Articles                                              School of Marketing and Entrepreneurship

# The Future of the Forestry Sector in Ireland

Siobhan McCarthy
*Technological University Dublin*, siobhan.mccarthy@tudublin.ie

# The Future of the Forestry Sector in Ireland

Siobhan McCarthy, Lecturer in Economics, Dublin Institute of Technology *

The most recent government strategy statement on forestry sets a planting target of 20,000 hectares annually for the Republic of Ireland, but in recent years this target has not been met. Public afforestation is now limited to the management and replacement of existing forests, so private afforestation must increase if this target is to be achieved. This article quantifies the relative importance of competing forestry and agricultural policy incentives in explaining trends in private afforestation. Several policy reforms to encourage forestry planting are proposed, including greater integration of forestry with the Rural Environment Protection Scheme and increasing the upfront payments which farmers receive.

## INTRODUCTION

Ireland is a very suitable location for planting forestry. Yet, despite this, it has the lowest forest to land ratio in the EU. A feature of Irish forestry is its strong interdependent relationship with the agricultural sector. This situation is complicated by the fact that both sectors are highly subsidised. In 1996 the Irish government produced an afforestation programme, *Growing for the Future, A Strategic Plan for the Development of the Forestry Sector in Ireland*. This programme set national planting targets of 20,000 hectares (ha) per annum from 2001 to 2030. After a promising start, actual planting levels have fallen to little more than half this target. Recent increases in agricultural subsidies are believed to have negatively impacted on the level of forestry planting, particularly by farmers.

Although methods of increasing the level of forestry planting to meet the national afforestation target are suggested later, it should be noted that an examination of whether this target is the optimal level of forestry planting is beyond the scope of this article.[1]

[1] See Clinch, 1999, for a discussion of this topic.

## THE HISTORICAL CONTEXT

Historically, widespread deforestation has been this country's order of the day. Without reviewing the entire history of the Irish forestry sector, it is worthwhile to highlight that, until the beginning of the 17th century, Ireland was covered with dense forests.[2] Several factors led to the forest clearance, the most important of which were the rise of Britain as a major naval and industrial power and the introduction of the Land Acts in the 1870s, giving rise to widespread deforestation and agricultural expansion. By the time of the establishment of the Irish Free State in 1922, there remained just over 90,000 hectares of forestry. Little changed under the newly established Irish administration, as 50% of the population was employed in farming and there was strong opposition to forestry from the farming community.

The new inter-party government of 1948 brought with it a significant change in forestry policy, due in large part to the Minister for External Affairs, Sean McBride. He set a planting target of just over 10,000 hectares per annum. Although the level of public afforestation increased, the difficulty of obtaining sufficient land proved to be a significant impediment.[3] Therefore, these ambitious planting targets were not met until 1959/1960. Subsequently, public planting declined particularly in the period 1972 to 1985. This problem intensified on Ireland's joining the EEC/EU, due to increases in agricultural subsidies under the Common Agricultural Policy (CAP). During the 1990s increasing forestry land prices and higher levels of private afforestation have caused a serious decline in the level of public afforestation in the Republic – see Figure 1.[4]

### FIGURE 1: THE LEVEL OF PUBLIC AFFORESTATION, 1982-2000 [5]
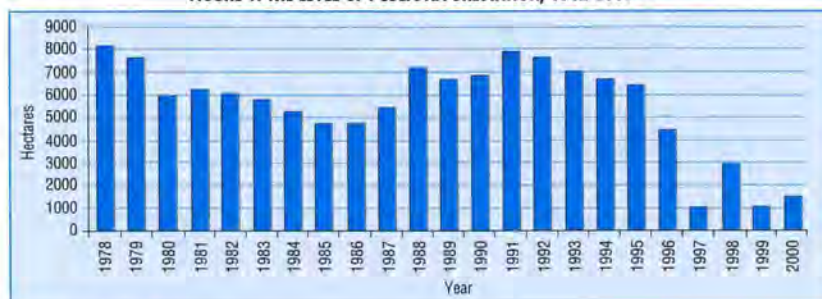


Source: The Forest Service, 1999

[2] Kula, 1988
[3] Public Afforestation refers to forestry being planted by the state on land which was not previously under forestry. Reforestation refers to planting land which was previously planted with forestry. Public Planting refers to both public afforestation and reforestation.
[4] Private Afforestation refers to forestry being planted by private planters on land which was not previously under forestry.
[5] This is the level of forestry planted on land previously not under forestry and therefore excludes reforestation.

## PUBLIC AND PRIVATE AFFORESTATION POLICY

In the 1990s the government's focus on purely public forestry changed to emphasise partnership with the private forestry sector. This partnership materialised in a number of schemes including the Farm Partnership Scheme. Introduced in 1992 by Coillte – the body established in 1988 to take control of the State forests – this has proven particularly popular. On entering this scheme, the landowner receives an upfront payment and tax-free income throughout the rotation of the forest. The landowner also receives the applicable forestry annual payments that are paid to all planters outside this scheme. The landowner retains full ownership of the land, but Coillte provides the necessary management and marketing skills.

The government, through Coillte, will not be involved in any future land acquisition for public afforestation, partly because public planting will no longer be eligible for forestry subsidies. In the future, public afforestation will be limited to reforestation.

Private afforestation was basically non existent until the 1980s. State forestry grants were introduced for private afforestation in 1928 and still remain in place today. These are generally paid in several instalments. The first payment is known as the planting grant, which covers the main planting expenses and is paid on completion of planting. The subsequent grants, known as maintenance grants, are paid a specified number of years after planting occurs and are intended to cover the main costs of maintaining the forest in its early years. However, forestry remained a secondary land activity to agriculture and the main aim of Irish private forestry policy in the period 1922 to 1977 was to restrict private afforestation to land that was unsuitable for any agricultural activity.

New financial schemes introduced throughout the 1980s and 1990s to encourage landowners to plant forestry were spurred on by the manner in which overall EU policy moved towards offering incentives to farmers to move out of agriculture in favour of alternative land use enterprises. The Western Package Scheme was introduced in 1981 in twelve western counties and this scheme increased forestry grants substantially for forestry planted by farmers on disadvantaged land. A unified scheme was introduced in 1991 which distinguished only between previously enclosed or unenclosed land and, since then, forestry grants have been regularly increased.[6]

The first attempt to address the problem of lack of annual income for farmers who plant forestry came in the introduction of the Compensatory Headage Scheme in the

[6] See McCarthy et. al, 2002

period 1986/1987. These payments were payable to farmers who planted forestry and who otherwise were entitled to livestock headage grants in disadvantaged areas. The Forest Premium Scheme replaced this scheme in 1989. The conditions attached to these payments and the payment amounts have varied and been increased over time, distinguishing between the nature of the land planted to forestry and whether the farmer had off-farm income or not. The scheme was extended to non-farmers and companies in 1994 at reduced rates.

Since the late 1980s there has been a sharp increase in the level of private afforestation in terms of hectares planted and as a proportion of total afforestation[7] (See Figure 2). Private and total afforestation peaked in 1995, but declined sharply thereafter despite the recent increases in forestry grants and premia.

#### FIGURE 2: TOTAL AND PRIVATE AFFORESTATION 1980-2000
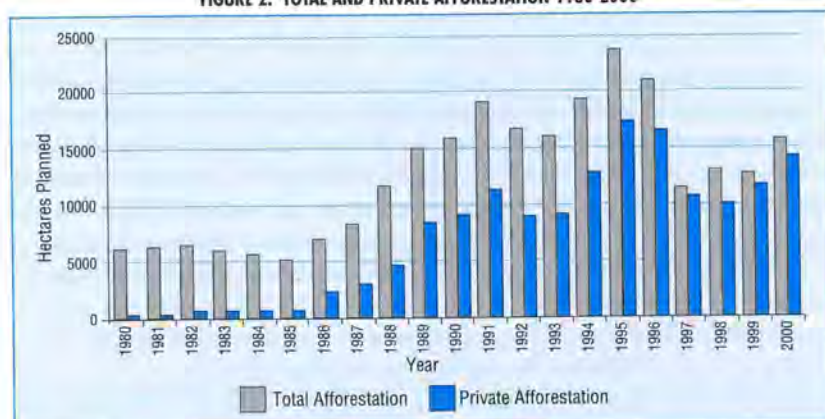


Source: Forest Service 1999 and Kearney 2001

One of the main reasons put forward for the fall in the level of private afforestation is the recent changes in agricultural policy. Two of the most important are the introduction of the Rural Environment Protection Scheme (REPS) and the changes in the eligibility rules for the extensification premium.

REPS is a five-year scheme, whereby the farmer enters a contract to farm in accordance with an agri-environmental plan. In terms of competing with forestry for land the main relevant aspects of REPS are the rate of the REPS premium, the

[7] Total afforestation is the sum of public and private afforestation.

maximum area on which the premium is payable and the cost of compliance. By the end of 1999, 33% of agricultural land was being farmed under REPS guidelines. Although there is no restriction on planting forestry on land entered into REPS, farmers cannot receive both REPS premia and forestry premia on the same land.

The extensification premium is somewhat different from other agricultural subsidies as it has an environmental objective; that is, it is a premium paid to farmers for cattle if their stocking density (number of animals) is kept under certain limits per hectare. Under the 1999 CAP reform the eligibility rules for the extensification premium were altered by reducing the stocking density. This is relevant to forestry as it increases the demand for land thereby reducing the amount of land available for afforestation purposes.

### THE ROLE OF CONFLICTING INCENTIVES

Several economic factors influence the level of private forestry planting in the Republic of Ireland. The afforestation regression model used in this analysis assumes that farmers weigh up the competing returns from forestry and agricultural production in deciding whether to plant trees or not (See Appendix for detail of the model used in this regression analysis). The forestry returns are composed of the net revenue from the sale of timber over the lifetime of the forest, forestry grants and the forest premium. Agricultural returns are proxied by the gross margin obtained from cattle and sheep production, which are the most common enterprises found on the marginal land in Ireland most likely to be used for forestry. In addition, account is taken of the competing attraction of enrolling land in REPS. Other factors such as the price of forestry land and the level of tax incentives for forestry can also be important.[8]

These factors operate against a background of generally negative attitudes among farmers towards planting forestry in the Republic, where there is no tradition of integrating forestry with farming and where forestry is seen as competing with agriculture for the scare resource of land.[9] The level of risk may also be an influencing factor, due to the long time span before forestry yields returns and the inflation risk attaching to forestry subsidies.

Previous empirical analysis of the determinants of Irish afforestation used time series data which suffered from the limited number of observations available through time.[10]

[8] See McCarthy, 2002 for a discussion on why these factors were not included in this regression model.
[9] See McCarthy, 2002 for details; also McCarthy et al, 2002.
[10] Barrett and Trace, 1999

The empirical analysis supporting this article used a panel data set based on county-level data covering the time period 1982 to 1999 for the twenty-six counties of the Republic of Ireland with explanatory variables, where appropriate expressed in 1999 constant prices.[9] A panel data set has the advantage of gaining observations for estimation and increasing the accuracy of the regression estimates. There are of course certain limitations in using panel data, including data limitation problems and the fact that it is not possible to include lagged dependent or independent variables as independent variables.[11]

The model is estimated as a fixed effects model in which planters in each county are assumed to respond in the same way to changes in the independent variables, but there are fixed (constant) differences in planting levels across counties due to unspecified county differences. The fixed effects model is appropriate if the cross-sectional[12] terms are 'one of a kind' and cannot be viewed as a random draw from the underlying population. This is the case for this analysis where all the cross-sectional terms represent counties.

A log-log regression model is used, as this is consistent with previous regression analysis in this area and because of the significant differences in the absolute values of the independent variables in levels. Thus the coefficient estimates can be interpreted as elasticities. Elasticities in this model represent the percentage change in the level of private afforestation caused by a 1% change in any of the independent variables.

Four variables are shown to be statistically significant in explaining private afforestation at a 1% significance level: the forestry planting grant, forestry subsidies, the expected forestry market margin and the area entered into REPS. The agricultural gross margin was not found to be a statistically significant explanatory factor. Table 1 shows these coefficients of the variables for this regression analysis.

To explain the results, the example of the forestry planting grant can be taken. This variable's coefficient is 2.83 which means that a 1% increase in the level of the forestry planting grant calculated at the sample mean would lead to a 2.83% increase in the level of private afforestation. This value can be converted into a marginal effect which is a format useful for policy analysis that measures the response of a one unit change in the various explanatory variables on the level of private afforestation. This is done by dividing the elasticity by the ratio of the means of the dependent variable and

[11] The independent variables are the explanatory variables in the regression model, in this case, the forestry market margin, the forestry planting grant, the forestry subsidies, the agricultural gross margin and the area entered into REPS. The regression attempts to identify which independent variables influence the dependent variable, in this case, the level of private afforestation.
[12] Cross sectional data are data on one or more variables collected at the same point in time.

**TABLE 1: PANEL REGRESSION ESTIMATES FOR PRIVATE AFFORESTATION**

| Variables | Units | Coefficient | P[13] Value |
|---|---|---|---|
| Constant | | −33.09 | 0.00 |
| Forestry Planting Grant | € in 1999 prices per hectare | 2.83 | 0.00 |
| Forestry Subsidies | NPV (Net Present Value) in 1999 prices per ha | 2.12 | 0.00 |
| Forestry Market Margin | 5% of NPV in 1999 prices per ha | 0.03 | 0.00 |
| Agricultural Gross Margin | € in 1999 prices per hectare | −0.01 | 0.99 |
| Area Entered into REPS | Hectares | −0.02 | 0.00 |
| $R^2$ (overall)[14] | 0.82 | | |
| $R^2$ (within)[15] | 0.55 | | |

Note: Dependent variable: Private Afforestation on a County Level (ha) per annum in logs
Source: Mc Carthy, 2002

the independent variable.[16] Because the dependent variable is the annual planting by county, to convert this to a national figure it is multiplied by 26. The marginal effect of the forestry planting grant is 20.28, which is interpreted to mean that every €1 increase in the value of the forestry planting grant leads to a 20.28 hectare increase in the national annual level of private afforestation (see Table 2).

**TABLE 2: MARGINAL EFFECTS OF INFLUENCES ON FORESTRY PLANTING**

| Variables | Units | Marginal effect of a one unit increase in the independent variable |
|---|---|---|
| Forestry Market Margin | 5% of NPV in € in 1999 prices per hectare | 1.66 |
| Forestry Planting Grant | € in 1999 prices per hectare | 20.28 |
| Forestry Subsidies | NPV in € in 1999 prices per hectare | 9.16 |
| Area Entered into REPS | Hectares | -0.02 |

Source: McCarthy, 2002

[13] The P value is the probability value which is defined as the lowest significance value at which the null hypothesis that each of the coefficients is zero can be rejected.
[14] The overall $R^2$ value measures the goodness of fit, that is the total variation in the dependent variable that can be explained by changes in the independent variables. The within R2 is the more usual measure used for fixed effects panel regression models.
[15] Not adjusted for robust standard errors, due to the way Stata calculates this measure of within variation.
[16] For the purpose of the results reported in Table 2, the time period is restricted to 1994-1999 in order to be consistent across all variables, as the Area under REPS variable only exists for this time period. However, for the other variables the reported values differ little from those calculated using the entire sample period.

### FORESTRY MARKET MARGIN

The forestry market margin is the Net Present Value (NPV) of the difference between the revenue and costs flows over the rotation of the forest, expressed as an annual annuity calculated at a 5% discount rate.[17] There are two main sources of revenue from timber production: namely, thinnings and clearcutting revenue. Thinning is the cutting out of selected trees from a plantation to improve the growth and quality of the remaining trees and clearcutting is the final cutting at the end of a rotation.[2] Clearcutting revenue will be highly discounted as this timber revenue will not transpire for at least 40 years. Timber revenue depends on the tree species, the timber price, the average volume of timber per tree, the number of trees per hectare and the average yield class.[18] The costs include establishment costs, fencing, road and drain repairs, road construction as well as the costs of marking and measuring the trees for thinning. Farmers are assumed to calculate future expected returns on the basis of an average of prices prevailing currently for timber and over the previous four years.[9]

The marginal effect of the expected forestry market margin is positive. However, at just 1.66 hectares for every €1 increase in the annual annuity, its economic significance is very limited. Most experts concur that the vast majority of farmers do not consider the forestry market margin when deciding whether to plant their land.

### THE FORESTRY PLANTING GRANT AND SUBSIDIES

The impact of the initial forestry planting grant – paid in the first year – and other forestry subsidies are separately distinguished. Forestry subsidies are a combination of the forestry maintenance grant payments and either forestry premia payments or compensatory headage payments as defined previously. The main purpose in combining these particular payments into a separate variable is to make a distinction between payments given to planters as upfront payments and delayed payments. This distinction is important as upfront payments do not suffer from the risks of inflation which are associated with delayed payments.

The marginal effect of the forestry planting grant is 20.28: that is, every €1 increase in the forestry planting grant will lead to a 20.28 hectare increase in the level of private afforestation while the marginal effect of forestry subsidies is 9.16. The marginal effect for the forestry planting grant is 2.2 times the marginal effect for the forestry subsidies for equivalent changes in expenditure measured in NPV terms. This implies

[17] The following formula is used for this calculation $\sum_{i=0}^{n} \frac{R_i - C_i}{(1+.05)^i}$ where $R_i$ and $C_i$ are forestry returns and costs in year i and n is the year of clearcutting.
[18] The yield class of a tree is a measure of the quantity of the timber produced from a stand of trees as a function of time (Clinch, 1999). It is assumed that Sitka Spruce is planted as this is the most popular species planted in Ireland.

that increasing the planting grant in preference to forestry premia would be a more cost efficient method of increasing private afforestation. This proposition seems to make sense, as the planter will receive any increase in the planting grant in the year of planting compared to any increase in the premia which is paid over a 15 to 20-year period.

This might be seen as a counter-intuitive finding because, due to the small-scale nature of farm forestry in Ireland and the lack of forestry knowledge, it has been usual for planting to be undertaken by specialist companies in return for payment by the farmer of the planting grant. Also, it is generally recognised that it was not until the introduction of an annual premium in 1989 that there was any farmer interest in forestry. However, there are at least two ways in which higher planting grants tended to stimulate higher levels of private planting. First, with higher grants, contractors would have had a greater incentive to seek out farmers to encourage them to sign up for the scheme. Secondly, in some cases farmers retained a portion of the planting grant through supplying their own labour or other services to the contractor.[9]

While these are the appropriate figures for making comparisons of the effect of equivalent government expenditure on forestry planting grants and subsidies, it is not so easy to interpret these in policy terms. But, noting that the NPV of a €1 increase in the annual forestry premium paid over 20 years is €13.09,[19] it is easy to calculate that the national increase in afforestation as a result of a €1 increase in the annual forestry premium is 9.16 x 13.09 or 120 hectares. Therefore, increasing the forestry premium (an annual payment) by €1 will be nearly six times more effective than a €1 increase in the forestry planting grant (which is only paid once). However, the ultimate cost to the Exchequer will be more than thirteen times greater.

### AGRICULTURAL PROFITABILITY

Agricultural production is forestry's biggest competitor for land. Increases in agricultural returns – as measured by the gross margin from farming – would be expected to reduce farmers' interest in planting land to trees and vice versa. Any analysis of agricultural margins in comparison to forestry margins must take into account that forestry will only compete with marginal agricultural land activities and a suitable agricultural gross margin must be based on low-return agricultural activities such as cattle and sheep farming. The agricultural gross margin used to compare with forestry is therefore a weighted gross margin of different sheep and beef farming

[19] This figure is the discounted value of a €1 increase in the annual forestry premia using a 5% discount rate over a 20 year period. The following formula is used for this calculation

$$\sum_{i=0}^{19} \frac{1}{(1+.05)^i}$$

systems. It would be desirable to try to capture the separate impact of the growing importance of extensification payments, but their influence on the demand for land is very farm specific and there is no easy summary measure available. Instead, these payments are simply included in the agricultural gross margin variable.

Although as expected the agricultural gross margin appears with a negative sign, it is found to be an insignificant explanatory factor. This is not an unexpected result as the higher level of forestry planting in the early 1990s, when taken in conjunction with the upward trend in livestock units, indicates that overall competition between forestry and agriculture did not prove to be very restrictive at least up to and including 1995.[20] One explanation for this is that up to recently the land planted with forestry was marginal land that yielded little or no agricultural return. Due to recent developments in the agricultural sector and as standards for planting are raised, the competition between agriculture and forestry will increasingly intensity and this variable may be significant in the future.

### THE AREA ENTERED INTO REPS
As previously stated, serious competition for land exists between forestry and REPS. Therefore, the area entered into REPS will be expected to have a negative relationship with the annual rate of private afforestation. The marginal effect of the area entered into REPS suggests that, for every thousand hectares so employed, twenty less hectares will be planted with private forestry. The average area entered into REPS per annum in the period between 1994 and 1999 was 266,667 hectares. Therefore, the marginal effect suggests that, on average, the level of private forestry planting has declined by 5,333 hectares per annum due to competition from this scheme alone.

### POLICY IMPLICATIONS

On the basis of these findings, it is possible to estimate the changes necessary in subsidy policies in order for Ireland to meet its current afforestation target of 20,000 hectares per annum. Either the standard forestry planting grant or the level of premia in 1999 would need to be increased by approximately 18%, *ceteris paribus*. In this context, the increase in forestry grants of up to 40% and the increase in premia payments of up to 33% which were introduced in late 1999 should help to restore interest in forestry planting among farmers in the coming years.

The marginal effect of the forestry planting grant and forestry subsidies variable in comparison to the forestry market margin variable confirms that, in current

[20] Kearney, 2001

circumstances, the development of the forestry sector depends on State subsidies. In fact, the expected forestry market margin would have to increase by a multiple of twenty in order to meet the current forestry target based on 1999 planting figures.

The analysis suggests that increasing upfront payments may be both a persuasive and cost efficient method of increasing the level of private forestry planting. Since the most recent increase in forestry grants in late 1999, planting grant payments are now related entirely to the actual costs incurred. Therefore, increasing forestry planting grant payments cannot be pursued as an incentive measure. However, tiering the premium payments over time so that a higher proportion of their value is paid in the earlier years would have a similar effect. This might be applied in a modification of the current Farm Partnership Scheme. The main alternation suggested is to allow the landowner to choose whether or not to receive the entire expected timber revenue in advance. The government, through Coillte, would then receive this revenue when clear-cutting occurred.[9]

Although increases in forestry subsidies are shown to be an effective method of increasing the level of private forestry planting, their incentive effect may be reduced if farmers fear that their future value might be undermined by inflation. The risk from inflation could be removed by indexed linking forestry subsidies. However, this would be a very radical step and would create a precedent that all agricultural direct payments should also be index linked which is unlikely to be welcomed by policy-makers in Brussels.

The introduction of REPS has been one of the main reasons for the decline in the level of private forestry planting in recent years. It is therefore natural to look at reforms to REPS to make it more forestry-friendly. Various policy measures could be put in place to integrate the current afforestation programme and REPS. Currently, all areas suitable for afforestation on applicant sites for REPS must be reported to the Forest Service. Further efforts might be made to explain to farmers the value to them of planting this land to forestry. A more draconian measure would be to require the landowner to plant these areas in order to be eligible for REPS payments. Such a proposal would appear to run counter to the REPS objective to encourage more environmentally-friendly farming and would be unlikely to be acceptable to any of the parties involved.

An alternative approach would be to allow the land planted with forestry to be eligible for both the forest premium and REPS payments. However, this would only be justified if the forestry management produced environmental benefits over and above those which might be expected from normal good forestry management practice. For

example, allowing public access to such land might be seen as warranting an additional payment.

Finally, adoption of the Commission proposals for the Mid-Term Review of the CAP announced in July 2002 would make a significant contribution to enhancing the relative attractiveness of forestry. These proposals envisage that farmers' eligibility for direct payments under agricultural policy schemes would be based on their historical entitlements and would not require them to continue the production of crops or animals to maintain their eligibility. Many farmers will find agricultural production at current market prices unattractive. As a result, the relative attractiveness of forestry will be dramatically improved, particularly if farmers can retain both their agricultural direct payments and receive, in addition, the usual forestry subsidies. If this turns out to be the case when the negotiations on the Mid-Term Review are completed, a boom in forestry planting in the next few years could be the result.

## REFERENCES

Barrett, A. and F. Trace (1999), 'The Impact of Agricultural and Forestry Subsidies on Land Prices and Land Uses in Ireland', Policy Research Series No. 35, Dublin: The Economic and Social Research Institute.

Clinch, P. (1999), 'Economics of Irish Forestry', Dublin: COFORD

Forest Service (1999), 'Forestry Statistics', Wexford: The Forest Service.

Kearney, B. (2001), 'A Review of Relevant Studies Concerning Farm Forestry Trends and Farmers' Attitudes to Forestry', Dublin: COFORD and the National Council for Forest Research and Development.

Kula, E (1988), 'The Economics of Forestry Modern Theory and Practice', London: Croom Helm.

McCarthy S. (2002), 'The Factors Influencing the Level of Forestry Planting in Ireland', Thesis submitted to Trinity College Dublin in fulfilment of Masters of Letters.

McCarthy S., A. Matthews and B. Riordan (2002), 'Economic Determinants of Private Afforestation in the Republic of Ireland', Land Use Policy, forthcoming.

## APPENDIX

The model to be estimated can be written as:

$Priv_{it}$ $= f(Formargin_{it}, Forplantgr_{it}, Forsub_{it}, Agrimargin_{it}, AreaREPS_{it})$

where

$Priv_{it}$ = the number of hectares planted with private forestry in county i in year t

$Formargin_{it}$ = the level of the expected forestry market margin achieved per hectare in county i in year t

$Forplantgr_{it}$ = the level of the forestry planting grant per hectare in county i in year t

$Forsub_{it}$ = the level of forestry subsidies per hectare in county i in year t

$Agrimargin_{it}$ = the agricultural gross margin per hectare in county i in year t

$AreaREPS_{it}$ = the area of land entered into REPS in hectares in county i in year t.