs

- Cities/Towns, Wider Countryside, Remote
- Tree type
 - WTP Conifer to Mixed forest - €25.63 – €26.37
 - WTP Conifer to Broadleaf forest - €18.24 – €18.60
 - Mixed forest preferred most
 - Broadleaves less preferred by farmers
 - Not affected by forest cover
- Reserve area
 - WTP None to 15% reserve - €20.55 - €21.77
 - WTP None to 30% reserve - €31.07 – €33.71
 - 15% - income increase importance, forest area decreases
 - 30% - forest area decreases importance

Discussion – Forest Attributes

- Harvesting
 - WTP Clearfell to Individual €38.80 - €39.36
 - Important issue- little previous research for comparison
 - Forest area decreases importance
- Access and trails
 - WTP No Access to Basic Trail - €67.09- €73.31
 - WTP No Access to Trail and Facilities - €91.72 - €96.32
 - Dominated attributes - Comprehensible, associated with use values
 - More important for forest visitors and less for farming households

Discussion

Support for afforestation alternatives increased by;

- Having visited a forest more than twice in previous 12 months
 - Appreciation of forests
 - Stronger views on access and recreation
- Income
 - Opt-out only zero cost alternative

Discussion

Support for afforestation alternatives reduced by;

- Forest Cover
 - Higher forest cover may be associated with
 - Sense of isolation
 - Loss of “traditional” landscape
 - Temporary loss of economic activity

- Membership of Farming household
 - Access issues
 - Competition for land
 - Loss of tradition

Conclusion

- Most preferred;
 - Mixed forest,
 - 30% reserves area,
 - Individual tree harvesting,
 - Access and trails
- Broad support for afforestation
- Weaker in areas of higher forest cover and among farming households

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