Broadleaves in Ireland

Can Broadleaves give adequate financial returns?

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INTRODUCTION

The following paper describes briefly the existing stock of broadleaf forest in the Republic of Ireland, with particular emphasis on the area owned by the state, for which detailed information exists. It is shown that the nature of the broadleaf estate indicates that financial considerations were not paramount in the decision to plant broadleaves. The question of whether or not broadleaves can be grown at a profit is examined.

THE GENERAL PICTURE

Broadleaves are not a major element in Irish forestry. Though they are common in hedgerows, which gives many parts of the country the appearance of being reasonably well wooded, stands of broadleaves represent only about 0.5% of the land area. There are two main sources of information on broadleaf woodlands in the Republic of Ireland: the 1973 Inventory of Private Woodlands and the 1978 Forest Service Inventory. Together these give a comprehensive picture of the situation up to around 1970, as outlined in Table 1.

Table 1: Broadleaf High Forest (ha)

Private	State	Total
33,000	11,000	44,000

The figure for Private Forests represents 62% of the total area under high forest on private land, whereas the area of state forestry under broadleaves is 3% of the estate. The total area of broadleaf high forest is 9% of the forested area in the country.

Table 2 gives the details by age class of both state and private broadleaf woodland.

Table 2: Areas in Thousands of Hectares

	Age Class	Private	State	Total
pre	1900	19.9	3.9	23.8
	1909	1.7	0.1	1.8
	1919	1.2	0.1	1.3
	1929	2.0	0.1	2.1
	1939	3.4	1.1	3.5
	1949	3.2	1.4	4.6
	1959	1.2	1.7	2.9
	1969	0.2	1.4	1.6
post	1970	0.2	2.2	2.4

Much of this area is overmature; two-thirds of the private and one-third of the state woodlands were planted before the turn of the century. As state plantation started after that time much of the existing state broadleaf woodland has been acquired rather than planted. The slight increase in state planting of broadleaves since 1920 only mirrors the general increase in afforestation, though very recently the amount of broadleaves planted has risen to 5% of total, from about 3% in 1970.

Table 3 gives the breakdown, by species, of the broadleaf high forest in 1970, both state and private.

Table 3: Broadleaf High Forest (ha) (by dominant species).

Oak	10,600	Sycamore	3,400
Beech	10,600	Elm	1,700
Ash	6,500	Alder	1,500
Birch	5,200	Other	1,700

Virtually every commercial species that will grow in Ireland has been planted somewhere at some time, but a small number dominate.

The Forest Service Broadleaf Woodlands

The Inventory of private woodlands involved an element of sampling; more comprehensive statistics are available for the Forest Service estate. Table 4 gives a breakdown of four of the major species.

Table 4: Broadleaves in state woodlands.

Status	No. of Stands	Area (ha)	Average Stand size
OAK			
High Forest	1175	2460	2.1
(Pure	554	1120	2.1)
(Dominant	621	1340	2.2)
Second Species	1166	2654	2.3
TOTAL	2341	5114	2.2
BEECH			
High Forest	1582	2760	1.7
(Pure	422	770	1.8)
(Dominant	1160	1990	1.7)
Second Species	1599	2968	1.9
TOTAL	3181	5728	1.8
ASH			
High Forest	630	1027	1.6
(Pure	177	234	1.3)
(Dominant	453	793	1.8)
Second Species	806	1567	1.9
TOTAL	1436	2594	1.8
SYCAMORE			
High Forest	196	259	1.3
(Pure	55	79	1.2)
(Dominant	141	180	1.3)
Second Species	214	355	1.7
TOTAL	410	614	1.5

As is clear from the figures, more broadleaves appear in mixtures than in pure stands. The statistics for the other broadleaf species present a similar picture. Thus the major part of the broadleaf estate is in mixtures.

For example, in the case of Sycamore it is pure on only 69 ha and it is dominant in mixtures with 16 other species. There are also 214 stands where sycamore is the second species in mixture with 18 different dominants. That gives a total of 35 mixture types in just 400 stands. In regard to other species certain mixtures of the major species are more common than others, such as oak/ash, oak/beech and ash/Norway Spruce, but the overall picture is one of great diversity.

The management approach to broadleaf silviculture is localised and variable. There is no reliable information available on the yield of these broadleaf plantations and the quality of the stands is frequently poor. In all, management of broadleaves has been poor and unclear in direction.

Financial Considerations

Can broadleaf species be grown to give a financial return?

To calculate this, various assumptions have to be made regarding the elements of economic analysis. They are

1. What interest rate is to be used, if any.
2. Yield: in terms of volume, quality and timing.
3. Establishment costs.
4. Other costs throughout the rotation.
5. Timber price.

In relation to interest, a range of rates can be tested: yields can be estimated using yield tables and establishment costs depend on techniques used. Timber price, however, can only be guessed. For this reason, the procedure followed in the present analysis is to make assumptions regarding the first four items above and then show what price per cubic metre would be required at clearfelling to break even financially.

(i) INTEREST RATE

Given that the question of the correct interest rate to use for relatively short rotation coniferous forestry has never been satisfactorily resolved, it is difficult to know what interest rate should be applied to rotations in excess of 100 years. At present 4% is generally deemed an acceptable return on forestry investment in Ireland, and is the interest rate most commonly used to compare silvicultural alternatives. This is much lower than the interest rates on recent borrowings, but it is justified on the basis of an examination of the historical return on investment in the economy over a period of decades. Perhaps such an argument could be extended to cover much longer periods and that an even lower rate be justified. Many advocates of planting broadleaves argue that no interest rate at all should be applied — and a system similar to the German should be used: that is, if income from the forest as a unit exceeds expenditure each year the forest is considered profitable. There are two difficulties with this approach.

(i) In Ireland, as we have seen, there is very little existing woodland, and new state planting is currently funded on money borrowed at high interest rates. This is true even if the money is nominally raised from sales of timber or other assets, because

funds realised from such sales could be used to reduce the state borrowing requirement rather than be reinvested in forestry.

(ii) Without the use of any interest rate the comparison of different silvicultural practices is difficult. For example, an investment of £1,000 to give a return of £1,100 in 100 years time could be considered more profitable than an alternative silvicultural practice which would yield £1,099 in two years, assuming the second investment cannot be repeated within the 100 years. This analogy is not as far-fetched as it might at first seem. If it is decided to spend money treating a 150 year old oak stand to produce high quality veneer at age 250 rather than felling its already valuable trees, this is the sort of comparison that is being made.

The use of zero interest rate is justifiable only where there is no choice, as in cases where the money from a standing crop must be reinvested in planting of a certain species, in a fixed way, to produce a specified product.

As this is not the case in Ireland, a range of interest rates are used in the analysis.

(ii) YIELDS

The British Forestry Commission yield tables are used. Two clearfelling times are considered. They are age of maximum mean annual increment (MMAI) and normal felling age. The figures used for the four species to be examined in this analysis are:

Species	Yield Class	MMAI (years)	Normal Felling Age
Oak	4	90	160
Oak	6	80	140
Oak	8	70	120
Beech	4	105	130
Beech	6	95	120
Beech	8	80	110
Sycamore/Ash	8	45	70
Sycamore/Ash	10	40	65
Sycamore/Ash	12	40	60

(iii) COSTS

The establishment costs to be used in an analysis such as this can vary greatly. Factors which influence the results are:

— whether or not to include the price of land
— planting grants
— whether the planting is afforestation or reafforestation

— site difficulty
— need for protection (tree guards?)
— whether or not overheads are included

Many of these factors will vary with species. To simplify the analysis a range of establishment costs are taken, from £2,000/ha to £5,000/ha. It is assumed as a rule of thumb that the establishment costs represent 75% of total discounted costs. Thus an establishment cost of £3,000 gives a total discounted cost of £4,000/ha. Higher establishment costs are likely to represent a bigger proportion of total discounted costs.

(iv) PRICE

The present analysis seeks to determine the prices required at clearfelling to give an internal rate of return equal to the specified interest rate.

For thinnings a price/size curve has been assumed. It is the same price/size curve calculated from all state sales of conifers over the period 1974-1986, for trees with a mean diameter of 30cms or less at breast height. Thereafter a premium of £10/m^3 is added to the broadleaves. This is to allow for the relative increase in hardwood value at larger dimensions.

Results

Of the four species examined, oak, ash, beech and sycamore, tables 5 and 6 below present the best results of the crops examined (Sycamore YC 12) and the poorest (Beech YC 4), assuming clearfelling at age of maximum mean annual increment.

Table 5: Sycamore Yield Class 12.

Amount required (IR£/m^3) at clearfelling to repay investment at a range of interest rates.

Assumed Establishment Costs (IR£/ha)	Interest Rate 2%	4%	6%
2000	—	30	102
3000	16	66	178
4000	32	101	254
5000	48	137	330

Table 6: Beech Yield Class 4.

Establishment Costs	2%	4%	6%
2000	150	1190	9100
3000	230	1840	13580
4000	310	2450	18070
5000	390	3060	22550

The very significant impact of both establishment costs and interest rates are evident.

Tables 7 summarises the results for the four species, taking an assumed establishment cost of £4,000/ha.

Table 7: Price required (£/m³) at 2% and 4% by species and Yield Class. Clearfelling at age of Maximum Mean Annual Increment and normal clearfelling.

	Price required (£/m³) at 2% MMAI.				
YC	**4**	**6**	**8**	**10**	**12**
Oak	300	150	90		
Beech	310	155	95	60	
Ash		350	95	60	
Sycamore		350	95	60	30
	Price required (£/m³) at 4% MMAI.				
YC	**4**	**6**	**8**	**10**	**12**
Oak	1,800	770	410		
Beech	2,450	1,170	580	370	
Ash		870	250	160	
Sycamore		870	250	160	100
	Price required (£/m³) at 2%. Normal Clearfelling Age				
YC	**4**	**6**	**8**	**10**	**12**
Oak	720	340	182		
Beech	370	186	112	68	
Sycamore		350	95	60	30
	Price required (£/m³) at 4%. Normal Clearfelling Age				
YC	**4**	**6**	**8**	**10**	**12**
Oak	17,000	5,700	2,200		
Beech	4,900	2,160	1,156	730	
Sycamore			385	245	150

DISCUSSION

As has been shown the existing stock of broadleaves is scattered, mixed and not suitable for extensive management prescriptions due to its diversity. The quality of much of it is poor. Many of the stands are not intensively managed. However, it is well to remember that from an amenity point of view such diversity can be attractive. If, on the other hand, broadleaves are to be planted with the objective of producing quality hardwood the considerable cost involved should not be overlooked.

Of the species examined here, the higher yield classes of ash and sycamore may have a reasonable prospect of giving a return at 2%. The position of oak and beech is questionable in this regard — as it is not known whether these species will produce timber of sufficient quality to fetch high prices given the short rotations and low costs assumed in this analysis.

As the figures above have been calculated using both the estimated age of maximum mean annual increment and what is considered normal felling age, the dimensions at clearfelling are not large, compared to longer rotations. It is questionable whether this relatively small dimension hardwood would fetch prices anything like those required at the 2% interest rate.

To produce larger logs and better quality timber requires increased rotations and hence greater prices. To achieve the sort of quality timber which allows the best veneer oak in Germany to make over £10,000/m^3 requires expensive establishment, very high initial stocking and very long rotations.

To put those high prices in context, a stand of YC 6 Oak grown to 250 years of age and established at a cost of £5,000/ha would need to fetch £5,000/m^3 using a 2% rate of interest for every cubic metre, on all trees not just select trees only. At 4% the average price would have to be over £600,000/m^3! Even the best specimen trees appear unlikely ever to be worth that — yet that is the *average* price per m^3 which would be required at clearfelling.

Ultimately we must conclude that the decision whether or not to plant oak and beech cannot be taken on the basis of financial considerations where the rotation lengths are very long. It cannot be dogmatically stated that in the year 2250 the best quality veneer oaks will not be selling for these enormous prices, but it appears unlikely.

REFERENCES

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