

# Availability of land for forestry in Ireland and its suitability for Sitka spruce

(*Picea sitchensis* (Bong.) Carr)

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## INTRODUCTION

The afforestation programme of the Republic of Ireland is at a cross-roads. Whether this cross-roads heralds a major crisis or presents new opportunities is still hidden in the future. The roads leading to this junction come from opposing directions. First and most disquieting is the rapid cutback in the State afforestation programme. At a time when land prices have fallen the State, through fiscal stringencies, is unable to avail of this opportunity to consolidate its forest holdings. If there is to be stability in the flow of raw material to the timber processing industries then we need a planting programme of at least 10,000 hectares for at least a further 15 years. Secondly, much hope is now being placed in private forestry — in this case, institutional private forestry — but this approach to afforestation also has its constraints. It is unlikely that institutional afforestation will fully replace the hectares lost through the FWS cutback in the near future. The second set of opposing roads which converge on our afforestation cross-roads and the one which will determine the eventual long term direction of the national afforestation programme — is the relative support systems for agriculture and forestry emanating from Brussels (Anon 1985, Andriessen 1986). On the agricultural side, the reduction in the milk quota and the stagnation or actual decline in the price supports for other farming systems, such as beef and cereals, has led to a distinct lack of confidence in the future within the farming sector. These constraints, which now enmesh much of the traditional farming enterprises which are possible in Ireland, have instigated a search for alternative land-use systems. Such a search has led to a more open-minded approach to forestry. If a proper support system of grants for farmers switching to forestry were devised — then

this third apex of the afforestation triangle, farmer forestry, could make a substantial contribution to the national afforestation programme. There is little doubt, that under Irish conditions, forestry offers the only alternative land-use system which can utilise extensive areas of marginal agricultural land. On the forestry side the supports and grants to those who plant are becoming increasingly attractive. These supports are not originating as part of a rational Irish forest policy but are rather the adjuncts of regional or EEC agricultural policy. Thus, there is now a greater interest in forestry at all levels of public awareness than there has ever been before.

It is in this context that a closer look at the possible land base for forestry is necessary. As all land in the country is privately owned, commonages, while jointly held, are still privately owned, mostly by farmers — any increase in forestry must use land coming from the agricultural sector. It is most likely that it will be the marginal farmer — in the economic sense — who will sell out or plant his land. As this type of farmer is normally located on difficult agricultural soils it is essential that the forestry potential of these soils should receive most attention.

## SUITABILITY

### *Methodology*

The Republic of Ireland occupies an area of 6,805 million hectares excluding rivers, lakes and major urban areas. Gardiner and Radford (1980) in their work 'Soil Associations of Ireland' recognised 44 major Soil Associations in the country. Gardiner and Radford define a Soil Association as follows: "The soil association is not a soil classification category but is a cartographic (or mapping) unit. It consists of two or more soils, usually formed from the same type of parent material, which are associated on the landscape in a particular pattern. For example, one may have an association of two soils — one a well-drained Brown Earth which occurs in the more favourable topographic positions and a poorly-drained Gley soil occurring in the depressional positions". They have further indicated the agricultural potential of these Soil Associations by grouping them into six land-use categories from wide to extremely limited. In subsequent work they have reduced the number of land-use categories to five (Gardiner and Radford, 1981). This paper uses the latter as the basis of its agricultural land-use categories.

On the forestry side, soil productivity is measured by the yield class (YC) system (Hamilton and Christie, 1971). However, the

yield class system is species dependent — the same site can have many different yield classes depending on what species is present. A site may have a YC 8 for oak while being rated YC 20 for Douglas fir. For the purposes of this study Sitka spruce (*Picea sitchensis* (Bong.) Carr.) is used as the indicator species. Sitka spruce is now the most frequently used species in Irish forestry and is capable of adapting to a variety of widely differing sites. Its range of yield classes is probably the greatest for any conifer in the country. For these reasons it is the obvious choice as indicator species for forest productivity.

Forest productivity is broken into five production categories ranging from 'Very Good' to 'Extremely Limited'. These categories while similar to those used in the agricultural land-use side, have no direct comparative economic or production relationship — they are simply used to describe the perceived value of the various production categories within their own enterprise system.

Each Soil Association, with three exceptions, is assigned to a single yield class category. Because there are still discernible soil differences within a single Soil Association each Association is assigned to a yield category which has a range of possible yields, rather than one exact yield class. The yield class categories used are; YC 0-8, 6-12, 10-16, 14-20 and 18-20 corresponding to "Extremely Limited", "Very Limited", "Moderate to Good", "Good" and "Very Good" respectively. Thus Soil Associations assigned to the "Moderate to Good" category may encompass soil areas with yields ranging from YC 10 to YC 16 although the bulk of soils will probably have productivity levels in the middle of the range. The production assessment, therefore, is closer to that of an extensive area of forest rather than to that of a fully stocked, uniform hectare of forest as envisaged by the actual yield class Tables. Finally, it should be understood that this study is only a first approximation and that many of the assessments of Soil Association potential are tentative and need further study. In general, assessments tend to be on the conservative side, particularly in the assignment of Soil Associations to the extreme categories of "Very Limited" and "Very Good". This paper represents a more detailed analysis than that attempted at the Forest and Wildlife Service, Private Forestry Seminar, in Kiltarnan (Bulfin, 1984). Soil Associations are assigned to a yield class category on production information gathered from a number of different sources: The Leitrim Resource Survey (Bulfin, Gallagher and Dillon, 1973); information published with the various Soils Bulletins (Bulfin, 1977; Bulfin, 1983; and Finch, 1971); from other published information (Carey and Griffin, 1981; Carey, Hammond and McCarthy, 1985; Dickson and Savill, 1974;

Gallagher and Gillespie, 1984; O'Flanagan and Bulfin, 1970; Savill and Dickson, 1975): from current work under an EEC contract (Bulfin, 1986): from other unpublished sources within the Agricultural Institute and from numerous discussions with forestry colleagues in various parts of the country.

### *Analysis of Difficult Agricultural Soils*

The word difficult is used to denote the physical difficulty which these soils present to farmers trying to work them. Because of these difficulties they are also likely to be economically marginal for agriculture. Gardiner and Radford, (1980) identify 1,958 million hectares (28.8%) of the soils of the Republic of Ireland as being extremely limited for agricultural production. This land is mostly located in the Mountain and Hill Physiographic Division mostly with blanket peat and lithosol soils but also including low level blanket peat soils on the west coast and the midland peats. With the exception of the midland peats, where major (and expensive) reclamation work can produce a valuable agricultural soil — all of the soils in this category have “severe (and permanent) limitations due to high altitude, rock outcrop, shallowness, steep slopes, wetness and inaccessibility”.

### *Soils classed as extremely limited for agriculture*

Table 1 shows the forestry potential of these soils. There is a definite correlation between land that is extremely limited for agriculture and land that is extremely limited for forestry. Thus, 17.1 of the whole country (representing 59.7% of the “Extremely Limited” category) is classed as “Extremely Limited” for both forestry and agriculture. Of the remaining 11.7% of the country occupied by this category, half of this is occupied by midland peats. These peats, which in the raw or in the hand-cutaway state are extremely limited for agriculture, are classed as having a “Limited to Somewhat Limited” to “Moderate to Good” productive capacity for forestry. More recent research is indicating that the Bord na Mona milled peat cutaway has a high potential for forestry and this is mostly placed in the “Very Good” category with expected yield class in the range YC 18-24, (Carey, Hammond and McCarthy 1985). The remaining 6.0% of soils in this agriculturally “Extremely Limited” category are composed of peaty gleys and peaty podzols mostly at high elevations and these have been placed in the “Very Limited” and “Moderate to Good” forest production categories.

**Table 1:** Soils classed as agriculturally "Extremely Limited" — distributed by forestry potential.

Forestry Yield Class Category Yield (M3/Ha/An)					
	Extremely Limited (0-8)	Very Limited (6-12)	Moderate to Good (10-16)	Good (14-20)	Very Good (18-24+)
Ha	1,162,752	384,945	220,507	111,600	78,033
%	17.1	5.7	3.2	1.6	1.2
Total Area in Category				1,957,837	28.8%

**Table 2:** Soils classed as agriculturally "Very Limited" — distributed by forestry potential.

Forestry Yield Class Category Yield (M3/Ha/An)					
	Extremely Limited (0-8)	Very Limited (6-12)	Moderate to Good (10-16)	Good (14-20)	Very Good (18-24+)
Ha			50,488	260,252	452,918
%			0.7	3.8	6.6
Total Area in Category				763,658	11.1%

**Table 3:** Soils classed as agriculturally "Limited" — distributed by forestry potential.

Forestry Yield Class Category Yield (M3/Ha/An)					
	Extremely Limited (0-8)	Very Limited (6-12)	Moderate to Good (10-16)	Good (14-20)	Very Good (18-24+)
Ha			316,338	138,244	185,994
%			4.6	2.1	2.7
Total Area in Category				640,516	9.4%

*Soils classed as very limited for agriculture*

Table 2 deals with the category of soils classified as agriculturally "Very Limited" which contains a total area of 0.764 million hectares (11.15% of the country). This category represents the poorer, from an agricultural point of view, wet mineral lowlands composed of gley soils on both drumlin and non-drumlin topography. The major limitation of these soils, for agriculture, is poor drainage originating in a number of different ways: either from a heavy texture and poor structure; from a high water table; or from the presence of seepage sources or springs. Most of these soils have a very high potential for forestry as documented in a number of studies. (Bulfin, Gallagher and Dillon, 1983; O'Flanagan and Bulfin, 1970). These are the soils which have given Ireland its reputation for high forest productivity — although there is relatively little afforestation on them. Some 0.713 million hectares (10.4% of the country) of these wet mineral soils are classed in the top two forestry production categories with expected yield classes ranging from YC 14 to 24 and above. If a rational land-use policy were to be adopted, then the nation would look to these lands and, possibly, to the midland peats for the bulk of its afforestation programme. However, from the agricultural and social point of view, these soils present certain problems for forestry development. These points will be touched on late in the paper.

*Soils classified as of limited use for agriculture*

Table 3 gives details of soils which, while of better agricultural value, still present definite difficulties in farm management. This category of soils of "Limited" potential for agriculture, occupies an area of 640,516 ha (9.4% of country) and is mostly composed of wet mineral lowland soils along with some lowland podzols in the west. These particular wet mineral lowland soils are of a somewhat better potential than those in the previous category, partly due to slightly better internal drainage and partly due to being located in lower rainfall areas. As expected this category, with a predominance of wet mineral soils, has a high potential for forestry. While these soils have an obviously high potential for forestry, they may not be easily or readily available for afforestation. They are located in what are generally considered better farming areas where, in some cases, dairying is the major agricultural enterprise e.g. east Cavan and parts of Monaghan.

*Summary of all soils with agricultural limitations*

Table 4 summarises the information from the previous four tables. The total area of marginal agricultural land in the Republic

of Ireland amounts to some 3,362 million hectares or 49.3 per cent of the country. Perhaps the most significant fact to emerge from this Table is that 1,163 million hectares (17.1 per cent) of the country is classed in the "Extremely Limited" forestry potential category. This includes much of the high mountain areas at elevations over 305 metres and the most inhospitable and exposed western blanket peats and lithosol areas such as the Burren. A further 5.7 per cent of the country (0.385 million hectares) is classed as "Very Limited" for forestry production. In the categories with definite potential for forestry 0.587 million hectares (8.5 per cent) have an average yield class in the "Moderate to Good" category. The average yield class for this category is close to the current national average of YC 14 for state forestry. The final two categories, with most potential for forestry, occupy 1.227 million hectares (18 per cent) of the country. These are mostly the wet mineral lowlands, which have a proven potential for forest production, and the midland milled peat areas. Thus, of the marginal agricultural soils of the Republic of Ireland 26.5 per cent or 1.8 million hectares are suitable for forestry with 1.25 million hectares of land capable of producing some of the highest yields in Europe.

**Table 4:** All soils with agricultural "Limitations" — distributed by forestry potential — Summary.

		Forestry Yield Class Category Yield (M3/Ha/An)			
	Extremely Limited (0-8)	Very Limited (6-12)	Moderate to Good (10-16)	Good (14-20)	Very Good (18-24+)
Ha	1,162,752	384,945	587,333	510,096	716,945
%	17.1	5.7	8.5	7.5	10.5
Total Area 3,362,071				49.3%	

#### LAND AVAILABILITY

Availability can be interpreted as the willingness of the landowner to either plant his own land or to sell for state or private planting. While land may be classified as very suitable for forestry, this does not mean that it is available for planting. Availability is determined by a number of complex factors, which depend on the economic and social constraints impinging on the landowner. It is not possible to give a detailed analysis of land availability in this

paper — only an outline of possible factors influencing availability can be touched on.

### *Owner planting*

The willingness of any landowner to plant some or all of his land will depend to a considerable extent on his own personal circumstances. Owners can first be categorised as to whether they are owner occupiers or absentee owners. Absentee owners are more likely to afforest or to sell their land for afforestation. They are also more likely to have small non-viable holding or marginal land and also a secure source of income or employment elsewhere. Very little information is available about the number or status of absentee owners, who currently are some of the key people either planting their own land or selling it for planting.

Landowners who farm their own land are less likely to undertake any serious afforestation. Resident farmers, large or small, are not in a position to lose current income by locking land up under forestry for long periods. The position is all the more intractable because there is no tradition of farmer forestry in Ireland and so they cannot look to their neighbours for example. In this we are in direct contrast with almost all mainland EEC countries. Until they are offered serious incentives, which match — or better — those which currently support them in agriculture, farmers will not seriously consider forestry as a viable option. EEC forestry officials, coming from countries with a long tradition of farm forestry are likely to expect too much from the operation of a simple grant scheme under Irish conditions. Such is, perhaps, the case with 1820/80, the Western Package grant scheme.

### *Part-time farmers*

A possible target group, who could become important contributors to the private afforestation programme, are those who practice part-time farming. In 1978 it was estimated that about 25 per cent of all landowners, with holdings of over 2 hectares, had other jobs besides farming (Higgins, 1983). Their numbers have been on the increase since 1961. Ironically, the largest concentration of these self-employed part-time farmers was in the more prosperous farming areas. It is regrettable that there is a lower rate in the forestry grants for these better farming areas. If planting grants in the east of the country were at the same level as the Western Package grants we could see an upswing of planting on the marginal soils in the eastern part of the country where farm sizes are larger. The number of part-time farmers by farm holding size category is given in Table 5. As is to be expected the largest number



of part-time farmers are to be found in the smaller farm size categories. Thus, 39.6 per cent of farmers in the 2-10 hectare category have part-time jobs and this represents 45.3 per cent of all part-time farmers. On average, part-time farmers, who were wage or salary earners, earned 80 per cent of their income, from their part-time occupation in 1981. Their loss of farm income, if they afforested their land, could readily be replaced by a supplementary grant system.

In the final analysis any landowner, who has not decided to sell out, will be influenced by his immediate income prospects. He can only consider forestry seriously for a substantial portion of his farm if he can see an annual income comparable to that which he is already receiving in agriculture. The prospects for such an annual income, from national or EEC sources, have been discussed elsewhere (Bulfin, 1985; Bulfin, 1986; Bulfin and Connelly, 1986).

**Table 5:** Number of part-time farmers by farm size — in Republic of Ireland.

Size Class	No. of holdings	With p.t. jobs	% of all p.t. farmers
Ha	%	%	%
2-10	28.4	39.6	45.3
10-20	35.9	21.5	31.2
20-30	11.7	26.9	12.7
30-50	15.1	12.5	7.6
50+	8.9	8.8	3.2
All classes	100.0	24.8	100.0

Source: Higgins 1983

### *Land sales for afforestation*

Ireland is a nation of owner occupiers with 92 per cent of the land in the owner-occupier category (Kelly, 1982). We also have the lowest (for the EEC 9) rate of change in the number of agricultural holdings. It is unlikely that many landowners selling their land will be greatly influenced by the proposed future use of their land, they will be mainly concerned with getting the best price. Thus, the availability of land for private planting is more likely to be influenced by the requirements of the purchaser than by the behaviour of the vendor.

Because of the grant system land being bought for afforestation, by the institutions or by other private investors, is located in the Western Package grant areas. Apart from location investors have parcel size and production or yield class requirements which must also be met. In general, investors appear to be looking for sites of at least 30 hectares and with an expected production level above YC 14-16. They show a definite preference for the wet mineral sites of YC 20 and above. Therefore, the main thrust of investor purchase is in the drumlin areas in the north-west and also in the wet mineral soils of Clare.

From the investors point of view, the required yield classes are readily available in these areas but the parcel size may not be — especially over the longer term. Kelly (1982) indicates that the average total area of land transferred through the market place is some 26,000 hectares (64,000 acres) per year or some 0.55 per cent of the crops and pasture land (which excludes hill and mountain land) of the country. It is always possible to combine a number of purchases but such organisation requires a considerable amount of time, effort and expense. Farm size categorised by topographical region, is given in Table 6. From this Table it can be seen, for the target wet mineral lowland areas, that over 50 per cent of farms are less than 12 hectares, (Scully, 1971). Only about 4 per cent of farms are over 30 hectares, the preferred size for investor purchase. The reservoir of appropriately sized farms is very limited. The purchase by investors of a considerable number of these larger farms, as they come on the market, would also pose serious structural and social problems for these regions. By taking up these larger farms they not only mop up the main source of potentially viable or viable farms but they also limit the remaining farmers in their efforts to expand their holdings into viable farms. The number of holdings sold and

**Table 6:** Percentage distribution of farms according to size by topographical region in hectares (acres).

Topographical region	Farm size group					
	Ha (acres)	2-12 (5-30)	12-20 (31-50)	20-30 (51-75)	30-40 (76-100)	40+ (100+)
Drumlin-Wet		52.9	27.7	12.5	4.0	2.9
Drumlin-Dry		60.2	22.9	10.6	3.2	3.1
Lowland-Wet		53.0	25.9	12.4	4.6	4.1
Lowland-Intermediate		57.0	26.7	9.0	3.7	3.6
All regions of west		51.2	26.0	12.0	5.1	5.7

Source: Scully, 1971, from appendix Table B.1.

their average area are given in Table 7. This table along with Table 9 indicates the large fluctuations in the number and area of land sold in response to market forces. It also indicates that the average area of farms sold over the period was 17.0 hectares.

Another aspect of the farm size problem is that not only are farms in marginal areas small but they are also fragmented with only a little over 50 per cent of farms in one parcel (Scully, 1971). Table 8 gives details of this fragmentation. Thus, the supply of a sufficient number of parcels of the right size to support a major investor afforestation programme, over the long-term, is problematic.

**Table 7:** Number of Land Sales in 11 Western Counties 1978-1981.

ITEM	YEAR				Average
	1978	1979	1980	1981	
No. of Sales	3778	2227	1695	1347	2261
Mean Size Ha	17.8	12.3	17.8	22.1	17.0
(Acres)	(43.8)	(30.4)	(44.0)	(54.7)	(41.9)

Source: Kelly (1982)

**Table 8:** Percentage distribution of farms according to number of separate parcels of land per farm, by size of farm.

Farm size group	Number of parcels of land per farm					Total
	1	2	3	4	5+	
Ha	%	%	%	%	%	
2-12	58.4	28.1	8.6	2.3	2.6	100.0
12-20	47.4	32.4	11.6	4.4	4.2	100.0
20-30	44.8	31.2	14.0	4.8	5.2	100.0
30-40	51.4	24.3	11.7	6.2	6.4	100.0
40-80	50.5	24.6	11.9	6.9	6.1	100.0
80+	50.9	28.7	7.4	6.5	6.5	100.0
All farms	52.9	29.3	10.4	3.6	3.8	100.0

Source: (Scully 1971)

Finally there is the cyclical state of the market-place with at times a glut of land on offer and at other times a shortage. Table 9 indicates trends in land sales for the eleven western counties over the 1980-84 period. As can be seen the amount of land sold in different years varies considerably. Table 9 gives a breakdown of the area of land sold by Soil Use-ranges as defined by Kelly. These ranges are similar but not identical to the use-range categories by Gardiner and Radfords (1980) detailed above. Use-ranges 1 and 2 are of wide potential, suitable for both tillage and grassland while Use-range categories 3-4 are suitable for grassland only. Categories 5 and 6 are the very marginal mountain and peatland soils of very rough grazing quality. The time series is very short to make any absolute statements but a few observations are possible. It seems that sales of good quality land tend to remain firmer than those of marginal land — six times more marginal land was sold in 1980 than in 1983. An interesting feature of this Table is the steady and marked increase in the sale of Use-range 1 soils, perhaps indicating the decline in confidence in farming.

A viable and significant investor contribution to the private planting sector is essential to maintain continuity and provide a solid backbone of regular private planting to the sector. If such a steady planting programme were maintained by the investor group this would be enough to keep contractors in steady employment. As a first estimate, and under present (1986) agricultural and forestry grant systems there would appear to be a market opening of 2-3000 hectares for the investor group.

**Table 9:** Percentage area of land by Soil Use Class 1980-1984.

Soil use class	1980	1981	1982	1983	1984
	%	%	%	%	%
1	17.0	16.8	31.2	30.3	27.2
2	5.6	10.5	11.3	12.6	11.8
3	11.9	11.5	11.2	17.5	16.4
4	10.3	12.5	16.3	23.1	21.5
5-6	55.2	48.7	30.0	16.5	23.1
	100.0	100.0	100.0	100.0	100.0
Total area sold '000 ha	41.8	37.6	28.4	23.3	44.5

Source: (Kelly 1986)

## CONCLUSION

As stated at the outset while a considerable area of marginal land is suitable for forestry the availability of this land is governed by a complex web of interacting factors. Some of the domestic factors have been dealt with above. However, in the longer term, the two most powerful contributing factors are the economic viability of agriculture and the relationship between relevant grant and support systems being delivered from Brussels for both agriculture and forestry. Both of these factors now seem to be favouring forestry. There is little joy among foresters at the current serious state of agriculture. However, if forestry can — as this author believes it can — make a long term and worthwhile contribution to rural welfare, then circumstances have never been more favourable for its development.

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