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Can't See the Wood for the Trees: The Returns to Farm Forestry in Ireland

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Abstract

The period 2007-2009 witnessed considerable variability in the price of outputs such as milk and cereals and this was compounded by a high degree of volatility in the price of inputs such as fertilizer, animal feed and energy. Previously, Irish farms have used the returns to off-farm employment as well as agricultural support payments such as the Single Farm Payment (SFP) and the Rural Environmental Protection Scheme (REPS) to protect their living standards against low and uncertain agricultural market returns. However, the downturn in the Irish economy has led to a reduction in the availability of off-farm employment and also the discontinuation of REPS. This may lead to an increase in afforestation on Irish farms, as forestry offers greater certainty through the provision of an annual premium in addition to the SFP. However, the decision to afforest represents a significant long-term investment decision that should not be entered into without careful economic consideration. The aim of this paper is to use the Discounted Cash Flow (DCF) analysis method to calculate the returns to forestry under alternative opportunity costs associated with conventional agricultural activities being superseded. The returns to forestry are calculated using the Forestry Investment Value Estimator (FIVE). These returns were then incorporated in the DCF model along with the returns to five conventional agricultural enterprises, which would potentially be superseded by forestry. This approach allows for the calculation of the Net Present Value (NPV) of three forestry scenarios.

Keywords: Farm forestry, net present value

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Introduction

The discontinuation of the Rural Environment Protection Scheme (REPS), the possibility of a switch from the current Single Farm Payment (SFP) to a flat area based payment and the recent volatility in the price of agricultural outputs and inputs, all suggest that Irish farmers are heading into a period of greater uncertainty and possibly lower farm incomes. Over the past 15 years the incomes of many farmers were buoyed by off-farm employment and the one-off sale of land for development and housing construction. However with the decline in the construction sector, those sales that do take place in the future are likely to be at substantially reduced prices. In their Spring 2009 Land Market Review, Irish Auctioneers Knight Frank estimate that the Irish property market is now tracking 2004 levels and they “see no reason why agricultural land prices will not follow this trend” (Ganly, 2009). The likelihood is therefore that given the increased uncertainty regarding the returns to traditional agriculture, changes in land use will receive greater consideration amongst Irish farmers. Converting land from agricultural to forestry production represents one such land use change that is likely to receive more attention in the future.

Despite the presence of establishment grants for forest planting and increases in the value of the forest premium payments, afforestation rates within Ireland have been on the decline since the mid nineties. Breen *et al.* (2008) argued that the increase in land value brought about by the construction boom of the last 15 years could be a principal driver of this decline rather than the relative rate of returns between forestry and agricultural enterprises. However, with the downturn in the Irish construction industry and its subsequent impact on land values, it is expected that the relative rate of returns between forestry and agricultural enterprises will once again become a key factor in the decision to afforest. Behan and McQuinn (2005) recommend the need to analyse the economic returns from forestry in the context of existing agricultural policy. Therefore, this paper presents an analysis of the returns to three alternative afforestation options in the context of five superseded agricultural enterprises, with sensitivity analysis used to assess the impact of key parameters on the economic returns of forestry.

Background

Trends in Irish Afforestation rates

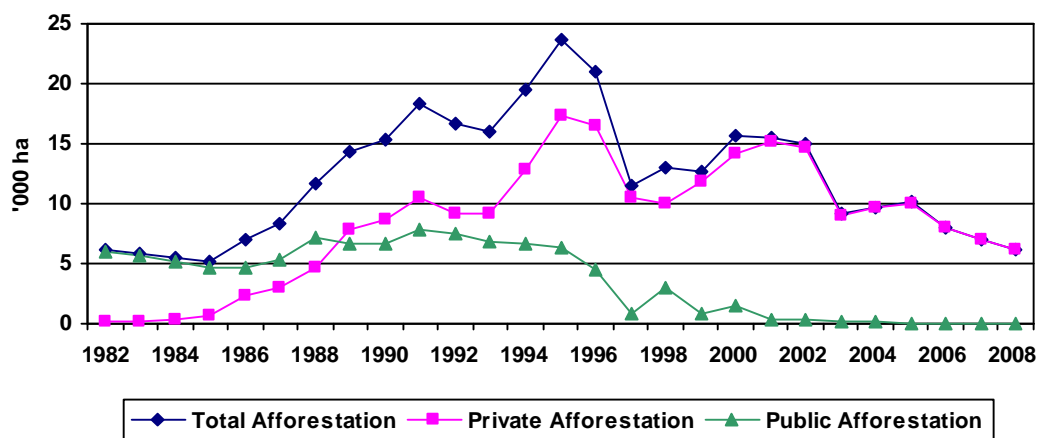
The past 30 years have seen major changes in not only the rate of Irish afforestation, but also in the number of landowners planting forests. Until 1980, public afforestation accounted for almost 100 percent of annual planting in Ireland with close to zero farm afforestation. The introduction of support packages for farm afforestation led to a complete reversal of this trend, with farm afforestation now accounting for close to 100 percent of Irish afforestation. However the level of farm afforestation has also experienced significant change as farmers respond to a variety of incentives and disincentives to afforest, including changes in the value of the forest premium payments, agricultural policy reforms and developments in land markets.

The introduction of the *Western Package Grant Scheme* in 1985 marked the beginning of supports for private afforestation in Ireland. The *Forest Premium Scheme*, introduced in 1989 and the *Forestry Operational Programme*, introduced in 1990, were significant in that as well as providing establishment grants for the planting of forests, the farmer also received an annual forest premium payment for the first 20 years after planting (Gillmor 1998 and Farrelly 2008). More recently, the Common Agricultural Policy (CAP) *Afforestation Scheme*, introduced in 2000, increased the incentives to plant broadleaved species on better quality land, by offering a considerably higher premium payment than that offered for planting conifers.

In 2007 the *Forest Environment Protection Scheme (FEPS)* scheme was introduced with the aim of rewarding farmers with an additional payment for including specific environmental measures in their forests to improve both biodiversity and recreation potential. The scheme would also offset the loss of payments to farmers participating in the Rural Environment Protection Scheme (REPS), if they chose to afforest a proportion of their farm. Interest in FEPS has grown rapidly to the extent that by the end of October 2009, FEPS accounted for 50% of the 2009 planted area (pers. comm. Forest Service, 2009). However, as a result of the closure of REPS to new applicants, entry to FEPS is now limited to farmers who are already participating in REPS.

Figure 1 presents the trends in Irish private and public afforestation for the years 1982 to 2008. Despite regular increases in the grant and premium, the trend since the mid-nineties has been largely downward, despite a short revival in private afforestation over the period 1999 to 2002. In 2008 approximately 6,128 hectares were afforested, which is well below the current national afforestation target of 10,000 hectares per annum (National Development Plan 2007-2013). This trend continued in 2009 as only 5,400 hectares were afforested by the end of October (Forest Service, 2009).

Figure 1: Total Irish Afforestation Levels 1982 - 2008



Source: Forest Service Statistics, (2008)

Prior to 2005 Irish farmers could potentially avail of a number of coupled premium payments, such as special beef premium or area aid payments, to supplement their market based income. With the introduction of decoupling, these payments that were paid on the basis of the number of eligible animals or hectares of a crop were now replaced with a single annual decoupled payment, referred to as the Single Farm Payment (SFP). The decision to decouple these direct payments allowed farmers to leave their agricultural land un-stocked but in “good agricultural and environmental condition (GAEC)” (European Commission, 2003, p. 3) or to plant it in forestry and still receive their SFP income support. This offered a potential windfall for Irish farmers who could continue to receive their SFP while also receiving a forest premium for 20 years. However despite this potential gain, Irish afforestation levels have continued to decline from 10,030 hectares in 2005 to 6,128 hectares in 2008.

The reluctance of Irish farmers to plant trees has been the focus of a number of published works, with Frawley and Leavy (2001) and McDonagh *et al.* (2009) both using farm surveys to identify farmers' main motivations for not planting. Taking into account that the McDonagh *et al.* (2009) survey was conducted almost ten years after that of Frawley and Leavy; and that a significant agricultural policy reform had taken place in 2005, the results of the surveys were remarkably similar. Frawley and Leavy (2001) found that 88 percent of the farmers surveyed were not considering afforestation. Frawley and Leavy (2001) also found that 51 percent of those farmers, who stated they would not plant, perceived the main difficulty with farm forestry as "farm too small/need the land". The most recent work conducted by McDonagh *et al.* (2009) echoes the earlier findings of Frawley and Leavy (2001). They found that for 48 percent of the farmers who stated that they would not plant, the most important barrier to planting land was that they needed all of their land for agriculture. This is despite the introduction of the SFP and the potential for farmers to plant up to 50 percent of their land without losing any payments. Surveyed farmers also cited the fact that there were no REPS payments on forests as a significant barrier. Earlier work conducted by Ni Dhubhain and Gardiner (1994) also found that Irish farmers were largely unwilling to plant land; only 10 percent of those farmers surveyed stated an intention to plant. Furthermore, of those farmers who stated an intention to plant land in the future, 58 percent said that their land was "good for nothing else" while 39 percent of those who said they would not plant said they did not have suitable land (i.e. they felt their land was "too good for forestry").

In addition to the factors cited above, Breen *et al.* (2009) provide a discussion of the motivations for farmers' reluctance to plant, citing the introduction of environmental regulations which have restricted the afforestation of large tracts of land, particularly of less productive marginal and peat soils. Breen *et al.* (2009) also note that the significant increase in the value of agricultural land during the period 1992 to 2007 was another motivation for farmers' reluctance to afforest their land.

A land use change from agriculture to forestry in Ireland is a permanent decision, due to the legal requirement under the 1946 Forestry Act to replant after clearfelling a forest (Irish Statute Book, 1946). Given the high prices that were paid for agricultural

land in recent years (Ganly 2009), this permanency was a major obstacle to planting. Wiemers and Behan (2004) used a real options approach to examine the role of uncertainty in the decision to plant, with particular attention paid to the potential value of agricultural land for development. They concluded that for farmers whose land had development potential, the returns to forestry would need to increase by more than 150 percent in order to trigger an investment in forestry. It remains to be seen as to whether or not the decline in the macro economy, and in particular the decline in the construction industry, will lead to a long-term reversal of current trends and an increase in the rate of private farm afforestation.

McCarthy *et al.* (2003) used a panel regression model to examine the factors that influenced afforestation rates in Ireland. They found that the afforestation grant, forest premium payments, expected forest returns and the area in REPS were all statistically significant at the 1% level. However, agricultural returns were not statistically significant. They noted that in the early 1990s most of the land planted was marginal land, and this may explain why agricultural returns are not significant in explaining the afforestation rate.

Each of the three studies conducted over a period of 15 years examining factors affecting farmers' willingness to plant (Ni Dhubhain and Gardiner (1994), Frawley and Leavy (2001) and McDonagh *et al.* (2009)), indicated that the size of the farm and the need to retain all their land for agriculture was a significant factor in the decision not to plant. This response may be motivated by the farmer's perception of him/herself as a farmer rather than a forester, and therefore they may believe that they need to retain all of their land in agricultural production. However, it may also be a reflection of the individual farmers' perceptions with regards to the relative rate of returns to agriculture and forestry, and a belief that agricultural activities offer a greater return than forestry. Therefore, this paper uses a Discounted Cash Flow (DCF) Analysis to compare the returns to three alternative forest options; each of these forest options includes the returns foregone from one of five superseded agricultural activities. The following section presents a description of the data and research methods that were used in comparing the returns of the alternative forestry investment

options. This is followed by a discussion of the results from this work, as well as some conclusions and areas for further consideration.

Materials and Methods

A Discounted Cash Flow Analysis

Given the long-term nature of farm afforestation, this paper uses the DCF method to evaluate the afforestation investment decision. The investment returns from the decision to afforest are evaluated as an alternative farm enterprise. Taking into consideration risk and uncertainty elements in many forest management models would seem to be of an unquestionable importance (Diaz-Balteiro and Romero 2008); therefore this paper also evaluates the effects of variation in key parameters on the performance of each investment. The evaluation of the alternative investment decisions is conducted on a per hectare basis in order to overcome issues related to the scale of the forestry investment.

A number of criteria exist for evaluating the returns to a long term investment decision, with Net Present Value (NPV) and Internal Rate of Return (IRR) being two of the more common. The DCF method evaluates an investment decision in terms of its Net Present Value (NPV) defined as the sum of the project's net cash flows discounted at the businesses' opportunity cost of capital (Boardman *et al.* 2001). The investment project is deemed to be 'worthwhile' if it generates a positive NPV. The IRR is the discount rate that results in a project breaking even or in other words generating a NPV of zero over its economic life (Boardman *et al.* 2001). The provision of a grant covering all planting costs means that the up-front investment is recouped immediately and therefore the IRR results may be unreliable. As a result the IRR is not presented in this analysis.

The DCF approach to calculate the returns from forestry is prevalent in the literature and has been employed by a number of authors including Brukas *et al.* (2001), Nieuwenhuis and Gallagher (2001), Rasul and Thapa (2006), and Hepburn and Koundouri (2007). While the DCF approach represents a deterministic analysis of the returns to the investment decision, sensitivity analysis allows for the impact of variability in key parameters such as grants and replanting costs on the returns to the

afforestation investment decision to be evaluated. The discount rate used will also have an effect on the present value of returns from a forestry investment. In the literature (e.g. Toivonen and Tahvanainen 1998; Clinch 1999; Styles *et al.* 2008) a 5% discount rate is prevalent when examining long term agricultural land use change, and so is used in this analysis.

Venn (2005) noted that land cost is an important factor in forestry investment decisions. However, Lewandowski *et al.* (2000) point out that some studies have omitted it from the calculation of the returns to the investment decision. Given the importance of the opportunity cost of land, in this analysis it is accounted for through the inclusion of foregone returns from a number of superseded activities. Therefore, our calculation of the NPV for forestry takes into consideration the cash margin foregone from the selected superseded enterprise, which is deducted annually from the net margin earned by the three alternative forestry enterprises. Our baseline analysis assumes that the superseded activity is land rental, and the opportunity cost of the market rental value of the land is included. Given the prevalence for grassland based agriculture in Ireland (approximately 80 percent of Ireland's agricultural area is grassland; Department of Communications, Marine and Natural Resources, 2007); the average rental value of grazing land is used.

In addition, a number of alternative superseded enterprises have also been included as part of a sensitivity analysis. Figures from the Irish National Farm Survey (NFS) have indicated that sheep, tillage and cattle farmers have signaled the greatest intention to plant forestry (Ryan *et al.* 2008), and therefore the superseded enterprises chosen for the sensitivity analysis are lowland sheep, store to finish beef, spring barley and winter wheat. Thus, the results presented in subsequent sections comprise the estimated investment returns from a decision to switch a hectare of land from a conventional enterprise to forestry.

One of the key strengths of the DCF approach is its capacity to allow for the comparison of investments with different cash flow profiles, such as annual versus multi-period systems, allowing for the timing of cash flows from year to year over the project life (Clancy *et al.* 2009). The model assumes that there are no changes in the

productivity of the forestry enterprises or of the superseded enterprises throughout the project lifespan.

Cost and Return Estimation of Forestry

The capital invested in forestry comprises the start up costs of the enterprise in the initial period, less planting grants, less the average working capital released from the superseded enterprise. The returns to forestry are taken from the Forestry Investment Valuation Estimator (FIVE), which was developed by the Forestry Development Unit in Teagasc as a forest advisory and research support tool that would allow for the calculation of the NPV of different forestry options. In this paper, the FIVE is used to calculate the costs and returns to three alternative forest scenarios. These costs and returns are then inputted into the DCF model to compare the NPV of the three alternative forest scenarios, with each of the five superseded agricultural enterprises. The FIVE was constructed using Forestry Commission yield models (Edwards and Christie, 1981), to give timber volumes which can be adjusted according to the assumed productive area. The FIVE allows for the inclusion of five alternative tree species; Sitka spruce, Norway spruce, Japanese larch, Lodgepole pine and ash/sycamore; the appropriate GPC (Grant/Premium Category) is selected for the species mix being examined. The level of grants and premiums payable are calculated based on the GPC, with total planting costs and initial maintenance costs assumed to be equal to the value of the afforestation and maintenance grants.

The conifer timber prices are based on historical data for 10 years of standing sales in Coillte Teoranta¹, while Irish and UK data are used to estimate a price size curve for broadleaves. The timber price data, along with the tree size and volume data from the yield models, allow for the calculation of timber revenues. Standard harvest losses are deducted and it is assumed that the remaining harvestable material can be sold at average prices. The FIVE is flexible as regards roading costs, which can be included or excluded in the calculation of the costs to forestry.

¹ Coillte Teoranta is the Irish State Forestry Board

Data and Assumptions

This section presents a description of the assumptions made relating to costs and revenues of the five superseded enterprises. Table 1 details the gross margins and average working capital released from the superseded enterprises.

Table 1: *Gross margin and working capital released per hectare for the superseded enterprises*

	Grazing Land Rental Value	Spring Barley	Winter Wheat	Sheep	Store to Finished Beef
Gross Margin ¹	€236	€260	€435	€365	€210
Working capital released ²	-	€291	€487	€50	€928

¹ Gross margin for production enterprises assume average levels of technical efficiency

² Working capital released is the average capital tied up in stock and variable inputs for each enterprise.

The grazing land rental value was calculated as the average paid per hectare by farmers engaged in this activity in the NFS (Connolly et al. 2008) from 2005-2007. It was assumed that any rental value less than €20 per hectare was a nominal value and so was excluded from the analysis. To avoid problems of allocation of fixed costs associated with owned machinery, calculations assume contractor charges for all field operations. All machinery and labour costs are therefore assumed to be variable costs. Due to a number of factors, such as the requirement that planted land be kept in forestry for perpetuity (Breen and Ryan 2008), it is likely that forestry will only be introduced to a small proportion of the adopting farms overall land base. This is borne out by average farmer planting figures of 7.9, 7.4 and 7.9 hectares in 2006, 2007 and 2008 respectively (Forest Service, 2008). Thus, the superseded enterprise is being reduced and not eliminated. In this context the reduction in fixed costs (e.g. labour) from reducing a conventional enterprise is likely to be quite small (Clancy *et al.* 2009).

The contractor prices were obtained from survey data reported in Management Data for Farm Planning 2006/2007 (Teagasc 2007) and inflated using FAPRI-Ireland input cost and price projections to 2009. Obtaining long range forecasts of costs and prices is a formidable task in any farm investment appraisal (Clancy *et al.* 2009). In this

analysis, estimates of input costs assume normal input levels under average production conditions as estimated by enterprise specialists. Average levels of technical efficiency, based on National Farm Survey data, are assumed for the superseded enterprises. Prices for all inputs and the outputs of superseded activities are conservative estimates based on medium term FAPRI projections. The resulting normalised margins for forestry and the superseded enterprises are held constant over the economic life of each project. The level of the premium payment for forestry is the current rate available in the Afforestation Scheme.

Afforestation Scenarios

Sitka spruce has historically been the most widely grown tree for commercial purposes in Ireland, and is typically planted with another conifer species such as Japanese larch in order to comply with the Afforestation Scheme. In recent years, there has been an increase in the planting of broadleaves in Ireland (Forest Service, 2008). The increase in broadleaf planting was largely as a result of higher premium payments for broadleaf species and more recently the introduction of FEPS has led to increased planting of broadleaf species. The three Afforestation Scenarios that have been included in this analysis reflect the compositions of many Irish farm forests:

SS: This scenario assumes a 10 hectare plantation that is comprised of Sitka spruce and Japanese larch and is consistent with Grant and Premium Category (GPC) 3.

Ash: This scenario assumes a 10 hectare plantation that is comprised of ash and is consistent with GPC 5.

Mixed: This scenario assumes a 10 hectare plantation that is comprised of Sitka spruce, Japanese larch and ash and is a combination of GPC 3 and GPC 5.

Table 2: Assumptions for alternative forest scenarios.

	SS	Ash	Mixed
Plantation Size	10 hectares	10 hectares	10 hectares
Tree Mix	Sitka Spruce 80% Japanese Larch 20%	Ash 100%	Sitka Spruce 48% Japanese Larch 12% Ash 40%
Productivity (Yield Class)	Sitka Spruce – 22 Japanese Larch - 12	Ash – 10	Sitka Spruce – 22 Japanese Larch – 12 Ash – 10
GPC Category	GPC 3	GPC 5	GPC 3 (60%) GPC 5 (40%)
FEPS	No	No	No
Establishment Grant (€/ha)	2,700	4,000	3,220
Establishment Cost (€/ha)	2,700	4,000	3,220
Cleaning/Filling In (€/ha)	873	1,200	1,004
Grant Maintenance (€/ha)	873	1,200	1,004
Rotation Length	40 years	40 years	40 years
Productive Area	85%	85%	85%
Forest Management	Thin	Thin	Thin
Maintenance Cost (€/ha)	15	15	15
Insurance Cost (€/ha)	20	20	20
Roading Year	Year 15	Year 15	Year 15
Roading Cost after Grant (€/ha)	900	900	900

Results

An initial baseline comparison of the NPV for all three afforestation options is made with land rental as the superseded enterprise. Despite receiving the lowest level of forest premium payments per hectare, the SS option returns the highest NPV per hectare (€4,035) when land rental is the assumed superseded enterprise. In comparison the Ash option, which received the highest level of forestry premium, had the lowest NPV as a result of the significantly lower volume of timber produced.

Table 3: Baseline investment performance in per hectare terms

	Net Present Value *
<i>Superseded: Land Rental</i>	
SS	4,035
Ash	2,524
Mixed	3,430

*Discount Rate is 5 percent.

Source: Authors Own Calculations

Table 4 presents the NPV for the three forestry options, when the alternative superseded enterprises are winter wheat, spring barley, lowland sheep production and store to finish beef. All of the forestry options examined with the exception of ash superseded by winter wheat, offer a positive NPV. However, there is a considerable degree of variability in size of the respective NPV's for different forestry mixes. For example the SS option with a superseded enterprise of store to finish beef has the highest NPV, €5,343 per hectare, while an ash plantation with a superseded enterprise of winter wheat has an NPV of - €317 per.

Table 4: *Investment performance of forestry in per hectare terms with alternative superseded agricultural enterprises*

		Net Present Value *
<i>Superseded: Spring Barley</i>	SS	3,908
	Ash	2,397
	Mixed	3,302
<i>Superseded: Winter Wheat</i>	SS	1,194
	Ash	-317
	Mixed	589
<i>Superseded: Lowland Sheep</i>	SS	1,933
	Ash	422
	Mixed	1,328
<i>Superseded: Store to Finished Beef</i>	SS	5,343
	Ash	3,832
	Mixed	4,738

* Discount Rate is 5 percent.

Source: Authors Own Calculations

Impact of Inclusion of Replanting Costs

Sensitivity analysis was conducted to examine the impact of the inclusion of the replanting costs on the NPV of each forestry option. The initial afforestation costs are covered by the provision of a planting grant. However, as discussed above, in Ireland after clear-felling Irish forest owners are legally obliged to re-plant and the cost of this re-planting is not covered by a grant. One argument for including replanting costs as part of the first forest rotation is that the profit from the first rotation is not realisable without incurring the replanting cost. On the other hand, it could be argued that replanting is part of the cost of the second rotation and should not be included as a cost against the first rotation. Similar to Clinch (1999) the cost of replanting is not included in the baseline scenarios. However, due to the replanting obligation, the cost

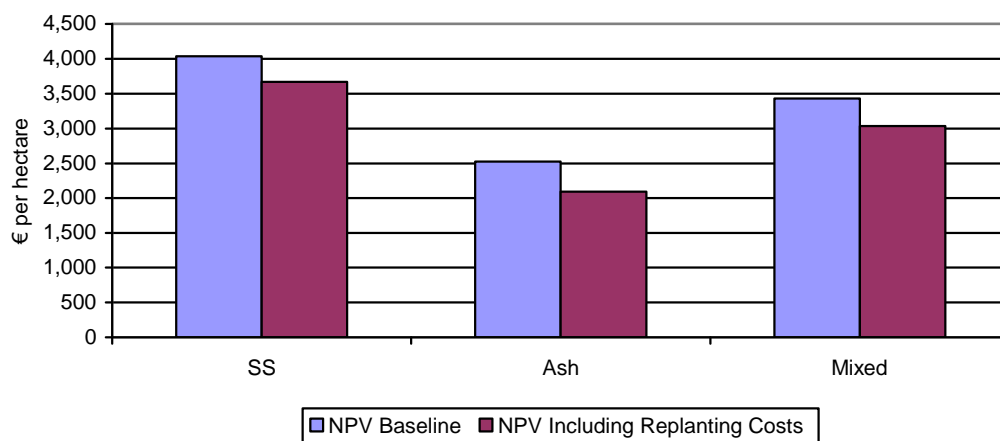
of replanting is included as part of the sensitivity analysis in order to assess the impact of the replanting cost on the forest NPVs. Figure 3 below compares the baseline NPV with a second scenario where we assume a replanting cost is incurred after clear-fell. The current cost of replanting is estimated at €3,000 per hectare for conifers and €3,500 for broadleaves due to the higher stocking rate for broadleaves (pers. comm. H. Phillips, 2009).

Table 5: *Assumed Cost of Replanting per Hectare*

	Replanting Cost (€) per Hectare
SS	3,000
Ash	3,500
Mixed	3,200

The change in the NPV is substantially smaller, varying from €368 per hectare for SS to €430 per hectare for ash, reflecting the fact that the replanting cost is incurred at the end of the investment decision and as a result is highly discounted. Furthermore, the inclusion of the replanting cost results in a negative NPV for ash with a superseded enterprise of lowland sheep production.

Figure 3: *Impact of Inclusion of Replanting Cost on the Net Present Value per Hectare*

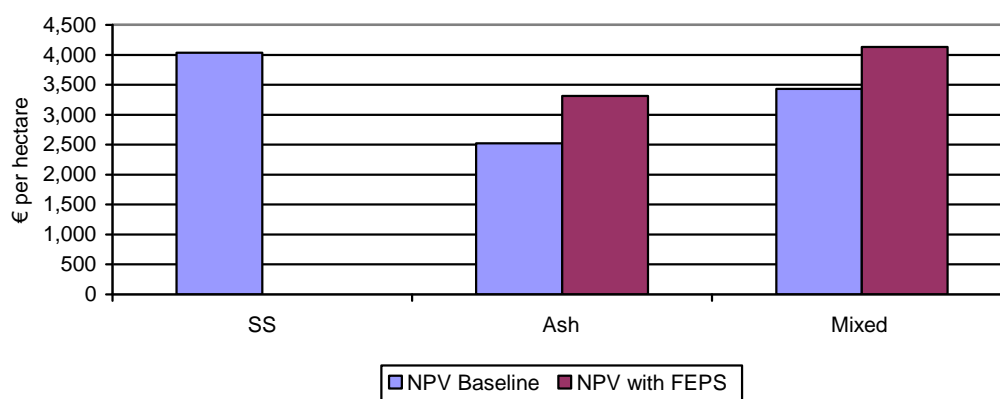


Source: Authors Own Calculations

Impact of Participation in FEPS

Further sensitivity analysis was conducted to examine the impact on the NPV of FEPS participation. Farm forest owners who are currently in REPS may avail of an additional FEPS payment. While entry to REPS 4 is not possible after July 2009, the pool of farmers currently in REPS (approx 62,000) is still eligible to apply for FEPS as a matter of course (pers. comm. DAFF, 2009). As many farmers in REPS have the option to enter FEPS, and as 50% of the land being planted currently is in FEPS, we included the FEPS payment in a sensitivity analysis. This analysis assumes a FEPS payment of €200 per hectare annually for five years, with no loss of REPS payment. It is not possible to avail of FEPS if only conifers are being planted, so the FEPS sensitivity analysis is only run for the Mixed and Ash forest options. The results indicate that participation in FEPS will lead to a higher NPV per hectare for both forestry options when compared with the baseline superseded enterprise of land rental. The increase in the NPV for Ash is €787 per hectare, however as seen in figure 4 the returns are still lower than the returns to the SS option. The increase in the NPV for the mixed forestry option is €701, which makes it more profitable than the SS without FEPS option. This analysis takes into account that participation in FEPS will lead to a lower productive area (80% compared with 85%, due to the greater requirement for biodiversity area (Forest Service, 2007)) for the non FEPS options. The lower productive area will result in reduced timber sales, which has a more adverse effect on the mixed forest scenario than on the ash scenario as a greater proportion of the returns in this scenario come from timber sales.

Figure 4: *Impact of FEPS participation on the Net Present Value per Hectare*



Source: Authors Own Calculations

Conclusions

Despite the stated reluctance of Irish farmers to plant forests the forest investment options examined offer a positive NPV, with the exception of ash where the superseded enterprise is winter wheat. There are already signs that long-term trends are reversing, and that forestry is becoming a more attractive option for farmers. The number of applications for planting approval to the end of September 2009 is up 78% on the same period last year (Forest Service, 2009). Possible reasons for this are the continuing downward trend in the returns from conventional agricultural systems and the higher forestry returns as evidenced in this analysis.

The results indicate that planting fast growing conifer species offers a substantially higher NPV (approximately €1,500 per hectare) than planting a broadleaf species such as ash. However, in recent years Ireland has seen an increase in the planting of broadleaves, which may have reflected the higher annual premium payments payable on broadleaves, as well as changes in the preferences of farm-foresters and increased afforestation on better quality soils. It should also be noted that while the DCF methodology shows the highest return to the SS option, the analysis does not consider any potential future earnings from the forest for its conservation, biodiversity or amenity value. Broadleaf and mixed species plantations would have a greater potential to avail of such revenue streams in the future than a plantation dominated by a non-native conifer species such as Sitka spruce.

The low afforestation rate that has been witnessed over the past 10 years has in part been attributed to the growth that was witnessed in the construction sector and the impact of that growth on land values. The requirement to replant forested land after clear-felling imposes restrictions that limit the price that can be realised for forested land. While the DCF approach employed in this study allows for a comprehensive analysis of the returns to forestry when compared with the returns foregone from alternative agricultural enterprises, it is not an effective tool for evaluating the potential loss in the land value that might arise from the decision to afforest.

A final note worth making is that the forest premium payments received and the revenue from timber sales are both tax-free, while it is likely that the revenue from

each of the superseded enterprises considered in this analysis would be subject to tax. The impact of the afforestation decision on the tax liability of an individual farm will vary considerably, depending not only on the value of the returns to the enterprise that is foregone, but also on the returns to other enterprises on the farm and the value of non-farm income. As a result, this analysis focuses on the return on the investment for three alternative afforestation scenarios over a number of superseded agricultural activities and does not consider the post tax implications of the afforestation decision.

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