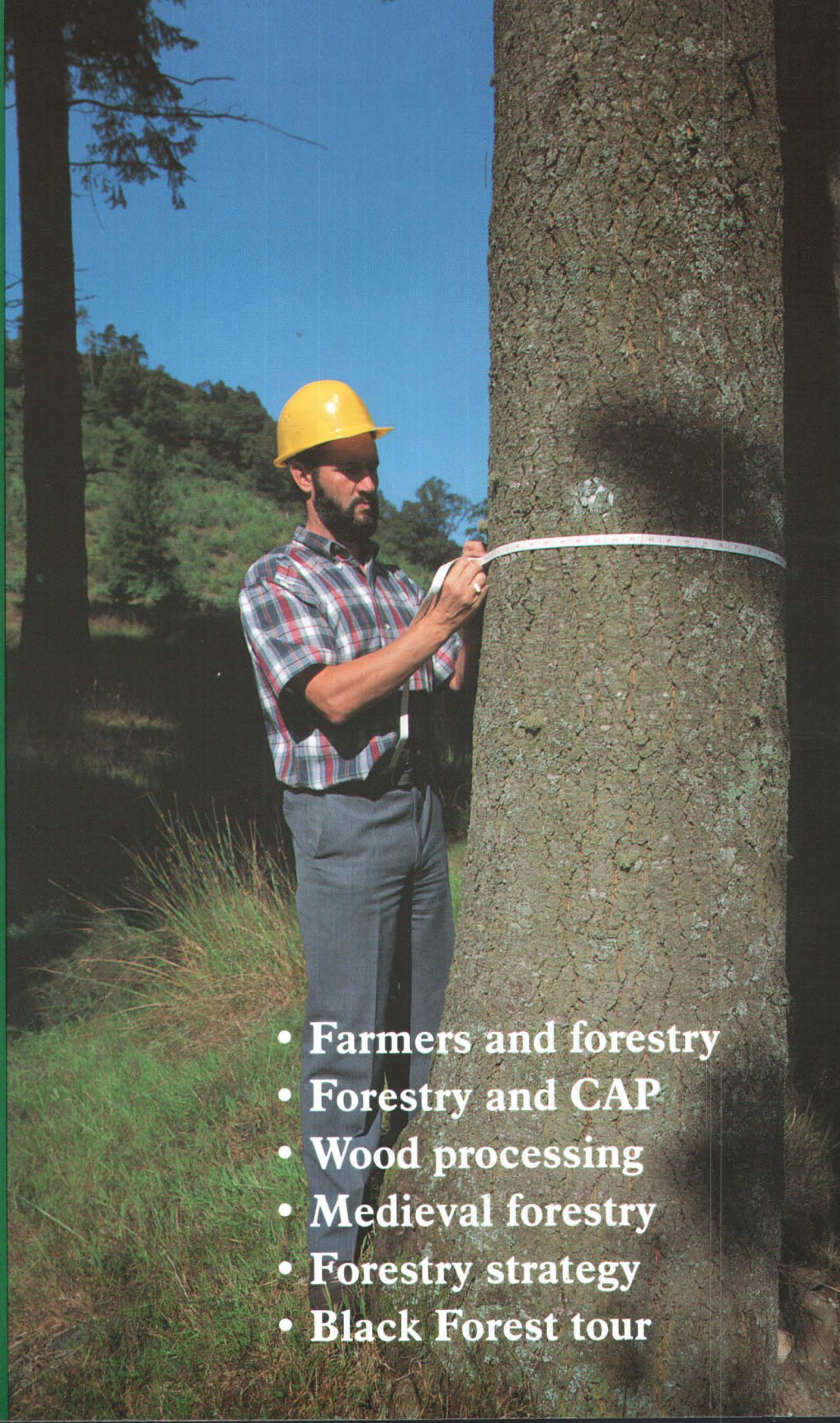
IRISH FORESTRY

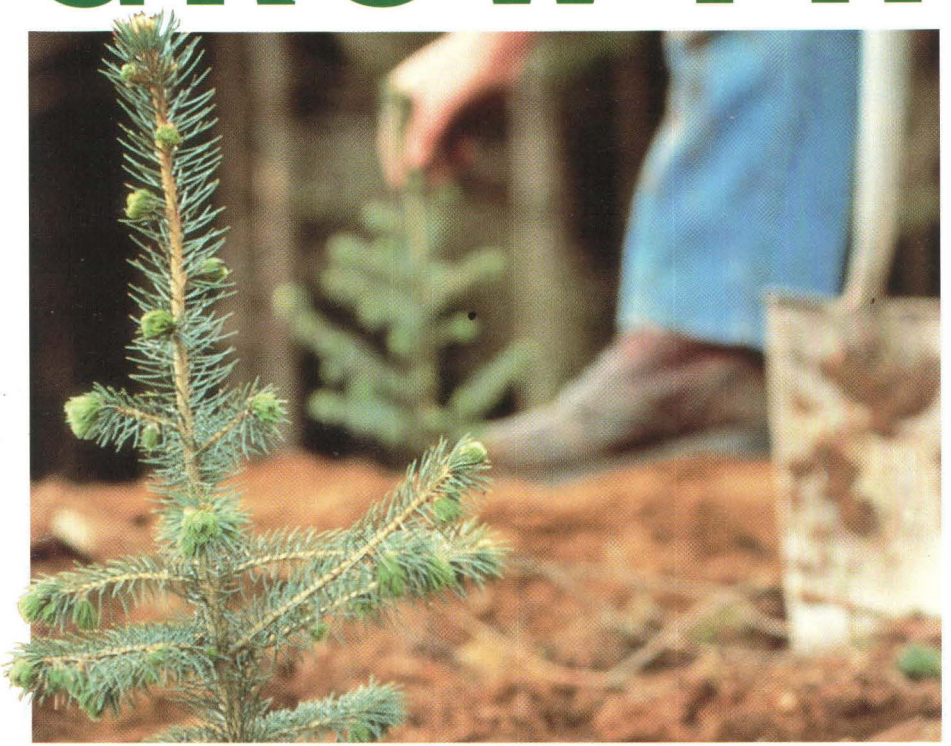
JOURNAL
of
THE SOCIETY
OF IRISH
FORESTERS



- Farmers and forestry
- Forestry and CAP
- Wood processing
- Medieval forestry
- Forestry strategy
- Black Forest tour

Vol. 51 Nos. 1 & 2, 1994

SOLID FINANCIAL GROWTH



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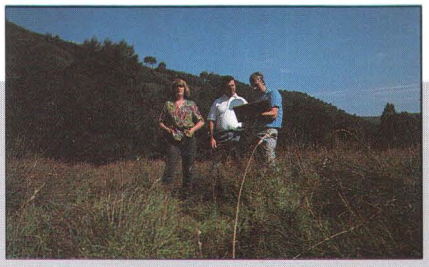

Farmers' attitudes to forestry (page 19)

Cover: Tim O'Regan measuring Douglas fir (planted 1923 at Lugduff, Glendalough). See *Douglas fir in France* (page 58). **Inside back cover:** Wicklow landscape. Private planting now exceeds State planting which is also at record high levels. See *Forestry and CAP – implications for forestry policy and practice* (page 34).
Photographs by Neil Warner

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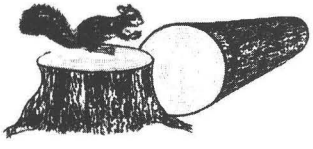

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The Society of Irish Foresters

The Society of Irish Foresters was founded in 1942. Its aims are: *to advance and spread in Ireland the knowledge of forestry in all its aspects, and to promote professional standards in forestry and the regulation of the forestry profession in Ireland.*

The main activities of the Society include:

- Organising symposia, field meetings and study tours on forestry topics
- Publication of the Society's journal *Irish Forestry*

In addition it organises forestry shows and exhibitions and has published two issues of *The Forests of Ireland* and *Forest Images, Fr. Browne's Woodland Photographs.*

There are three types of membership:

Technical (MSIF): Members who wish to promote the objectives of the society: at the time of election hold a degree or diploma in forestry of a recognised university, or who have successfully completed a full-time course at a forestry school or who hold the Foresters Certificate of the Society. Annual subscription (from January, 1990) £25.00

Associate: Persons not qualified for technical membership but who wish to promote the objectives of the Society. Annual subscription (from January, 1990) £25.00

Student: Persons studying forestry at universities or schools or colleges. Annual subscription (from January, 1990) £10.00

In all cases membership is subject to the approval of the Council of the Society. Enquiries regarding membership or Society activities should be made to: The Society of Irish Foresters, No. 2 Lower Kilmacud Road, Stillorgan, Co. Dublin.

Notes to Assist Contributors

Two copies of each paper should be submitted in typescript, with double spacing and wide margins.

Diagrams and illustrations should be clearly drawn in black ink on good quality paper. Captions should be written on the back of each illustration. The approximate position of diagrams and illustrations in the text should be indicated in the margin.

Tables should not be incorporated in the body of text, but should be submitted separately at end (one table per page). Their approximate position in the text should be indicated in the margin.

Nomenclature, symbols and abbreviations should follow convention. Metric system should be used.

References should be in the following form:
GALLAGHER, G. and GILLESPIE, J. 1984. The economics of peatland afforestation. Proc. 7th Int. Peat Cong. Dublin. Vol 3:271-285.
KERRUISH, C. M. and SHEPHERD, K. R. 1983. Thinning practices in Australia. A review of silviculture and harvesting trends. New Zealand Journal of Forest Science, 47:140-167.

A short summary of the paper should be included. It should precede the main body of the text and not be more than 300 words.

Submission of an article is understood to imply that the article is original and unpublished and is not being considered for publication elsewhere.

EDITORIAL

Influencing Change

When the first issue of *Irish Forestry* was published in 1944 the challenge facing its readership was to successfully establish a forest industry in Ireland. This ambition must have seemed remote given the poor quality of land which was made available for afforestation and the absence of clear forest policies. Pioneering foresters of the 1940s had limited information and resources at their disposal: forestry would continue to be the land-use of last resort for another half-century and would wait until the sixties before the first tangible forest research results would be available. Small wonder then that the editorial aim of the early journals was to satisfy its readers' thirst for solid informative articles. The main object of publishing *Irish Forestry* was, according to Mark L. Anderson, "to benefit the individual members of the Society and through them the Society as a whole" (Editorial – Vol. 2, No. 1, 1945).

The educational theme has remained constant throughout the first 50 volumes of the journal. The Society's objective "to advance and spread the knowledge of forestry in all its aspects" has also shaped the journal's own aims over the last half-century. As a result, *Irish Forestry* has remained focused; evolving slowly but consistently as a technical and scientific journal aimed mainly at Society members.

However the forestry audience has increased. This is reflected in the Society's own membership which has grown and diversified. Foresters are, as never before, involved in a professional way with a wide cross-section of the general public including specialist interest groups such as farmers, investors and environmentalists. All of these have legitimate interests and concerns about the development of forestry. The Society, through the journal and the recently revised *Policy Position Statements*, should address these concerns. It is important, therefore, that the Society builds on its educational ethos. The challenge facing *Irish Forestry* is to strike the optimum balance between technical issues and wider policy, social and economic issues and to ensure that the end result is communicated in a style which is accessible, informative and (dare we say it) entertaining. Accordingly, we have made a number of changes to the journal both in terms of content and format. This edition places considerable emphasis on issues such as forestry policy, farmers attitudes to forestry etc. These subjects along with social, economic and environmental issues will be addressed in future editions. They will not however, dominate the agenda but will be presented alongside technical issues in a way which is challenging yet consistent with the Society's objectives. The more obvious changes in this issue of the journal are to the design and format which have changed little over the years. These have been restyled to complement and enhance the content. We believe that these changes will have a positive effect on the journal's readability.

The journal is more than a one-way information medium: it needs to include a lively interchange of ideas and opinions to stimulate the debate on contemporary forestry and to influence change. We therefore welcome and encourage articles and letters from all our readers. Dialogue is essential if *Irish Forestry* is to develop as a journal capable of generating informed discussion on a wide range of forestry issues relevant to its readership.

Submissions to *Irish Forestry* are welcome and will be considered for publication. News items, general articles and letters are particularly welcome. These should be addressed to:

The Editor
The Society of Irish Foresters
2 Lower Kilmacud Road, Stillorgan,
Co. Dublin.

The attention of contributors is drawn to "Notes to Assist Contributors"

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NEWS

Minister announces IR£242m in forestry grants

The Minister for Forestry and Rural Development, Mr Liam Hyland, TD promised a balanced forestry programme when he announced details of a five year IR£242 million forestry package on May 19. The Minister said that under the new forestry package, which is part of the accompanying measures in the CAP reform, farmers would achieve the greatest increases in grant and premium payments. Farmers would now receive up to IR£300 a hectare for 20 years compared to IR£120 a hectare for non-farmers over a period of 15 years. He maintained that the package was weighted heavily in favour of farmers and this was reflected in their planting returns which are now 75% of all private sector planting.

The forest estate covers almost eight per cent of the country and the National Development Plan sets a target of 10 per cent by the end of the century. the Minister said that the balance in future afforestation would be set out in the *Strategy for the Development of the Forestry Sector to the Year 2015* document which had received over 100 submissions from interested parties.

AFFORESTATION GRANT SCHEME (IR£/ha)			
	Afforestation Grant	*Maintenance Grant*	*Total Grant*
Unenclosed land	975	325	1,300
Enclosed improved land			
Non-diverse species	1,125	375	1,500
Diverse species	1,350	450	1,800
Broadleaf/conifer mixtures: *Approved species other than oak/beech*			
50% stocking of broadleaf	1,500	500	2,000
50% stocking of broadleaf	1,575	525	2,100
60% stocking of broadleaf	1,650	550	2,200
75% stocking of broadleaf	1,800	600	2,400
Oak/beech			
50% stocking of oak/beech	1,950	650	2,600
60% stocking of oak/beech	2,100	700	2,800
75-100% stocking of oak/beech	2,250	750	3,000

Source: Forest Service

FOREST PREMIUM SCHEME (IR£/ha)				
Land Category	*Premium Rate*			
Farmers				
Enclosed/improved land	*Conifer*		*Broadleaves*	
	non-diverse species	*diverse species*	*ash/sycamore etc.*	*oak/ beech*
More severely handicapped	155	190	220	235
less severely handicapped	190	220	250	265
non-disadvantaged	220	225	280	300
Unenclosed land	130			
Others				
Enclosed/improved land	100		120	
Unenclosed land	80			

Source: Forest Service

Cost effective early thinning

The EU has decided to support the Concerted Action "Cost Effective Early Thinnings" (CEET) financially. Eleven countries of the EU and three EFTA countries have joined the programme. The programme will be co-ordinated by Pieter D. Kofman, Danish Forest and Landscape Research Institute, Vejle, Denmark. The duration of the project will be three years.

The complete title of the Concerted Action is: "Cost effective early thinnings in multiple-use forest with consideration to sustained yield and ecological and environmental conditions". This means, that the subject of the co-operation is not only focused on the economy of thinnings, but that the ecological and environmental factors are also considered.

The main purpose of the Concerted Action is to identify those common problems in harvesting early thinnings, that are suited to be solved through co-operative research. At the same time these research projects should fulfil the objectives of the EU forest research programme. The Concerted Action is divided in three main projects:

- Environmental consequences of harvesting operation.
- Harvesting techniques.
- Thinning management.

Each project is the subject of a week long meeting, organised by the project leader. In each participating country a national contact has been appointed whose task is to collect and to distribute information to and from the Concerted Action.

Further information on the Concerted Action is available from Eugene Hendrick who is Ireland's contact person. He can be contacted at COFORD The National Council for Forest Research and Development, Agriculture Building UCD Belfield, Dublin 4.

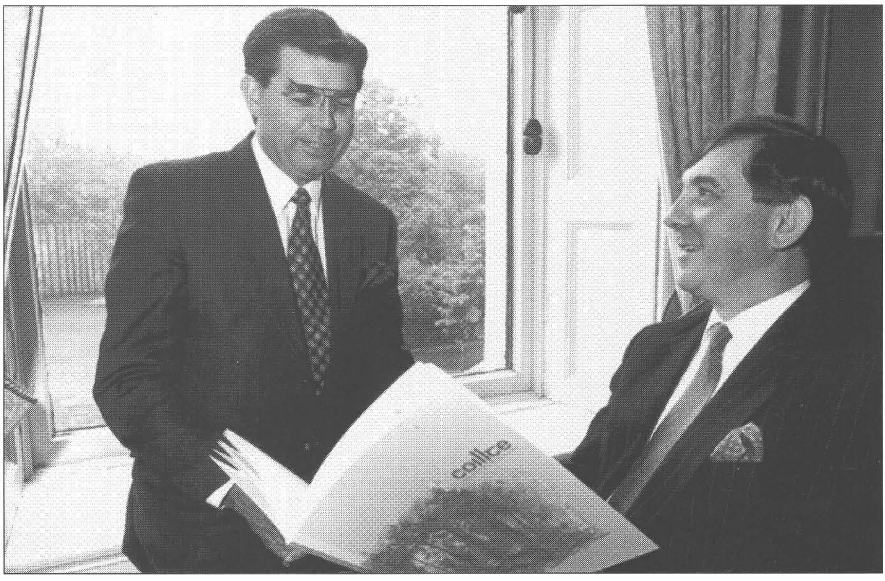
NEWS

Coillte return to profitability

Coillte reported a IR£1.68 million profit in 1993 compared to a loss of IR£1.15 million in 1992. After a difficult first eight months, trading conditions improved considerably towards year end. Despite this late recovery a small fall in revenue from forest products was recorded. However, turnover showed a slight increase to IR£41.9 million which was due to an increase in non-core revenue from IR£7.2 million in 1992 to IR£8.0 million. This combined with reduced costs, increased EU planting incentives and lower interest rates helped Coillte to return to profitability. The company maintained its level of core borrowings at IR£15.00 million. The value of shareholders' funds increased by IR£34 million.

The medium term future for the company is positive. Profits for 1994 will increase considerably mainly due to the continued high demand and prices for logs. Coillte also plans to broaden the groups revenue base to reduce dependence on log sales especially after the cyclical downturn in timber prices experienced from 1991 to mid 1993. During the year Coillte reached agreement with the Louisiana Pacific Corporation to establish a plant in Waterford to manufacture oriented strand board (OSB).

A total of 11,248 hectares were planted, of which 6,827 hectares were afforestation and 4,421 were reforestation. The company failed to deliver on its promise of greater species diversification. Principal species planted were Sitka spruce (84%), Lodgepole pine (6%), Norway spruce (2%), Douglas fir (2%) other conifers (3%) and broadleaves (3%).

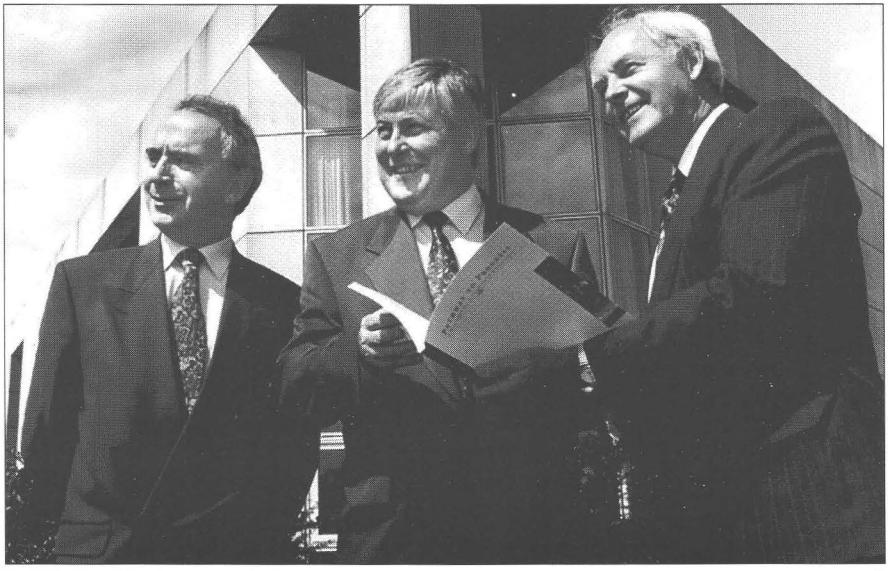


Pat Cooney, Chairman and Martin Lowery, Chief Executive, Coillte at Coillte AGM 1994

Minister launches research programme and announces agreement on Forestry Centre

The Minister of State at the Department of Agriculture, Food and Forestry, Mr Brian O'Shea, TD, launched *Pathway to Progress*, the first national research programme for forestry at the Industry Centre, UCD on the 13th July. The five year programme outlines the research needs of the major sectors of the forestry industry including reproductive material, silviculture, harvesting, and transport and wood processing sectors. In his introduction to *Pathway to Progress*, Mr Fergal Mulloy, Director of COFORD, stressed the importance of involving all sectors of the industry as this is pivotal to "maintaining competitiveness, achieving a multi-purpose forest resource and providing sustainable employment."

Speaking at the launch, the Minister praised COFORD for producing a comprehensive evaluation of the research requirements of the forestry sector in Ireland. He also announced agreement in principle to the establishment of a Forestry Centre. The Minister said that this agreement is based on "the belief that there is an urgent need to establish a centre which will provide the necessary linkage between education, research and industry and to ensure that all of these integrate to achieve a common objective."



At the launch of Pathway to Progress *(left to right): Mr. Brian Joyce, Chairman COFORD, Mr. Brian O'Shea TD, Minister of State at the Department of Agriculture, Food and Forestry and Mr. Fergal Mulloy, Director COFORD.*

Critics poised to defeat privatisation

The prospect of the (UK) government privatising the Forestry Commission's forests are receding rapidly. An inter-ministerial review group is expected to recommend against it in the near future.

The review is instead believed to recommend dividing the commission's wood-lands between commercial forests and those for recreation whose value is primarliy as part of Britain's natural heritage. It is expected to propose creating an executive agency within the commission to manage the commercial forests with greater financial transparency.

Financial Times
28 January 1994

Plant construction could create 150 jobs

Up to 150 jobs will be created during the construction of the IR£40 million Louisiana Pacific timber board plant in Belview, Waterford Harbour, the operation's spokesman confirmed yesterday.

A new joint venture company, Louisiana Pacific Coillte Ireland Ltd., a partnership between the American giant and the state forestry body, applied for planning permission last week to Kilkenny County Council for construction of a 30,000 square metre factory on a 60 acre site adjacent to Waterford harbour.

Construction is due to start early in the summer, and the plant is set to go into full production within twelve months of this. However, there is a likelihood the plans will be challenged on environmental grounds, as the company incurred a record fine in the US two years ago for breaking the terms of its emission licence.

Cork Examiner
February 4th 1994

Guidelines on tree preservation issued

Local authorities are being urged by the Minister for the Environment, Mr Smith, to take a more active role in preserving trees because of their amenity value as well as the contribution which they make in reducing carbon-dioxide levels in the atmosphere.

Launching National Tree Week in his home town of Roscrea, Co Tipperary, the Minister announced the publication by his Department of a new set of guidelines on tree preservation for the Republic's 87 planning authorities – many of which have tended to ignore this subject.

Irish Times
7th March 1994

Wood row goes against GATT grain

When the Ohashis, a family living in Yokohama, built their house they chose to use an American-style structure and imported wood from Washington State.

They are among a growing number of Japanese who are choosing North American lumber for their homes rather than the traditional cedar found throughout Japan's mountainous landscape.

The trend has helped to fuel a bustling trade in wood products imported into Japan not only from the American continent but from as far off as Finland and Sweden.

This trade in wood products has become the focus of a row between the US and Japan that has cast a shadow over the Uruguay Round of trade liberalisation talks under the General Agreement on Tariffs and Trade (GATT).

The US is unhappy with an offer by Japan to reduce tariffs on wood products that was made last year to conclude the Uruguay Round talks.

The US already imposes export restrictions on its wood and the Clinton administration has announced a policy to limit logging to protect the environment. As a result North American lumber prices have doubled since 1992.

Japan also has its environment to think about when considering how far it can reduce tariffs. The plantation of trees prevents landslides in Japan's mountainous terrain, ensures clean water and helps prevent global warming, Mr. Wako says.

Financial Times
1st May 1994

Coillte woos pension funds

Irish pension funds are the target of a new IR£29million forestry unit trust which is being set up by Coillte, AIB Investment Managers and Irish Life.

To be known simply as the Irish Forestry Unit Trust (IFUT), the fund already has a value of around IR£29 million and has been formed following the amalgamation of Irish Life's existing forestry fund with that of AIB Investment Managers.

Business & Finance
10 March 1994

Reprieve for Coolattin Woods

A long drawn out campaign of opposition to the felling of the oak trees at Coolattin Woods near Shillelagh by conservation and action groups has borne fruit.

For the last remaining oak woodland at Tomnafinnogue is being taken into public ownership which means that the trees will not now be axed.

The reprieve comes just in the nick of time for 323 of the 1,800 oak trees in the 165 acre stretch of woodland.

Wicklow People
18 March 1994

FORESTRY AND THE MEDIA

Planting bad land

During a speech to his party's annual Agricultural Conference, Taoiseach, Mr Reynolds was critical of Coillte and other forestry agencies. He said that far too much good Irish land was being planted in forestry while much bad land remained unused. "Coillte and others are driving the price of land far beyond what can be afforded by farmers and I would like to see a situation where the bad land is planted to avoid this".

Irish Times
9th May 1994

Coillte rejects policy attack

Coillte, the commercial state forestry company, yesterday hit back at the Taoiseach's criticism of its planting policy, writes Willie Dillon.

It said it fully agreed with Mr Reynolds' view that poor quality land should be used for tree planting in preference to higher quality farmland. But it rejected his claim that the bidding power of Coillte and private forestry developers is pushing land out of the reach of local farmers.

The Taoiseach said at the weekend he would much prefer to see Coillte and others planting bad land in the first instance, leaving good land for other uses.

And, he added, too much good land was being "bid out of the reach of local farmers" by Coillte and others.

Mr Reynolds' comments were welcomed yesterday by the two main farm bodies, both of which repeated calls for a clear national policy on how land should be used.

However, Coillte said its whole thrust and policy was that trees should be planted on land which was marginal for agriculture.

The proof of this was in the average IR£600 and acre it paid for land, with the highest ever being less than IR£800 and acre.

Irish Independent
10th May 1994

"Plant some of our bad land"

Taoiseach, Albert Reynolds will have started something with his remark in Kilkenny last Sunday. "In regard to afforestation, I would much prefer Coillte and others to plant some of our bad land in the first instance and leave our good land for other uses. Indeed, I would like to see some of our bad land used for fast-growing trees for biomass production as a source of alternative energy". Leave aside the biomass for another day. He would much prefer Coilte and others "to plant some of our bad land". Surely we have been hearing for years that much bog-planting leads to instability of trees. To having them blown down in storms. To finding that bad land gives timber of inferior commercial value. A bit of confusion here, surely, though the Taoiseach will have had to take notice of recent agitation over Meath land, for example, having been bought for afforestation, where farmers claim the acres could be used for better purposes.

Irish Times
14th May 1994

Increase in broadleaf planting urged

The Tree Council of Ireland has asked the Government to increase the level of broadleaf planting to 20 per cent of all new forests because Ireland's broadleaf resources have become depleted and largely overmature.

The recommendation is contained in a document drawn up by the council which said there is concern about over-reliance on conifers in the national afforestation programme and the consequences for landscape values and species diversity.

Irish Times
10th May 1994

Wood pulp prices go higher still

North American and European wood pulp producers are taking advantage of unexpectedly strong paper markets to push through another hefty price increase.

Several companies have notified customers of a 10 per cent rise in northern bleached softwood kraft pulp, the industry's staple product, bringing the price to US$560 a tonne.

The latest increase means that pulp prices have soared by more than 40 per cent since the market first came to life last autumn, but they remain far below the peak of US$840 a tonne reached in the late 1980s.

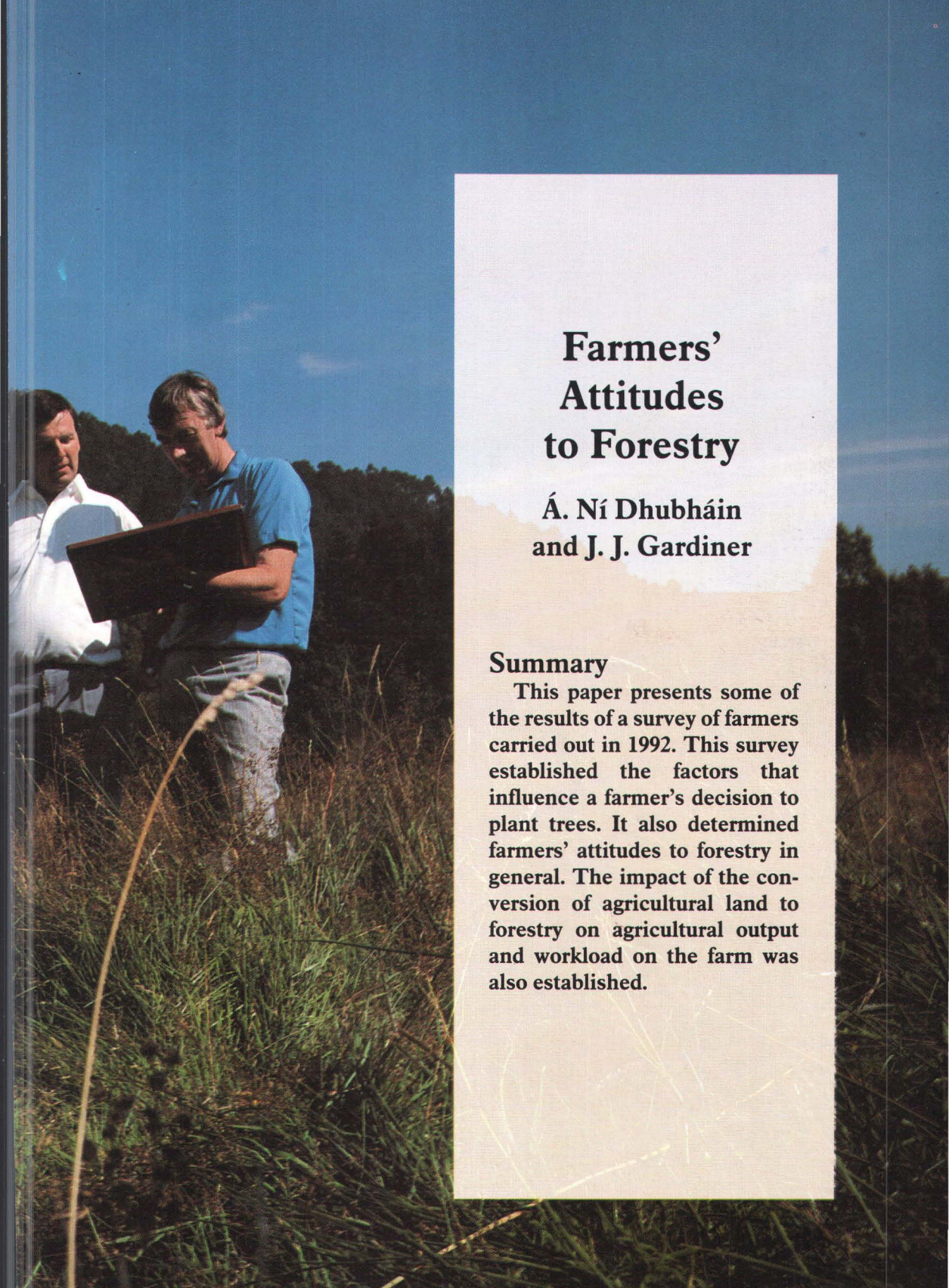
Financial Times
12th April 1994

Ireland's tallest tree at Curraghmore

Ireland's tallest tree is a Sitka spruce measuring 52.6 metres (172 feet) in height, growing at the Curraghmore Estate, Co. Waterford. The tree believed to be planted in 1835 was measured recently by John McLoughlin, Chief Environmental Officer, Coillte and Dr. Jack Durand, President, Trees for Ireland. This tree which had been the champion for many years lost its lead in 1991 when a Douglas fir tree now measuring 50m (164 feet) at the Powerscourt Estate surpassed it but it has once again regained its lead.

According to Alan Mitchell, a leading British tree export, the tallest tree in Britain is a grand fir, measuring 63 metres (206 feet) at Strone House in Scotland.

Munster Express
22nd April 1994



Farmers' Attitudes to Forestry

Á. Ní Dhubháin
and J. J. Gardiner

Summary

This paper presents some of the results of a survey of farmers carried out in 1992. This survey established the factors that influence a farmer's decision to plant trees. It also determined farmers' attitudes to forestry in general. The impact of the conversion of agricultural land to forestry on agricultural output and workload on the farm was also established.

1. Introduction and Background

The Republic of Ireland has the smallest percentage of land area (8%) under forest of all European Union (EU) countries. However, over the last decade the forestry sector in Ireland, in particular the private forestry sector, has expanded considerably. Planting rates in the private sector have risen from a mere 498 hectares in 1982 to 9,617ha in 1992. An estimated 23,000ha were planted by farmers during the five year period from 1988 to 1993. It is expected that by the year 2000 an additional 3 percent of the land area in Ireland will be afforested.

The continued expansion of the forest estate depends ultimately on farmers' willingness to either convert some or all of their land to forestry or to sell land for forest development. This paper presents the results of a survey of farmers carried out in 1992. This survey established the factors that influence a farmer's decision to plant trees. It also determined farmers' attitudes to forestry in general. The impact of the conversion of agricultural land to forestry on agricultural output and workload on the farm was established.

2. The Farm Survey

The survey was carried out in July, 1992. It concentrated on the west of Ireland which was defined for the purposes of this work as those parts of the country that were deemed to be either severely disadvantaged or disadvantaged under EC Directive 268/75. Thus the survey area consisted of eleven entire counties, i.e. Donegal, Sligo, Leitrim, Mayo, Roscommon, Longford, Cavan, Monaghan, Galway, Clare, Kerry, and parts of Cork. On average, forty-five farmers were interviewed at random in each county yielding a total sample of 542 farmers.

"The continued expansion of the forest estate depends ultimately on farmers' willingness to either convert some or all of their land to forestry or to sell land for forest development."

The objectives of the survey were as follows:

(a) to establish the factors that influence a farmer's decision to plant trees;

(b) to determine farmers' attitudes to forestry;

(c) to determine the impact of the conversion of agricultural land to forestry on agricultural output and workload on the farm.

Reason	*% of respondents*
Shelter provision	45
Aesthetic reasons	8
Use up wasteland	15
Financial reasons	23
Other reasons	9

Table 1. *Main reason for planting trees in the past*

3. Results

The following is a selection of the results from the farm survey.

3.1 Farmers who have planted trees

Of the 542 respondents interviewed

only 12% had planted trees on their land (excluding individual trees and hedgerows). While the average area planted was 7.1 ha, the vast majority of these woodlands were less than 5 ha. The average age of the woodlands was 10 years. Most of the farmers that had planted had done so on bogland or on land that had previously been used for rough grazing (i.e. 76% of those that had planted).

The respondents were asked their main reason for planting trees and their responses are shown in Table 1. The majority stated that they had planted in order to provide shelter (45%). A further 23% gave financial reasons (i.e. availability of grants and long-term income). Only thirty-eight percent of these "tree planters" received grant-aid for planting.

The woodlands were described as shelterbelts (in 48% of cases) or as commercial blocks of woodland in 40% of cases. The vast majority had planted conifers, with broadleaves accounting for only 14% of planting. Of the conifers planted, pure stands of Sitka spruce were most common (i.e. 37% of conifer planting).

Most of the respondents considered that their woodlands were managed and it was most commonly the owner who carried out the management.

The uses to which the woodlands were being (and will be) put varied. Some respondents indicated that their woodlands were used for only one purpose while others indicated that their woodlands had a number of uses. Shelter provision was the most popular use of the woodlands (i.e. 57% of respondents) (Table 2). Forty-five per cent listed the production of timber for sale as a function of their woodlands.

The impact of planting trees on farm output was queried. Eighty-four per cent of respondents indicated that their farm output had not been affected by planting part of their land with trees. Furthermore, the majority of respondents (i.e. 73%) indicated that planting trees had not affected the workload on the farm.

Use	*% of respondents*
Shelter	57
Timber for sale	45
Landscape	32
Timber for domestic use	28
Recreation	12
Cover for game	13

Table 2. *Uses to which the woodlands are being put*

3.2 Farmers who did not plant trees

The eighty-two per cent of respondents who had not planted trees were asked to give their reasons for not planting. Lack of suitable land and a limited land resource were the two most popular reasons given (35% and 15% of the respondents respectively). Many of those giving the former reason indicated that their land was "put to better use in agriculture" or was not "bad enough" for forestry. Nineteen percent of the respondents stated that they had never considered planting trees. The long time period associated with the returns from forestry and other financial reasons deterred 15% of the respondents from planting trees. Only 4% indicated that they did not like trees. Twelve percent gave other reasons for not planting.

Forty-one per cent of these respondents were unaware of the availability any grant-aid for forest development.

Reason	*% of respondents*
To use up poor ground	58
Shelter provision	8
Landscape reasons	8
Financial reasons	16
Conservation reasons	4
Other reasons	6

Table 3. *Main reason for planting trees in the future*

3.3 Farmers who will plant trees in the future

All respondents were asked to indicate whether they will plant trees on their farm in the next 10 years. Only ten per cent stated that they will plant (of these, one third had planted trees in the past). A further 31% said that they were unsure about planting while the remaining 59% will not plant trees. The average area to be planted per holding is 7.8 hectares with 63% of future woodlands less than 5 hectares.

"All respondents were asked to indicate whether they will plant trees on their farm in the next 10 years. Only ten per cent stated that they will plant"

The most popular reason given for future planting was to use up poor ground which was "good for nothing else" (i.e. 58% of cases). Financial reasons were also popular (16% of cases). The responses are presented in Table 3.

Land used for rough grazing or cutaway bog/peatland was most likely to be planted with trees (80% of respondents).

Almost half of the respondents said that they will carry out the planting and management of these woodlands themselves. A further 40 per cent stated that they will use contractors to carry out this work.

Some respondents stated that their future woodlands will only have one use while others stated that their woodlands will have a number of uses. As Table 4 shows the most popular use to which these future woodlands will be put is the production of timber for sale (77% of respondents). Shelter provision will also be an important use of these woods.

Seventy-five percent of the respondents intending to plant trees expected that the output from other agricultural enterprises will not be affected. Forty-six percent expected the workload on the farm to be the same, thirty-three percent expected it to increase.

Only 31% of those intending to plant, knew the current level of grant-aid for forestry.

Use	*% of respondents*
Timber for sale	77
Shelter	33
Timber for domestic use	19
Landscape	17
Cover for game	15
Recreation	13
Don't know	2

Table 4. *Uses to which the woodlands will be put*

3.4 Farmers who will not plant trees in the future

Fifty-nine percent of the respondents stated that they will not plant trees in the next ten years. The most common reason given for not planting was lack of suitable land (i.e. 39% of cases). In many instances the respon-

dent indicated that he/she had no "bad" land. The second most popular reason was scarcity of land (17%). The long delay in receiving returns from forestry appears to continue to deter many farmers. Over 11% of the respondents indicated that this was the reason they will not convert land to forestry. A further 10% considered themselves too old to plant trees. Six percent stated that they did not like trees and five percent stated that they had never considered planting trees. Twelve percent gave other reasons.

Farmers who will not plant trees were asked to identify any factor that would encourage them to plant. Over 67% could not identify any factor while a further 17% stated that an increase in financial support would encourage them to plant.

Only 11% of those who will not plant, knew the current level of grant-aid for forestry.

3.5 Attitudes to forestry

A series of statements of frequently expressed attitudes to various forms of forestry development were presented to the respondents, who were asked to indicate whether they agreed or disagreed with the statements. They were also given the option to indicate that they didn't have an opinion regarding the statement. The forms of development included state forestry development (which has now become semi-state), commercial private forestry development which concerns the development of forestry by financial institutions and other such large groups, and farm forestry. Table 5 lists the responses given by all the respondents

Analysis of the responses showed that the number of respondents who felt that state forestry generated employment was significantly greater than those who felt that CPF generated employment. In addition, more respondents considered that CPF caused population decline than considered that state forestry caused popu-

Table 5. *Attitudes to state and private forestry*

State forestry	**No**	**Yes**	**D.K.***
Generated employment	25	68	7
Caused population decline	50	40	10
Caused isolation of farm houses	41	51	8
Used up land that should have been distributed among farmers	44	48	8
Allowed small farmers to stay in business	44	41	15
Made land prices increase	44	40	16

Commercial private forestry (CPF)	**No**	**Yes**	**D.K.**
Generated employment	31	54	15
Caused population decline	25	55	20
Caused isolation of farm houses	38	51	11
Used up land that should have been distributed among farmers	38	49	13
Allowed small farmers to stay in business	39	44	17
Made land prices increase	37	46	17

Forestry on farms	**No**	**Yes**	**D.K.**
Kept people on the land	50	36	14
Generated additional income for farmers	31	60	9
Caused isolation of farm houses	51	43	6
Used up land that should have been used for agriculture	53	41	6

* ***D.K.*** *= Don't know*

lation decline. The number of respondents who felt that CPF had caused land prices to increase was significantly greater than those who felt state forestry had increased land prices.

Sixty percent of respondents agreed that forestry on farms generated additional income for farmers but only 36% agreed that it kept people on the land.

A comparison of the attitudes of those that had planted with the attitudes of non-planters showed that planters had a more positive attitude to all forms of forest development. In particular, significantly less of the planters considered that state forestry had caused population decline. Similarly, significantly less of the planters considered state forestry had used up land that should have been distributed amongst farmers.

With regard to the impact of private forestry on employment generation there was a major difference in attitude between the planters and non-planters. Significantly more of the planters considered that private forestry had generated employment. Furthermore, significantly less of the planters considered that private forestry led to isolation of farm houses or used up land that should have been distributed among farmers.

As all the planters were involved in some form of farm forestry it was expected that their attitudes to farm forestry would be more positive than those of the non-planters. The responses confirmed this, i.e. significantly less of the planters considered farm forestry caused isolation of farm houses while significantly less thought that it used up land that should have been used for agriculture.

"Analysis showed that those respondents who knew the current level of grant-aid were almost three times as likely to plant than those who did not."

3.6 Factors affecting the decision to plant in the future

There are many factors which may influence the decision to plant trees. In this section the impact of some of these factors is examined.

(a) Socio-demographic factors

Factors included in the analysis were age and education level of the farmer, his/her marital status as well as his/her off-farm employment status. The effect of farm size was also examined. The relationship between each of the factors and the decision to plant trees was examined using logistic regression. This analysis showed that only farm size significantly influenced the decision to plant trees, i.e. respondents with large farms were more likely to plant trees than those with small farms.

(b) Knowledge of grant-aid

Analysis showed that those respondents who knew the current level of grant-aid were almost three times as likely to plant than those who did not.

(c) Planting in the past

Analysis was carried out to investigate whether the likelihood of planting trees in the future was related to planting in the past, i.e. were those who had already planted, more likely to plant in the future than those who had never planted at all. The analysis showed that farmers who had planted in the past were significantly more likely to plant (i.e. more than three times more likely) than those who had never planted.

4. Discussion

It is clear that the vast majority of farmers interviewed considered fores-

try to be a land use suitable only for poor ground. The land on which trees had been most commonly planted was bogland or land that had been previously used for rough grazing. Indeed the most popular reason given by the farmers as to why they intended planting trees was to use up waste ground which was frequently described as being "land good for nothing else". With so many planting on poor quality land it is not surprising that the vast majority of farmers stated that the output from their other farm enterprises had not changed as a result of planting trees. Extensive grazing is commonly carried out on poor ground and farmers who converted such land to forestry could maintain the same livestock levels on a smaller area of land. These results are similar to those from a survey of Irish farmers who had applied for grant-aid for forestry (Kelleher, 1986). The majority intended planting only small areas of "waste-ground". Nearly 90% of the respondents in that survey stated that their plans regarding forestry would have no effect on their farm activities.

In the future it seems that farmers will continue to plant trees on poor quality land, thus the impact on their agricultural output will remain limited. However, some changes are evident. The percentage of respondents expecting their agricultural output to be unaffected as a result of planting trees is 75%. This is somewhat less than the 85% who indicated that their output had not been affected by past planting. However, any reduction in agricultural output will be compensated by an increase in forestry output from farms as more farmers plant for commercial timber production. Recent changes to the forestry grant scheme makes planting on non-disadvantaged land more attractive from a financial viewpoint. However, attitudes to forestry will have to change before most farmers consider forestry for this type of land.

One of the functions of this research was to identify factors that influence the decision to plant trees. The analysis showed that farm size was an important factor, with those farming large farms much more likely to plant trees than those on small farms. This might be due to the fact that large farms are more likely to have land available for forestry. At the same time, other work on diversification has shown that those on bigger farms are most likely to invest in alternative farm enterprises (Phelan *et al.*, 1994). The survey also showed that farmers who had already got involved in forestry were much more likely to plant more areas of their land than those that had never planted. This would suggest that the experience of these farmers with forestry has been positive.

Knowledge of current levels of grant-aid was another important factor influencing the decision to plant. Those who knew the current level of grant-aid were more likely to plant than those who did not. The vast majority of those who will not plant trees, did not know the current level of grant-aid. Furthermore, forty per cent of those that did not plant trees in the past were not even aware that grants were available for forest development. Thus it is clear that farmers are not being adequately informed of the availability and value of grants for forestry despite the fact that this a major factor influencing the decision to plant trees. If more farmers are to get involved in forestry it is necessary that this information gap be bridged.

"

. . . farmers are not being adequately informed of the availability and value of grants for forestry . . .

"

Recently, forestry development has been receiving considerable media attention in Ireland. Some of this coverage has been negative. Claims have been made that forestry forces people off farms and leads to isolation of farm houses. When statements reflecting various perceptions of forestry were put to farmers in this survey, opinion was divided. For many statements the number of positive responses equalled the number of negative responses. It was clear however, that farmers' attitudes to state forestry were more positive than their attitudes to commercial private forestry. This was particularly evident in their responses to employment generation and population decline. The majority of farmers had a positive attitude toward farm forestry. In particular the majority of farmers thought that farm forestry had generated additional income for farmers. Not surprisingly, the attitudes to forestry of those farmers that had planted trees were more favourable than those that had not planted. This was true for all forms of forestry development.

"It was clear that farmers' attitudes to state forestry were more positive than their attitudes to commercial private forestry"

5. Conclusion

This study has described farmers' attitudes to forestry. It shows that the vast majority of farmers remain uninterested in converting parts of their farm to forestry. It also shows that farm forestry, to date, has had little impact on agricultural production. Unless farmers consider planting better land, agricultural production will remain largely unaffected by farm forestry. While the financial incentives for farmers to afforest good land are now quite attractive, attitudes to forestry will have to change before most farmers consider forestry for this type of land. This survey highlighted that fact that most farmers are not aware of the level of financial incentives for farm forestry. Therefore increased awareness of these incentives is a priority.

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Wood processing in the Irish Republic: a survey report

C. Anderson, K. Thomson
and D. Psaltopoulos

1. Introduction

This paper reports the nature of, and preliminary results from, a recent survey of wood-processing plants in the Irish Republic, carried out as part of a large research study of the role of forestry in rural development in less favoured areas in both parts of Ireland and in Scotland (see Ní Dhubháin, this issue). Similar surveys of wood processors (and of forest contractors) were carried out almost simultaneously in Northern Ireland and in Scotland, but this paper is restricted to the processing sector in the Republic, in the interests of space and homogeneity. The objective of the survey was to investigate the relationship between these enterprises and the rest of the rural economy, either through the purchase of input from, and sale of output to, other rural sectors, or through the maintenance of rural employment.

In the Republic of Ireland, the benefits of forestry employment, especially in the more deprived areas of the West, have been widely recognised amongst policy-makers since the 1930s. The employment potential of forestry was also a major objective of the EC Western Package and more recently, the 1989-1993 Forestry Operational Programme. When large-scale afforestation started in the 1950s, increased attention was given to the contribution of the forestry sector towards manufacturing development in the wood-processing industries (Mather, 1993). Until the 1960s, the wood processing sector consisted of large number of small sawmills located in rural areas, producing non-standardised products. Because production from these plants could not compete with imported wood products, and since forecasts of domestic wood supplies were promising, government assistance was sought and often obtained for the establishment of modern wood-processing plants. However, as a significant number of these new plants were located near towns and cities, this could have reduced the economic benefits of afforestation to rural areas. In recent years, plantations established just before or after the Second World War have matured, and the quantity of wood processed is rapidly increasing (Gardiner, 1991). This has led to the steady development of an Irish wood processing industry consisting of sawmills and wood-based panel mills.

This paper consists of four main sections. The next section presents the survey procedure, Section 3 deals with the analysis of the survey findings, and in more detail with issues such as utilised capacity, employment, wood

Table 1. *The Sawmilling Industry in the Republic of Ireland: Population and Sample*

Sawmills	*Population*	*Sample*	%	*Response*	%
Small (up to 10,000m³)	51	10	(20)	7	(70)
Medium (10-60,000 m³)	8	5	(62)	3	(60)
Large (over 60,000 m³)	8	3	(38)	3	(100)
TOTAL	67	18	(100)	13	(72)

supplies, and the type and destination of output. The last section discusses some conclusions derived from the findings of this survey.

2. Survey Procedure

Data was collected for sawmills, defined as enterprises which convert roundwood timber (home-grown or imported) into "commercially desirable rectangular products" (IDA, 1983).

2.1. Sampling

The first task of the survey was the development of a sampling procedure. A list of 67 sawmills in the whole of the Republic of Ireland, stratified by size and geographical location, was provided by Coillte. Of these, it was decided to survey a non-random sample of 18, classified by size (throughput of wood) – see Table 1. As the information sought was often confidential, firms were approached by a covering letter which indicated the value of the research project both to the study-areas and the wood-processing industry, and gave an assurance that all information supplied would be treated in strict confidence. The survey was carried out in March 1993, with personal visits by two interviewers. The overall response rate was 72 percent, due to relatively lower responses in the smaller-capacity sawmill size classes (Table 1). Data collected referred mainly to year 1991.

3. Analysis

3.1. Utilised Processing Capacity

Table 2 indicates the aggregate available and utilised processing capacities of the sawmills participating in the survey.

Although small sawmills represented 54 percent of the sample, they only accounted for 5 percent of aggregate processing capacity, of which only 75 percent was utilised. Medium-sized sawmills accounted for 22 percent of total capacity, and were slightly more capacity-efficient than their smaller counterparts, with 78 percent of their capacity being utilised in 1991. Large sawmills accounted for 73 percent of the total capacity considered by the survey, and in terms of utilised capacity, they were the most efficient category, with 86 percent of their

Table 2. *Utilisation of Wood Processing Capacity: Republic of Ireland, 1991* *Source: 1993 CAMAR Study Survey*

Sawmills	*Processing Capacity ('000m³)*	*Number of mills*	*Aggregate available capacity ('000m³)*	*Aggregate utilised capacity ('000m³)*	*Utilised capacity as % of available capacity*
Small	under 10	7	29	22	75
Medium	10-60	3	126	98	78
Large	over 60	3	426	365	86
Total		13	581	485	83

Sawmill size	*Harvesting*	*Sawmilling*	*Marketing*	*Transport*	*Admin.*	*Other*	*Total*
Small	0	52	2	4	8	1	67
Medium	0	92	3	4	5	0	104
Large	50	254	14	20	23	0	361
Total	50	398	19	28	36	1	532

Table 3. *Number of Employees (FTE's), by Sawmill Size : Republic of Ireland, 1991* *Source: 1993 CAMAR Study Survey*

processing capacity being utilised in 1991. Overall, the (weighted) average utilised capacity of the sawmill sector was 83 percent.

3.2. Employment Characteristics

The surveyed sawmill workforce accounted for a total of 532 employees (full-time equivalents, FTEs) (Table 3). The level of employment in primary production (sawmilling, harvesting), as opposed to service operations (administration, sales and marketing etc.) treats the latter (loosely) as "overheads". Small mills accounted for 13 percent of total employment (compared to 5 percent of capacity – Table 2), while medium-sized mills accounted for 19 percent and large mills for 68 percent of total employment (compared to 30 and 73 percent of total capacity).

The small and medium-sized sawmills did not directly harvest any of their timber inputs. In the small sawmills, 78 percent of the workforce was employed in sawmilling and the remaining 22 percent in service activities. An even higher 88 percent of the workforce in medium-sized sawmills was employed in sawmilling. In large sawmills, 84 percent of the workforce were involved in timber harvesting and sawmilling.

Unit labour costs (Table 4), clearly indicate economies of scale in the sawmill sector, with such costs in the "small" mills four times that of the "large" mills. Unit labour costs in "medium" sawmills are also high relative to that of the large mills.

3.3. Wood supply

Volumes, types, and location of wood supplies (including imports) were identified with a view to investigating demand for raw material by mill size, as well as the economic relationship between these enterprises and other aspects of the rural economy and landscape.

In 1991, Irish sawmills, processed almost exclusively softwood (Table 5, right-hand column). The small-size category purchased 22,000m³, or 5% of total supplies to the sample, while

Sawmill Size	*Sum of Processing Capacity (000m³)*	*Sum of Wage Costs (£'000)*	*Unit Labour Costs (£/m³)*
Small*	24	381	16
Medium	126	823	7
Large	426	1540	4
Total	576	2744	5
* Figures adjusted for non respondents			

Table 4. *Unit Labour Costs by Sawmill Size: Republic of Ireland, 1991* *Source: 1993 CAMAR Study Survey*

Table 5. *Volume and Type of Wood Supplies by Sawmill Size: Republic of Ireland, 1991* *Source: 1993 CAMAR Study Survey*

	Volume of Supply Type ('000m³)					
Sawmill size	*Pulpwood*	*Palletwood*	*Small sawlog*	*Large sawlog*	*Total*	*% soft wood*
Small	3	5	8	6	22	98
Medium	11	30	30	27	98	100
Large	59	196	37	73	365	100
Total	73	231	75	106	485	100

98,000m³ (20 percent) was acquired by the medium-size sector. The large mills surveyed accounted for the remaining 75% of total wood supplies. Palletwood was the most commonly used form of wood, due to the high volumes utilised by the large processors. On the other hand, small and medium-sized mills mainly processed small sawlogs, taking half the aggregate supplies. Pulpwood and small sawlogs each accounted for 15 percent of total wood supply, while a further 22 percent was in the form of large sawlogs.

The geographical source of wood supplies (Table 6) indicates the relationship between the processing sector and the regional economy. Only 14,000m³, (3 percent of total supplies) were imported by the surveyed sawmills. The remainder was split evenly between local (within 30 miles) and more distant national sources, although differences did occur within the various size sectors. Small-sized sawmills seemed able to obtain a slender majority of their supplies locally, whereas medium-sized mills purchased 58 percent of their supplies from without 30 miles. Large mills also obtained about 50 percent of wood input from their local area; however, due to their size they were directly responsible for 78 percent of local timber marketings.

It seems that in general, small mills tend to favour the more valuable wood types, i.e. the larger-diameter small and large sawlogs, possibly in order to produce specifically for targeted "niche" markets which reward better the use of higher-value wood supplies. On the other hand, low-cost production seems to be characteristic of the large sawmillers.

3.4. Output

Table 7 indicates output volume by size of sawmill. The sawmills surveyed produced a total of 208,000m³ of sawn timber in 1991. Of this, the small mill-size category was responsible for 7 percent (including 100m³ of sawn hardwood). Medium-sized sawmills

Table 6. *Location of Supply Sources by Sawmill Size: Republic of Ireland, 1991* *Source: 1993 CAMAR Study Survey*

	Volume of supplies ('000 cu.m.) sourced from:			
Sawmill size	*Within 30 miles*	*Rest of the Republic*	*Imported from Northern Ireland*	*Total*
Small	12	8	2	22
Medium	41	57	0	98
Large	183	169	13	365
Total	236	234	15	485

('000m³)				
Sawmill size	*Sawn softwood*	*Sawn hardwood*	*Softwood residues*	*Total*
Small	14	0.1	7.9	22
Medium	39	0	59	98
Large	154	0	211	365
Total	207	0.1	277.9	485

Table 7.
Volume of Output by Output Type and Sawmill Size: Republic of Ireland, 1991
Source: 1993 CAMAR Study Survey

contributed 40,000m³ (19 percent) of total softwood output, whilst the large mills surveyed were responsible for 154,000m³ (74 percent). Of the 277,000m³ of residue output, the large sawmills produced a rather higher proportion than they did of sawnwood; the small mills produced far less residue per cubic metre of timber output compared to large plants, or at least sold a lower proportion.

In order to determine physical and monetary flows between sectors, the survey attempted to determine the industrial and geographical destination of sales of processed timber (Table 8). With regard to sawmills, the survey revealed that pallets and packaging were the largest output categories overall, with just over 100,000m³ (48 percent of total output). Construction was the second largest market, accounting for over 25 percent of total production, while fencing came third, with 20 percent. However, differences exist between mill-size categories. Construction was the principal market for the small mills, accounting for 43 percent of output. The furniture market was exclusively provided for by these mills, although only 2 percent of their output was sold in this form. The largest markets for the medium-sized mills were pallets and packaging (44 percent of output) and fencing (37 percent). The largest market outlet for large mills was also pallets and packaging. Within all the markets, except the "niche" furniture sector, large mills dominated in terms of market share.

With regard to geographical destination of output sales (Table 8), surveyed sawmills sold 54 percent of their total output within the Republic (most at a distance of more than 30 miles from the plant), and exported a further 33 percent to Great Britain, with the rest to Northern Ireland. Eighty-one percent of small sawmill output was sold locally (all market sectors represented), with almost all of the remainder sold within Ireland. Medium-sized mills sold 38 percent of their output (including most of construction and fencing sales) elsewhere in the Republic, whilst a further 30 percent (mainly pallets) was exported to England. The remainder was split evenly between local sales (17 percent), and exports to Northern Ireland (31 percent). The large sawmills were notably absent in local markets, selling only 2 percent of their output there, but the majority (48 percent) of their output was sold within the Republic, (90 percent of construction, and a third of all other products sales respectively). The remainder (36 percent) was exported to Great Britain.

Table 8. *Geographical Destination of Output by Volume and Sawmill Size: Republic of Ireland, 1991*
Source: 1993 CAMAR Study Survey

Sawmill size	Market sector	Volume of output ('000m³) sold:					
		Within 30 miles	*Within ROI*	*To NI*	*Exported to Great Britain*	*Exported to elsewhere*	*Total*
Small	Construction	4595	1110	96	0	0	5801
	Pallets & Packaging	1236	638	93	0	0	1967
	Fencing	5037	755	0	0	0	5792
	Furniture	308	0	0	0	0	308
	Other	300	0	0	0	0	300
	Subtotal	11476	2503	189	0	0	14168
Medium	Construction	1000	4300	0	0	0	5300
	Pallets & Packaging	4660	1980	1320	9240	0	17200
	Fencing	165	7472	4230	2683	0	14550
	Board Mills	0	1160	290	0	0	1450
	Other	1000	0	0	0	0	1000
	Subtotal	6825	14912	5840	11923	0	39500
Large	Construction	130	37398	2047	2047	0	41622
	Pallets & Packaging	2200	26124	5581	39625	7410	80940
	Fencing	195	6966	4979	6934	1950	21024
	Other	0	2808	312	7280	0	10400
	Subtotal	2525	73296	12919	55886	9360	153986
All sawmills	Construction	5725	42808	2143	2047	0	52723
	Pallets & Packaging	8096	28742	6994	48865	7410	100107
	Fencing	5397	15193	9209	9617	1950	41366
	Board Mills	0	1160	290	0	0	1450
	Furniture	308	0	0	0	0	308
	Other	1300	2808	312	7280	0	11700
	Total	20826	90711	18948	67809	9360	207654

"Large sawmills appear . . . as modern, low-cost, export-oriented wood processors."

4. Summary and Conclusions

This paper reports a recent survey of wood processing plants in the Republic of Ireland, with questionnaire information for a 26 percent sample of main plants. Survey results provide significant information about the structure and characteristics of the different sizes of sawmill in the Republic, as well as their relationship with the rural economy.

The small-sized segment of the sawmill sector represents a very high proportion of total number of plants. However, at least in the survey sample, it accounted for a very low share of total processing capacity (5 percent), produced a similar share of total output volume and employed 13 percent of the sector's labour force. The level of capacity utilisation is the lowest in this sector, whilst labour cost per unit is the highest. On the other hand, the wood-conversion rate is relatively high. However, supplies tend to favour the more expensive wood types, whilst output (mainly construction and fencing) satisfies "niche" local markets. The continued survival of small-sized sawmills suggests the presence of a

dual market-structure. It would certainly seem that the ability to identify and manipulate target markets is crucial to the small-size categories of sawmills, since these mills do not seem to be competitive in the major markets.

Medium-sized sawmills account for a third of total processing capacity, and their capacity utilisation is marginally better than that of small sawmills. Wood supplies are almost equally distributed between palletwood and sawlogs, while most of their output (mainly construction and fencing) is either exported or sold at a distance of more than 30 miles from the plant.

Large sawmills appear in the survey results as modern, low-cost, export-oriented wood processors. They account for a significant number of jobs on a full-time equivalent basis, and their production is characterised by comparatively low labour costs per unit. Their supplies mainly consist of lower-value home-grown, but not necessarily local, timber, while much of their output (50 percent) is exported. In general, large plants seem to enjoy a strong competitive situation. Cost-efficiency allows them to export most of their production; the mills contribute to the rural economy with regard to input purchases, output sales, and employment provision, The input, output, and employment shares of the small mills seem to be quite low. However, their economic activity is characterised by a strong local element, and in the case of output, a high degree of production flexibility and dependence on niche markets. The medium-sized sector seems to be in an intermediate position, not competitive compared to large plants, and not flexible compared to small mills. Its prospects do not seems very favourable because its market share may be penetrated by larger, more efficient processors.

"Medium-sized sawmills account for a third of total processing capacity, and their capacity utilisation is marginally better than that of small sawmills."

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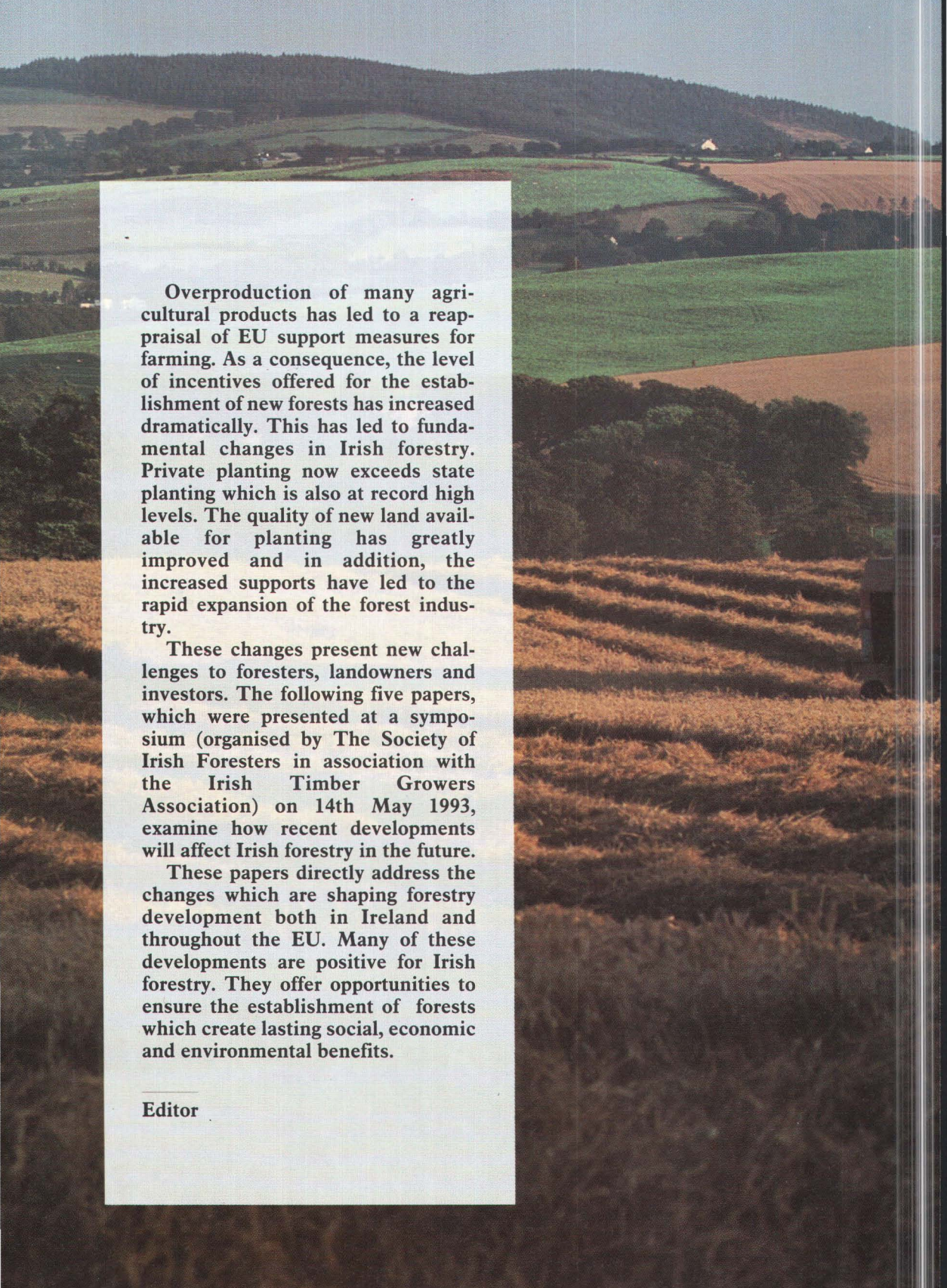
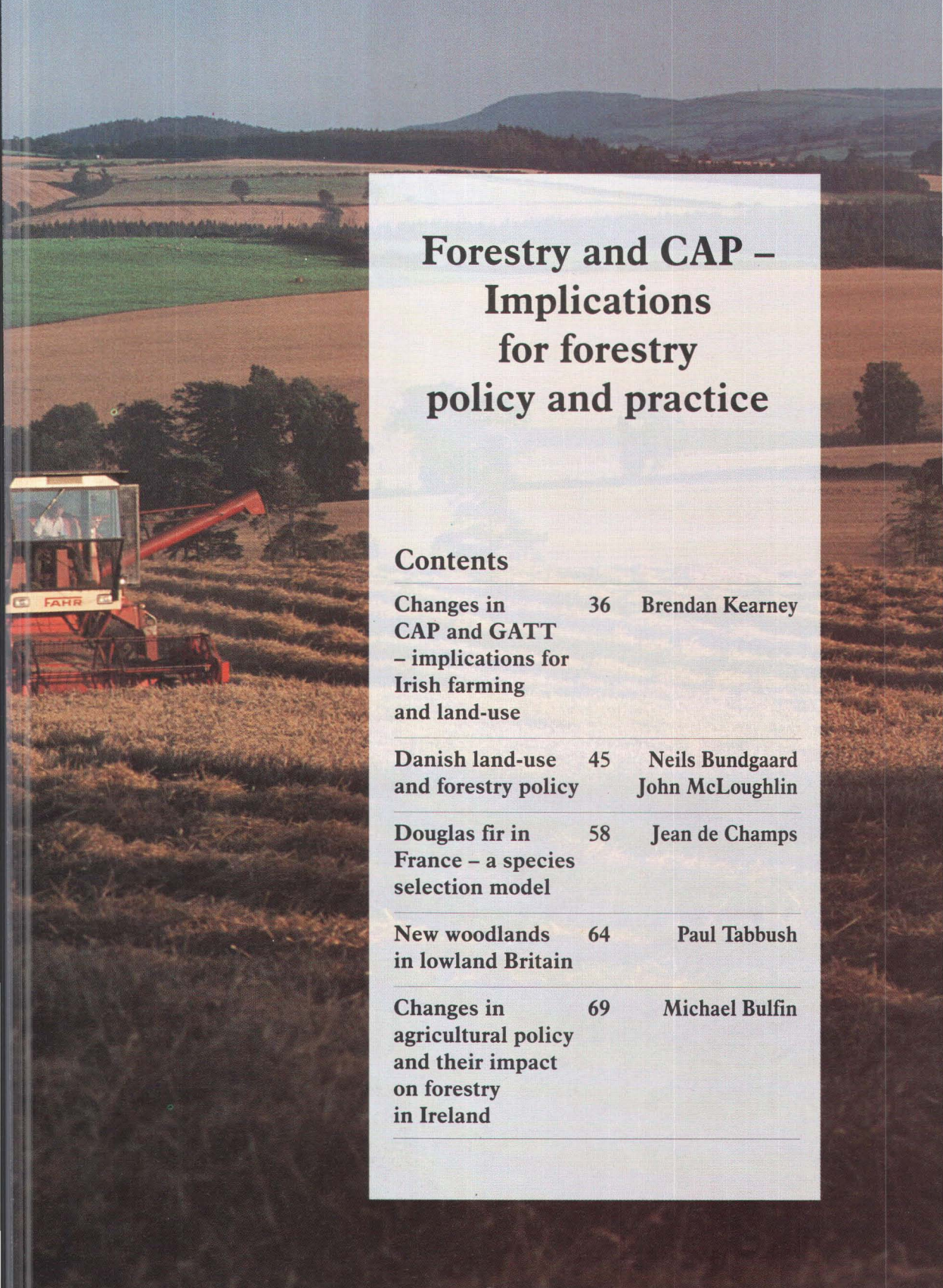


Overproduction of many agricultural products has led to a reappraisal of EU support measures for farming. As a consequence, the level of incentives offered for the establishment of new forests has increased dramatically. This has led to fundamental changes in Irish forestry. Private planting now exceeds state planting which is also at record high levels. The quality of new land available for planting has greatly improved and in addition, the increased supports have led to the rapid expansion of the forest industry.

These changes present new challenges to foresters, landowners and investors. The following five papers, which were presented at a symposium (organised by The Society of Irish Foresters in association with the Irish Timber Growers Association) on 14th May 1993, examine how recent developments will affect Irish forestry in the future.

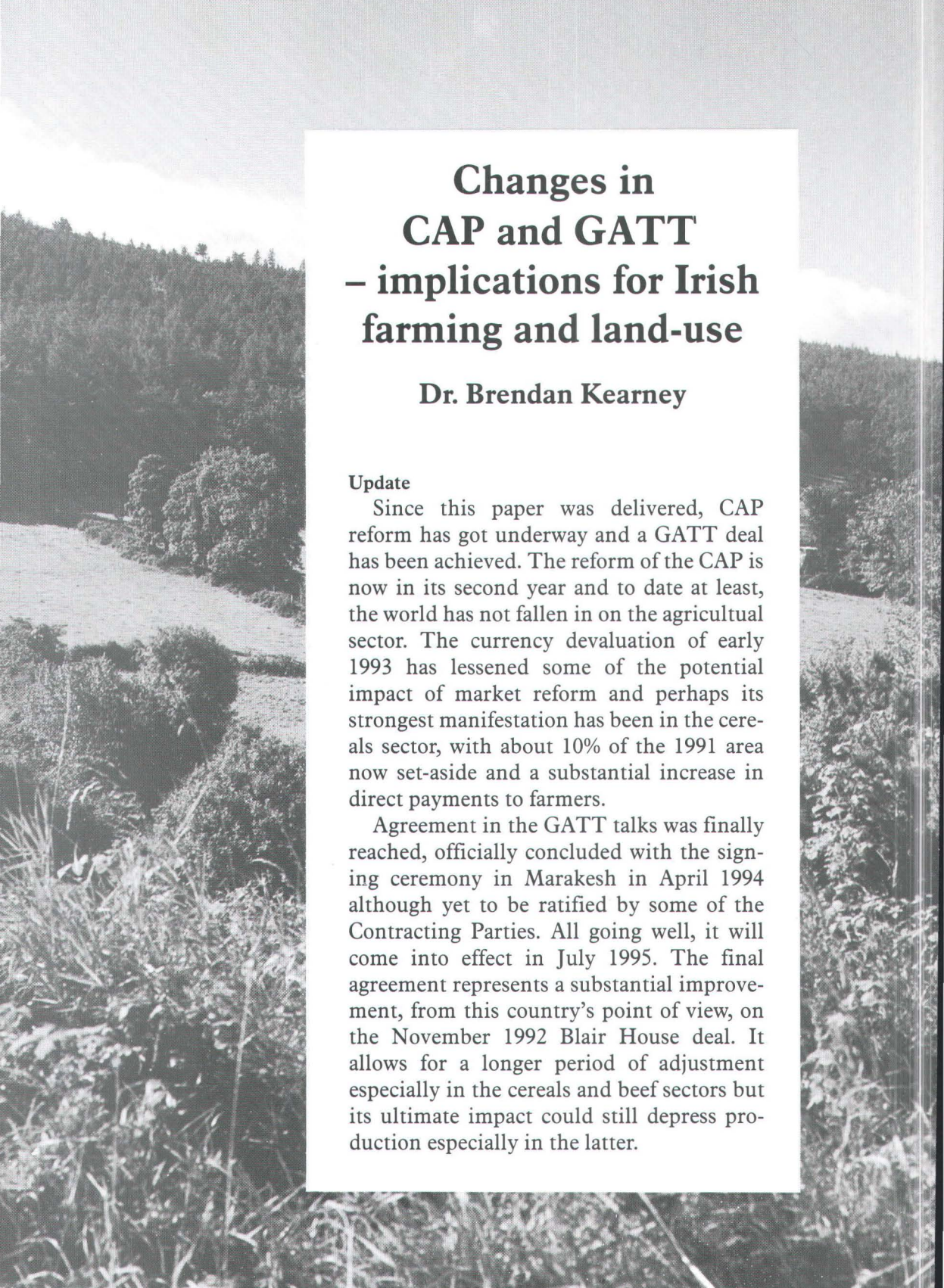
These papers directly address the changes which are shaping forestry development both in Ireland and throughout the EU. Many of these developments are positive for Irish forestry. They offer opportunities to ensure the establishment of forests which create lasting social, economic and environmental benefits.

Editor



Forestry and CAP – Implications for forestry policy and practice

Contents



Changes in CAP and GATT – implications for Irish farming and land-use

Dr. Brendan Kearney

Update

Since this paper was delivered, CAP reform has got underway and a GATT deal has been achieved. The reform of the CAP is now in its second year and to date at least, the world has not fallen in on the agricultual sector. The currency devaluation of early 1993 has lessened some of the potential impact of market reform and perhaps its strongest manifestation has been in the cereals sector, with about 10% of the 1991 area now set-aside and a substantial increase in direct payments to farmers.

Agreement in the GATT talks was finally reached, officially concluded with the signing ceremony in Marakesh in April 1994 although yet to be ratified by some of the Contracting Parties. All going well, it will come into effect in July 1995. The final agreement represents a substantial improvement, from this country's point of view, on the November 1992 Blair House deal. It allows for a longer period of adjustment especially in the cereals and beef sectors but its ultimate impact could still depress production especially in the latter.

Introduction

The recent reform of the CAP is undoubtedly the most fundamental overhaul of the support system for agriculture since its inception 30 years ago. While the main emphasis was on the price/market issue rather than the socio-structural, the reform still represents a major shift in emphasis from price support as a means of assisting incomes to a policy based on direct payments. More commodities, with the notable exception of milk, now have this feature, and in consequence support mechanisms will now be much more transparent than the system they are replacing.

The rationale for and background to the reforms do not merit any lengthy treatment at this point as they are well known. A difficult budgetary situation, following on the Gulf crisis, German reunification and increased world food supplies provided the stimulus for tackling some of the basic weaknesses of the CAP. These included: the build-up of surpluses which were costly to dispose of and created tensions on world markets, the encouragement of intensive production methods which damaged the environment, and, the inequity of a system whereby income support was proportional to the volume of output-- the oft-cited 80:20 argument. Additionally the CAP was deemed an inefficient system in supporting incomes in that only a fraction of total support found its way to producers due to the deadweight losses in storage, administration and other costs of dealing with surpluses. It would be naive to believe also that international trade issues such as GATT were not factors in the orientation of the reforms. The European Commission had earlier stated that "a more competitive agriculture through continuing action on prices (is) considered essential" and stressed that Community policy must be based on the need to meet inevitable competition both on its domestic and world markets.

All that is history now and a package of measures has been put in place which effectively ties up the price and market policy regime for cereals, beef, and sheepmeat for the next 3 marketing years and indirectly affects pig and poultry production also. The dairy quota policy remains in place until the end of the decade while the sugarbeet regime is next for review and reform. I will now dwell briefly on their impact as measured in a static sense.

'Static' effects of reforms

The static effects of the reforms take no account of possible producer reactions such as volume adjustments, enterprise substitution or changes in production practices in the course of and following the implementation of the reform measures. The price and other features of the reforms are simply imposed on the expected situation for 1992 and the results compared with that year. How the output and incomes will evolve in the next 3 to 4 years will depend on market prices and cost developments, productivity, and random factors such as weather.

The reforms represent a major improvement on the original proposals where an aggregate IR£62m loss is translated into a gain of IR£85m. The main beneficiary is the beef sector where a loss of IR£50m is replaced by a gain of about IR£60m, largely because of the easing of the stocking rate restriction, introduction of the extensification and spring slaughter premia and the greatly increased male cattle and suckler cow grants. There has

been a considerable improvement also in the cereals sector, relative to the earlier proposal, largely because of the extension of compensation for set-aside to all producers, and the lower price reduction. The dairy sector emerged from the CAP relatively unscathed both with respect to the form of the regime itself and price/market adjustments. The sheep sector has also benefitted in the final agreement with the restoration of ewe flock size limits to their current level (1000 on hills and 500 on lowlands) subject of course to the numbers qualifying being pegged at the 1991 level.

The degree to which the CAP reforms differentially impact on particular farming systems and size has also been examined in a National Farm Survey context by Teagasc (Teagasc, 1992). Their analysis shows that dairy farmers will neither gain or lose from the adjustments – reduced milk prices being just about offset by increased cattle subsidies and reduced feed costs. Cattle farms will gain most from the reforms, confirming the conclusion from the budgeting exercise outlined above.

The Teagasc analysis shows substantial variations in the manner in which the reforms impact across size groups. In proportionate terms, smaller farms gain relatively more as shown in Table 1.

Hill farms also gain more than the national average, confirming that smaller farms in the more marginal farming areas will do relatively better from the CAP reforms.

Output and incomes

The first point to remember is that the compensatory or direct payments will not be index-linked and their value in Irish pounds will depend on the prevailing Green rate for the Irish pound against the ECU. To the extent that the Green pound would be devalued then the value of the direct payments would be increased accordingly and this follows from the devaluation of last February. There is no doubt that these payments will increase appreciably as a proportion of income by the end of the reform period as indicated in Table 2.

They have risen in value from about 13% of total farm income in 1987 to an estimated 23% in 1992. However over the next few years they will sharply increase possibly reaching over 40% of total income in 1996. This is another way of saying that returns from the marketplace will be much less significant as a determinant of farm income in the medium term while at the same time direct payments will loom much larger in income formation. The direct payments approach was proposed for the dairy sector but this enterprise now stands apart from the other main land-using enterprises in being virtually wholly underpinned by the conventional CAP support mechanisms of a

Table 1: *Effect of reforms on average family farm income (FFI) per farm by farm size (IR£).*

Farm Size Group (ha)	2-20	20-50	50-100	100+	Hill Farms	All
Average FFI pre-reform	2473	8973	18429	27830	3366	6282
Average FFI post-reform	2914	9560	19306	27802	3855	6774
Gain (Loss)	441	587	877	(28)	489	492
% Gain (% Loss)	17.8	6.5	4.8	(0.10)	14.5	7.8

Source: Teagasc, 1992.

high price policy, intervention and export support.

The actual income level realised in any particular year will still be significantly affected by market returns. This will particularly be the case in the dairy sector but market returns will still play a key role in determining incomes in the sheep and cereal sectors and particularly in beef. I have assumed in the static exercise that cattle market prices would follow the downward path of 5% per annum in intervention prices and that this would translate into a 15% reduction in market prices. In such a scenario, direct supports including headage, would account for about 40% of the combined revenue of the cattle sector. Should finished cattle prices however decline further than that assumed, then the advantage of the reform could be steadily eroded and at a price fall of 20% the value of the extra payments would be fully offset. Conversely, if cattle prices decline by less than 15%, then cattle producers would be better off than suggested above.

At the end of the transitional period, 1995/96, we are likely to have approximately the same level of cattle output as we have in the current year with a possible deviation of plus or minus 2%. Sheep output could be marginally less due to environmental pressures and the establishment of the ewe quota at 1991 application levels. Milk production could be 2-4% less in 1995/96 than in the current marketing year particularly if markets disimprove relative to their present state, while cereal production will be reduced by perhaps 10% because of the impact of set-aside.

While the total volume of output in agriculture at the end of the reform period may be close to or a little lower than in 1992 the volume of inputs will possibly contract also, particularly arising from some reduction in fertiliser use and crop protection chemicals. The other main determinant of income is the so-called internal terms of trade or cost/price developments. The significance of the price element in the case of cattle has already been mentioned but the relationship of costs to prices has the most vital bearing of all on incomes in the short-term. At the same time it is well nigh impossible to anticipate price movements with any degree of accuracy 3 to 4 years ahead but we can be somewhat more audacious in projecting that there will be significant downward pressure on costs. So taking the price relativity as it is in 1992, together with the input, output, and non-market income support expectations already referred to, then farm income levels could be relatively stable over the next few years.

Year	%
1987	12.6
1990	22.7
1991	22.0
1992	23.0
1996 (forecast)	40.0+

Table 2: *Direct payments as % of farm incomes.*

Impact in marginal farming areas

In examining the impact of CAP reform on the forestry sector we must focus on those areas where the pace of afforestation has been greater than average and in particular on the farming systems in such areas. As shown in Table 3 while dairying is relatively important in Soil Class 2 it is almost insignificant in Soil Class 3.

However as the margins in dairying are so high, forestry is scarcely in com-

Table 3: *Farming systems in marginal farming areas – by Soil Class*

	Class 2	*Class 3*
Dairying	35%	7%
Cattle	53%	56%
Sheep	12%	37%

petition with dairying. Sheep farming is quite important on Soil Class 3 but largely on the hills where henceforth we are unlikely to see much afforestation. Thus we are going to concentrate on the cattle enterprise and the distribution of systems within this enterprise is shown in Table 4.

Table 4: *Cattle systems in marginal areas*

	Soil Class 2	*Soil Class 3*
Suckling	34%	75%
Other	45%	20%
Dairying	21%	5%

The dominant cattle system is single suckling or systems with a suckling element so it is of particular interest to examine the impact of CAP reform on this system. Two examples are chosen: the first where the new price and compensatory payments relevant to the final year of the 3-year CAP reform transitional period (1995/1996) are superimposed on the present average gross margins realised in the National Farm Survey (Table 5) and the second where a budgeting exercise is undertaken to determine the change in margins following CAP reform (Table 6).

In both instances the increase in margins is considerable: over 40% in the survey-based and 50% in the budgeting exercise. Both exercises assume the payment of the extensification premium and a 15% reduction in cattle prices. To the extent that cattle prices decline by more or less than 15% then margins will be affected correspondingly. However the suckling cattle system does best out of CAP reform and it would take a reduction of over 40% in the market price of the product of this particular system to offset the effects of the increased premia.

> "As the margins in dairying are so high, forestry is scarcely in competition with dairying. Sheep farming is quite important on Soil Class 3 but largely on the hills where henceforth we are unlikely to see much afforestation."

Having said that however, the farmland of Ireland is still extensively used as indicated in Table 7.

About 43% of the grassland area of the country is stocked at less than one livestock per hectare or less on the basis of stocking rates calculated for the purposes of CAP reform. While it has to be recognised that much of this land may not be suitable for forestry or that the surplus areas involved may be individually too small for commercial afforestation, nevertheless over 1.7

Table 5: *Effect of CAP reform on beef returns (Gross margin/ha)**

	Pre-reform IR£	*Post-reform IR£*	*% change*
Soil Class 2	223	320	42
Soil Class 3	137	195	42

** includes green punt devaluation*

	Pre-reform IR£/cow	*Post-reform IR£/cow*	*% change*
Output	376	346	-8
Subsidies	152	352	131
Variable costs	198	203	3
Gross margin	330	495	50

Table 6: *Effect of CAP reform on single suckling system**

* *includes green punt devaluation*

million hectares of grassland are yielding very little in their present use and would be more productive in forestry.

Stocking rate (LU/ha)	*% Grassland*	*Area ('000 ha)*
<1.0	43.1	1 746
1.0-1.4	28.2	1 142
1.4-1.8	18.3	741
1.8+	10.4	421
Total	100.0	4 050

Table 7: *Land use intensity in Ireland*

Factors affecting land prices

One of the fundamental principles which underlies the determination of the price of agricultural land was enunciated almost 180 years ago by David Ricardo when he stated that:

"Corn [ie. its price] is not high because a rent is paid, but rent is paid because corn is high".

In other words Ricardo was implying that since land is in relatively inelastic supply, movements in the price of land will be mainly influenced by developments in the demand for land. The statement implies that not alone is land relatively fixed in supply but it is substantially so relative to other farm inputs like labour and capital. This viewpoint lies at the basis of the view among agricultural economists that the effect of most farm programmes tend to ultimately impact on the returns to farmland and consequently get capitalized in the price.

In general terms, the price of farmland is determined by:

(a) the expected returns from farmland in agricultural or related (forestry) activity,

(b) the expected real rate of interest and

(c) the expected real rate of appreciation/depreciation in farmland prices.

This formulation suggests that reductions in the expected returns from agricultural production will tend to reduce the price of farmland while increases in the real rate of interest will tend to drive down land prices. Likewise if the percentage rate of change in farmland prices is expected to run below the expected future trend in inflation, then the price of farmland will tend to fall.

Each of the three elements that constitute the demand for farmland are open to considerable speculation. The impact which any one of them will have on the land price depends very much on how forward-looking are the land market participants. It is probably fair to argue that market participants will be very influenced by short-run developments, for example, up to 4 or 5 years ahead.

The evolution of land prices is

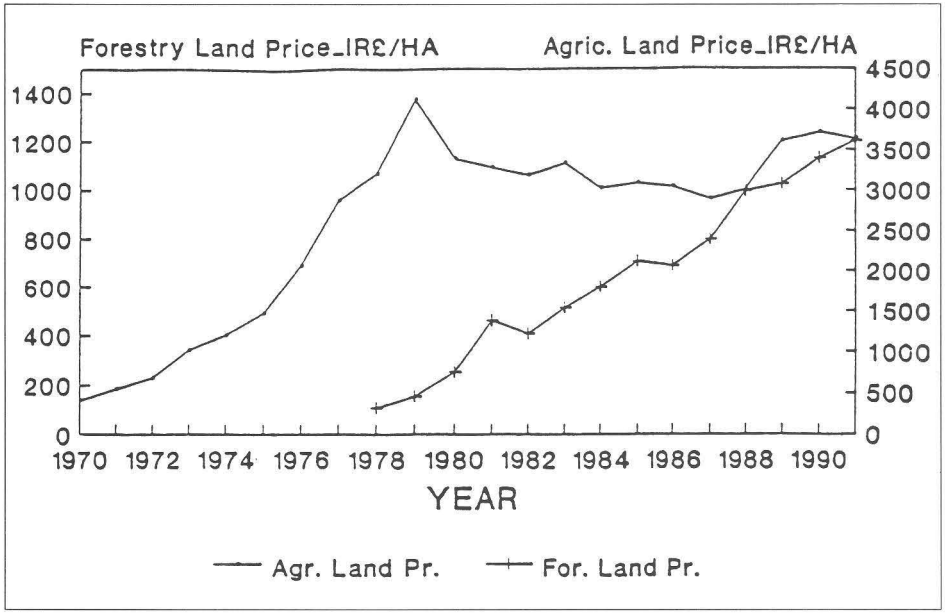


Fig. 1
Forestry and agricultural land prices IR£/ha (Nominal values) Source: O'Connor and Conlon

shown in Fig. 1. In the case of farmland, the price peaked in 1979. The story for forestry land is different in many respects. The data series in Fig. 1 only commences in 1978 and is interesting in that forestry land prices appear to lag developments in farmland prices by about two years. Thus the peak occurs in 1980 and the slump in 1982. However, the forestry land price recovers much more robustly than farmland and since 1983, with the exception of two years (1986 and 1989), there has been a capital gain in the price.

Forestry land prices may of course be influenced by the presence of the State purchasing agency in the market and the improved quality of the land now being purchased.

Future forestry planting programme

As far as the future planting programme is concerned much depends on the returns in farming and their impact on land prices in turn, and on other factors, such as the impact of the accompanying measures and not least on the level of forestry incentives.

As far as the situation in farming is concerned farm incomes have recovered well having risen by 18% in 1992 and a further sizeable increase is in prospect for 1993. The scenario for income in the next 2-3 years suggests some element of stability, before the possible impact of a GATT agreement would materialise. However farm returns are very sensitive to developments in cattle prices and a price reduction of greater than 20% would more than offset the effect of the compensatory payments although its impact would be moderated in farming areas which are more likely to be planted. It must also be pointed out in this context that cattle and sheep livestock numbers are at a record level and

not likely to decline significantly in the short-term at least.

This brings me to the issue of GATT and its possible implications. The EC-US GATT agreement of November 1992 has yet to be ratified by the EC Council of Ministers and an endorsement can by no means be taken for granted, given the attitude being adopted by the French. The likelihood is, however, that the November accord will substantially frame the ultimate outcome. The agreement covers a six year period, possibly 1994/95 to 1999/2000.

The main features of the agreement concern:

- Community imports
- Community internal supports, and
- Community exports

The main issue is whether the GATT agreement will warrant EC price and market policy responses additional to those of the CAP reforms, or whether the CAP reforms will lead to outcomes which will encompass the GATT agreement. The Commission is clearly of the view that the outcome of the CAP reforms will encompass the targets laid down in the GATT agreement.

The agreement on exports causes most concern since it is very difficult to establish the likely production impacts of the CAP reforms and developments in internal consumption in the EC as a whole. One would suppose that in the case of cereals and milk, the EC negotiators would not have agreed to the export reductions unless they felt they were consistent with the relatively predictable production effects of "set-aside" and production quotas. As regards the meat sector, and especially beef, it is much more difficult to call. There is very real concern about the impact of the agreement on the beef sector. The CAP reforms are unlikely to curb production to a degree warranted by the GATT agreement. On the reasonable assumptions of stable production and consumption over the balance of the decade, the exportable surplus could be around 1.2 million tonnes by the end of the period. This contrasts with an allowable exportable surplus of about 0.82 million tonnes which implies an excess of about 0.4 million tonnes or about 5% of EC consumption. If this volume were to be diverted to intervention it would lead to a substantial drop in cattle prices as there would be a tremendous pressure to limit intervention further and effectively removing any floor from cattle prices. We have assumed that as part of CAP reform producer cattle prices will fall by the full cut in intervention prices of 15%. We can say however that if subsidised exports of beef have to be curbed to the extent indicated it makes it more likely that producers prices will fall by more than 15% or supports will be curbed further. It should be noted that the earliest date for the implementation of a GATT accord would be mid 1994 and thus any initial adverse effects would be expected to emerge in 1995 and would be cumulative over the succeeding five years.

With respect to the accompanying measures as part of CAP reform they would also have particular effects on the planting programmes. The forestry measure will obviously be strengthened so as to beneficially affect the national forestry programme with the level of the support determined both by the availability of resources and the scale of stimulus required to achieve

particular targets. The agri-environment measure could have the opposite effect. This measure aims to give recognition to the dual role of farmers and producers and custodians of the environment and to encourage and reward less intensive farming. It could however, restrict the availability of land for forestry as aid would be given to conserve or re-establish biological diversity and set-aside land as conservation reserves and biotypes and for extensification. The farm retirement scheme does not seem all that positive for forestry either, as while it may increase the supply of land coming on the market it may be largely used for agriculture.

Concluding remarks

The achievement of any given rate of afforestation depends, of course, on prevailing economic circumstances as well as on the particular policy mix directed towards rural development. The recent CAP reform market regime measures, in the absence of adjustments to the forestry incentives, probably retard expansion in forestry in the short term by increasing agricultural returns and raising land prices. By contrast, the GATT measures should they materialise along present lines will depress returns in agriculture in the medium term and thus encourage forestry. A particular feature about land prices as noted is that incentives to encourage private afforestation may become capitalised into land values while the removal of farmland from agriculture tempers the extent to which farmland values fall.

The particular policy mix can also contain internal conflicts and contradictions. For instance the receipt of social welfare payments impedes afforestation, even on near derelict holdings, while other CAP related measures, like the extensification and the agri-environment schemes, will tend to offset the effect of the forestry incentives.

While one cannot be too definite, it may be difficult to achieve and sustain the rate of afforestation which has been achieved in recent years. In the first place, the response to the new planting incentives was possibly at its maximum after their introduction and would be expected to gradually taper off, requiring even greater incentives to maintain any given rate of planting. Second, the outlook for agriculture may be less pessimistic than previously realised and the resilience of farmers can often be underestimated. Third, while the current high unemployment and weak labour market persist, there will be less restructuring and rationalisation in land ownership and use than would otherwise occur.

So, taking account of the implications of recent price/market and socio-structural policy adjustments, the future forestry programme may present a more formidable challenge than its immediate predecessor. The planting programme is likely to display a less regular planting pattern while the shift in the composition of planting as between the public and private sectors may not be sustained.

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Danish land-use and forestry policy

Neils Bundgaard
John McLoughlin

Summary

Denmark currently has 12% of its land area under trees and proposes to increase this area to 25% in a tree generation, i.e. 80 - 100 years. The Danes have experience of planned forestry since 1762 and they have developed silvicultural systems to suit their own climate and conditions. Ireland, with its rapid development of afforestation can learn lessons from the Danish experience. Their well developed planning and consultative process, together with good environmental management and their multiple use concept of forestry have ensured that opposition to afforestation, prevalent in the developed countries, has not been an issue in Denmark.

1.0 Introduction

1.1 Location and general geography

Denmark is delicately balanced between Scandinavia and mainland Europe. Apart from a scattering of small islands, three main land masses make up the country – the islands of Zealand and Funen and the peninsula of Jutland, which extends northwards from Germany.

Denmark's total area is around 48,000 sq. km, – equivalent to about half the size of the island of Ireland. Agriculture utilises 62% of the area, forests 12%, nature areas 12% and the remaining 14% is covered by buildings and roads. It lies between 54°34' and 57°45' north latitude, and 8°5' and 15°12' east longitude.

Denmark's greatest length (N-S) is 250km and its greatest width (E-W) is 300km. Due to the great truncation of the landscape, it has a coastline of 7,300km, which is equivalent to one sixth of the earth's circumference.

1.2 Physical features

Along the west coast of Jutland stretches an almost unbroken row of high, denuded dunes. Mid-Jutland is characterised by heaths, lakes and "mountains" which do not approach a height of more than 170m. The highest hill, "Yding Skovhoj", soars to a mere 172m. The east coast of Jutland is indented with many fjords surrounded by woodland and fertile agricultural land. The islands of Funen and Zealand are flat with fertile land.

1.3 Development of the landscape

The landscape was mainly formed during the last Ice-Age, in which ice from north and east extended to a line (the principal ice-front) running east/west near Viborg and north/south through the middle of Jutland. To the north and east of this line the landscape was formed by the movement of the ice, and there the soil is mostly fertile. South and west of this ice front the country was formed by the melt water from the ice, resulting in a poor,

"Ireland, with its rapid development of afforestation can learn lessons from the Danish experience."

leached soil. Dune formations are found along the west coast of Jutland. Smaller dunes are found in north Zealand and in the southern part of the island of Bornholm, where the country's only rock formations are found.

1.4 Climate

Denmark has a temperate insular climate. The precipitation varies from 900mm in the central Jutland, to less than 550mm in the coastal regions of the islands. The number of frost free days varies from 140 in the middle of Jutland to more than 200 near the coast. It is the date of the latest spring frost that is important for the growing of many tree species.

Denmark is a windy country, the prevailing wind direction is from the west. The forests are frequently exposed to gale disasters. In 1967, two gales blew down a total of 2.7 million m^3 of both broadleaves and conifers. In November 1981, one gale blew down 2.8 million m^3, mostly conifer, in less than 24 hours.

1.5 Soils

Compared to Ireland, Danish soils are not very complex. To the north and east of the ice front the soils are generally good and suitable for intensive agriculture and many tree species. This soil type, called "till", covers about three quarters of the country. To the west and south of the ice-front where the Danish heath is found the soils are poor, sandy and leached, with little organic material. During the previous centuries, large areas of heathland were formed west of the ice front on the poorer soils. The natural vegetation was mainly oak, but once removed by man, the underlying soil quality deteriorated.

1.6 Forest history

After the last Ice-Age, different tree species, mainly broadleaves, began to colonise the land. The only native conifers remaining are yew and juniper. The whole land area was under tree cover.

However, about 2500 B.C., man began to clear the forest and this process continued until almost all of the area under forest was cleared.

Planned forestry began in Denmark in 1762, and the planning ethos has survived to the present day. By the end of the 17th century, only 3% of the land was under trees and this too was subject to exploitation. In 1805, a new Forest Act, which protected all forested areas, came into force. After losing the 1864 War, it was decided to utilise the remaining land, to a greater extent, to alleviate the land loss to Germany. The State Forest Service and the Danish Heath Society planted the heathland extensively, and by 1900 a total of 6% of the land area was forested.

In the middle of the 19th century, afforestation with mountain pine and Norway spruce was initiated on large parts of the heaths. However, not all heathland is afforested. At present approximately 75,000ha of heathland remain, mainly in Jutland. The heathland in Denmark is a threatened biotope and much work is needed to prevent its natural afforestation and to promote self-regeneration of the heather. The last remaining habitats of the almost extinct black grouse are also found on the heaths. About 50 specimens still remain.

The Forestry Act, 1935 strengthened the 1805 Act, while the recent Nature Protection Act 1992 and the new Forest Act 1989 give a special position to nature conservation and the multiple use of the forest respec-

tively. A new Act in 1992 gives special protection to the archaeological and natural heritage.

"The current programme plans to plant 5,000ha per annum and to increase the percentage of forest from 12% to 25% in the next 80 to 100 years."

Today, 493,000ha or 12% of the total land area of Denmark is forested. The current programme plans to plant 5,000ha per annum and to increase the percentage of forest from 12% to 25% in the next 80 to 100 years.

It is expected that half the programme will be carried out by the State and the remainder by the private sector.

1.7 Ownership

Approximately two thirds of the forests are privately owned. Annual felling is 2.1 million m^3. However, this only accounts for one third of consumption, and as a result, there is a significant trade deficit in timber based products. There are over 20,000 forest owners and on average each owner has about 22ha of forest. Almost all private forest owners are farmers, which helps to integrate the two industries.

The forest areas are split up into thousands of small properties, evenly distributed in all parts of the country, leaving only a few small islands without forests. Private forestry development is the responsibility of the Ministry of Agriculture.

The country's State forests, which amount to 180,000ha, are divided into 26 districts, usually with five forests in each district. The State Forest Service which is the responsibility of the Minister for the Environment is called the National Forest and Nature Agency (NFNA), and has responsibility for wildlife, archaeology and nature matters. It is also responsible for the administration of the broadleaved woodland scheme.

2.0 Tree species and utilisation

2.1 General

Deciduous forest is the natural forest type of Denmark. Today most of the tree species planted are conifers. In State forests it has been decided that a minimum of 25% of trees planted will be broadleaved, regardless of location. In the established woodland areas, i.e. in eastern Denmark and eastern Jutland, the selection of tree species is expected to change in favour of a larger proportion of deciduous species, particularly beech. In the new woodland districts west of the line of the ice front, where a considerable amount of afforestation is expected to take place, conifers will continue to predominate, but deciduous species, principally oak, are expected to be accorded greater priority, particularly on woodland fringes and as stabilising elements during the

"In the new woodland districts west of the line of the ice front, where a considerable amount of afforestation is expected to take place, conifers will continue to predominate, but deciduous species, principally oak, are expected to be accorded greater priority"

establishment phase and for recreational purposes.

Private growers receive grants covering 75% of costs (plants, planting and fencing) for planting broadleaves and 60% for conifers.

2.2 Broadleaves

Beech

Beech is the most important tree in the old forests east of the ice front. There are now 73,000ha of beech. In Denmark beech is at its northern limit, but it still grows well. For the past 150 years, efforts have been made to select for good form. In addition to Danish beech, imported plant material from Central Europe has been used successfully. Now beech is regenerated mainly by natural seeding, and rarely by planting. While the average rotation is 110-120 years, beech, which is grown on the better soils and thinned heavily, can have a rotation of 80-90 years. However, some of the beech is on poor soils with a considerably longer rotation. Average annual production is $9m^3$/ha.

Oak

The most common oak species in Denmark is the pedunculate oak (*Quercus robur*). When the Danish navy was taken by the British during the Napoleonic wars, at the beginning of the 19th century, large areas were planted with oak, this was done to prevent a future scarcity of oak timber for shipbuilding. This is a good example of Danish forestry's long term planning.

Oak can reach the greatest age; it stands firmly against the wind and is therefore used together with other broadleaves as a stabilizing framework in the forests. An understorey of other tree species is grown in order to prevent epicormic growth and to achieve the best possible quality of the mature bole. The rotation length is 120-150 years and average annual production is $6m^3$/ha.

Ash

Generally ash is not grown in large pure stands, but is found intermixed with beech or as smaller stands in well drained hollows rich in humus. The rotation length is 60-80 years and the average annual production is $7m^3$/ha.

Sycamore

Sycamore like ash, is used as a mixture in other stands, and develops well on good soils with humus. After the violent gales of 1967, extensive pure stands of sycamore were planted. Because of uncertainty about its performance, it is now planted less. The rotation length is about 80 years and the average annual production is $12m^3$/ha.

2.3 Conifers

The only native conifers in Denmark are the yew and juniper. Other conifers were introduced about 200 years ago, by the German forester Johan Georg von Langen. Previously, conifers were planted at close spacing, 1.25m by 1.25m. After the gales in 1967, economic considerations made wider spacing of 2m x 2m, more desirable. Today the usual spacing lies somewhere between these two figures.

Norway Spruce

Norway spruce is the main conifer and it covers about 135,000ha. On good sites, Norway spruce produces up to three times the volume of beech. The rotation length for Norway spruce is 40-70 years and the average annual production is $15m^3$/ha.

Sitka Spruce

Although Sitka spruce only forms a small portion of Danish forests, amounting to 35,000ha, its importance is increasing in Danish crop establishment. Sitka spruce is mainly planted in the coastal areas and on clayey soils with a high ground water table. Sitka spruce can produce from 10-100% more than Norway spruce depending on site characteristics.

Other Conifers

Since 1864, areas of heaths and dunes, amounting to 11% of the land area, have been afforested with mountain pine. This is a low volume producer with poor quality pulp but it improved the soil for the subsequent crop. It is now being replaced on the dunes with Scots pine and Sitka spruce, and on the heaths, where late spring frosts are not too severe, with Sitka spruce. Norway spruce is still the main species in the heath plantations. In some of the dune areas trees are not being replanted and the felled areas are being allowed return to their natural state. However, there has been local opposition to this scheme and demands have been made to replant these areas. The distribution of other coniferous species is as follows: Douglas fir and larch 17% and other fir species 9%.

"In some of the dune areas trees are not being replanted and the felled areas are being allowed return to their natural state. However, there has been local opposition to this scheme and demands have been made to replant these areas"

2.4 Silviculture

The forests of Denmark are mainly artificial, built up over the last 200 years, and this is evident in the silviculture with very intensive planting followed by heavy thinning intensity. Denmark has a long tradition of heavy thinnings, carried out at relatively short intervals. The thinning intensity is not only dependent on conditions of biology and production, but is also influenced by the forest's standard of mechanization.

2.5 Wood industry

In Denmark 2.1 million m^3 are felled annually. The demand for round timber in Denmark is 7 million m^3, and the net imports are 4.5 million m^3. The imports are almost entirely softwood, while half the hardwood from Danish forests is exported as partially processed products. Denmark has a relatively large number of small sawmills. The sawmills use 1.3 million m^3 round timber annually.

Besides these, there are sixteen other round-timber processing factories, which use a total of 320,000m^3 round timber. The most important ones are particleboard factories and "Juncker's industries", which makes flooring from hardwoods, mainly utilizing beech.

3. Forest and environmental management

3.1 General

Forest management in Denmark is governed by the Forest Act (1989). The Act is designed to ensure the

forests are managed to increase and improve wood production as well as protecting landscape amenity, nature conservation, recreation, cultural heritage and environmental interests. It is envisaged in the Act that wood production, recreation and nature conservation are compatible – the emphasis in on multiple use of the forest. As well as the Forest Act 1989, there is the Nature Management Act, which allows for the provision of funding for the State afforestation and nature programme. The Forest Subsidy Act, 1989 provides funding for private forestry; 75% of direct costs when planting broadleaves and 60% of direct costs for conifers in the designated forestry zones, and 50% and 40% respectively outside the zone for areas exceeding 2ha. The Agricultural Holdings Act 1989 gave tree crops the same status as any other agricultural crop. The Act on National and Regional Planning gives guidelines to local authorities for designating areas for afforestation. A new Nature Act which came into force in July 1992, gives further protection to nature areas as well as areas of cultural heritage and included the Nature Management Act.

3.2 Multiple use forest management

The Act envisages that in the long term the sustainable forest is the best for individual users and for society as a whole. The multiple use forests would have increased and improved timber production while also protecting landscape amenity, nature conservation, cultural heritage, environmental considerations and promoting recreation at the same time and location.

The Act recognises that forests are an extremely valuable resource, but the public must realise that forest management is about the optimization of an industry that must realise a financial return just like any other enterprise. Sustainable forest use is the basis for multiple use forest management. The Act safeguards the many different interests and has rules for:

- subsidies for reforestation with broadleaves and the management of the forest edges;
- the conservation of small biotopes;
- good forest management.

"The edges of the forests, broadleaved trees or bushes, must be preserved. Today, it is the practice to plant at least 10 rows of broadleaved trees or bushes around each new plantation and along roadways"

"Clearfelling should not take place until the age of maximum mean annual increment."

The Act declares that clearfelled areas should be replanted quickly. All tree stands must be properly tended and thinning must be carried out in all stands in order to improve the return on the investment. Clearfelling should not take place until the age of maximum mean annual increment. Felling must take place with due consideration to limit the risk to windthrow. It also states that trees must be removed after felling as quickly as possible, in order to reduce the incidents of diseases and insects.

The edges of the forests, broadleaved trees or bushes, must be preserved. Today, it is the practice to plant at least 10 rows of broadleaved

trees or bushes around each new plantation and along roadways. In the heath areas broadleaved belts are planted internally in order to provide shelter.

No domestic animals, including deer farming, may be kept in forest reserves. This rule also applies to all forest owners.

The Act permits up to 10% of the area to be used for Christmas trees and foliage production; prior to this Act it was illegal to use forest reserves for short rotation forestry.

3.3 The forest reserve

The concept of the forest reserve began in Denmark almost 200 years ago with the passing of the 1805 Forest Act. This stated that all areas that are registered as forest reserves must be subjected to silviculture. The area should be allowed to develop to a high forest with good silviculture practice. In all 85% of all forest areas are forest reserves. The following areas are forest reserves;

- forests that are the property of the State, county councils municipalities and the public church;
- forests recorded as forest reserve in the Danish Land Register;
- oak scrub.

3.4 Change of ownerships

On change of ownership the new owners must inform the authorities of the change. He will then be informed about the rules and the advice that is available to him.

3.5 Guidance and advice

The National Forest and Nature Agency (NFNA) has prepared advice on good forest management. Advice is also available to owners from the Danish Land Development Agency and the Federation of Danish Forest Owners' Association and others.

3.6 Subsidies for existing forests

Grants are made available for the improvement of broadleaved woodland. Grants are paid for planting, sowing or natural regeneration. If cutting of an immature plantation takes place grants will not be paid. Grants are also paid for the creation of forest edges with broadleaved trees and bushes that blend with the landscape; for edges the emphasis in on the use of indigenous species. Where the natural regeneration method is not practised, the plants must be of an approved provenance. There are also subsidies for the propagation of plants and for research and development of broadleaved woodlands.

Subsidies for other improvements are also available. These are administered by the Ministry for Agriculture, e.g. subsidies are available for thinning and clearfelling in younger stands, planting strips of broadleaves internally where there is a risk of fire or windthrow, for roads, and the preparation of Management Plans.

3.7 Afforestation

The Nature Management Act 1989 expects the areas under afforestation to increase substantially, and that afforestation must be for the best possible benefit to society as a whole. While not stated in the Act, the current policy is to plant 5,000ha per annum for the next 80 to 100 years and to increase the area under forest from 12% at present to the EU average of 25%.

It has been estimated that between 250,000 and 500,000ha of farmland

will be taken out of agricultural production in Denmark by the year 2000. In order to counter any unfavourable consequences of this development, the Ministries of Agriculture and Environment carried out an analysis of alternative uses of this surplus land. The study's conclusion was that afforestation was the most economic environmentally sound alternative. The Ministry of Environment also decided that some of the new afforestation should be near towns to provide recreational facilities. It is expected that 25% of all State afforestation will be urban forests.

The Forestry Act has been the basic foundation of Danish forestry for about 200 years and it is expected that the changes in 1989 Nature Act will continue to build on the firm foundation already laid down.

3.8 Funding for the afforestation programme

The funding for the State programme comes from the 1989 Management of Nature Act (now the Nature Protection Act). It was envisaged that the funding would be in the ratio 40-40-20, 40% afforestation, 40% nature projects and 20% for recreation. To date, because of the reluctance of the NFNA to proceed with afforestation until the Regional Councils have completed their plans, more has been spent on nature.

3.9 The planting of farmland

Unlike Ireland, where much of the land used for afforestation has not been intensively used for agriculture, in Denmark all afforestation will take place on land that was previously intensively managed. In order to ensure that there is no conflict, a broad-based consultative committee has been set up. The group meets three to four times a year, and is chaired by the Ministry of the Environment, which provides the Secretariat. The Regional Authorities are involved in projects on private land for which the National Forest and Nature Agency, (NFNA), is responsible. The Agricultural commission, made up of three people, a chairman and two representatives of the farmers, are consulted in all acquisition cases. There is an agricultural committee in each of the 14 regions.

To ensure that the NFNA does not acquire land at prices higher than current market prices in the area, the price level is assessed by the Central Customs and Tax Administration.

In general, co-operation from land owners and between authorities has been an essential element in the implementation of the national management projects.

Local support is seen as an essential element of the process. The consultative committee and the NFNA believe that compulsion should only be used in exceptional cases in connection with key nature restoration or recreative projects.

3.10 Environmental management

The direction forestry should take in relation to the natural environment is clearly defined in the 1992 Nature Protection Act. For afforestation, no disturbance can take place within 100m of archaeological remains. In Denmark an archaeological remain is defined as a structure over 100 years, in Ireland it is defined as pre 1700. Development is not allowed within 100m of rivers and streams or 150m of lakes or the coastline.

A major environmental issue in Denmark is the high level of nitrates

in ground water. Because of its low levels of fertiliser and pesticide use, afforestation is an important mechanism in redressing this trend.

4.0 Forest and environmental planning

4.1 General

Planning has been an integral part of forestry development in Denmark for over 200 years. A German forester, Johan Georg Von Langen introduced the concept of forest planning in 1762 and it now forms a pivotal role in forest management both in private and State forests.

He divided the forest into compartments, formulated forest maps and calculated volumes. He also founded the forest school. For more than 200 years Danish forestry has been influenced by Von Langen's principles, and management plans are now an established part of the forest administration. The aim of management planning is to ensure the appropriate use and maintenance of the forest resource. The planning process takes account of environmental, recreational, nature management and wood production considerations.

4.2 Regional planning

The fourteen regional councils have been given the guidelines by the Government to designate 6% of the agricultural land area under their control for forestry development. The plans are 12 year plans and they are updated every 4 years. In drawing up the plans the council are asked to consider all the interests involved: agricultural, forestry, ground water protection with trees, nature preservation and recreation. The designated areas are:

(1) where afforestation is desirable;

(2) intermediate areas;

(3) where afforestation is undesirable.

State forestry will only take place in category 1 areas, except where the afforestation is taking place beside an existing plantation in a category 2 zone. However, private forestry can take place in categories 1 and 2.

4.3 The Planning process

While planning is carried out in the public and private sectors, this paper only deals with the process in the State forest sector. The emphasis of the plan is in the management of the existing plantation and appendices are added should new areas be purchased or if a major windthrow should occur during the period of the plan. The plans are for a 15 year period. Various other periods (10-20 years) were used in the past but the 15 year period was found to be the most satisfactory. The plan is made on a district basis and currently there are 26 districts with usually 5 forest units in each. Each district completes an annual operational plan for the forest in accordance with the long term plan. A simple summary of the plan is as follows:

(1) It analyses what is in the forest.

(2) It examines what can be achieved.

(3) It examines how it is going to be achieved.

(4) It estimates what the results will be.

4.4 The Consultative phase

Since 1987 consultation is held with the local authorities in the district the

plan is being prepared in. At the meeting, representatives of the statutory and voluntary bodies attend. The Open Air Council is an umbrella organisation of the environmental interests and the Danish Society for the Conservation of Nature are given a statement of the intent of the plan. These organisations must then make submissions in writing to be included in the planning. Other areas of the State forest agency make contributions; the biology section, the ecology section, the landscape office (deals with regional plans), the archaeological office and the recreation office.

While the plan is prepared at the agency headquarters, it is done in cooperation with the district's staff. In the planning process the planning office has the co-ordinating role and makes the final decisions. As well as being important for everyday planning, the plan also acts as a control mechanism. The structure is a very flat one. All 26 district managers and the 15 heads of section in the headquarters work directly to the Directors so that there is no room for day-to-day consultation about operational matters.

4.5 The Analysis Phase

After the consultation phase the analysis phase begins. The basis for the analysis is the inventory of the estate, which is updated annually by the inclusion of all new planting and the addition of increment based on yield models. A full inventory is carried out every 15 years prior to the plan update. The inventory consists of a registration of land, updating maps, register of species and volume estimation. The inventory forms the basis of the 15 year forecast and this dictates thinning and clearfelling proposals for the period. While a date for thinning and clearfelling to be carried out is not dictated by the plan, the plan stipulates that such operations should be implemented within the planning horizon. A balanced view is taken of the estimates of the respective volume and type of material, i.e. percentage pulp sawlog etc. This is very detailed down to defining the sub compartment to be treated. Then the types of species to be used are outlined and also the limit to commercial development. Plans for areas for nature conservation, cultural history or recreation are also made.

4.6 The Plan Format

4.6.1 General

The format of the plan varies from district to district, but usually it has ten sections.

4.6.2 Draft Plan

Initially a draft plan is prepared, and after formal discussion between the Planning staff and District staff chaired by the Deputy-Director, the final plan is prepared. The draft plan is usually in three sections; an outline of the district with updated maps showing all boundaries, a register of all land and their uses, and the species and age class distribution presented in tabular form. The growth pattern and the volume at the beginning of the increment and the harvest are summarised.

This is followed by a control mechanism, which is composed of a critical analysis of the performance of the previous plan.

The silvicultural policy outlines whether there should, for example, be more broadleaves, Christmas trees, or recreation in the district. It includes policy on rotation length and thinning intensity as well as a policy for nature and environmental considerations.

The final section of the draft plan outlines the forecast models that are used, and the total thinning and clear-fell volume by species. This forms the basis of decision and change of species from, for example, mountain pine to Sitka spruce. This process takes about two years to complete, one year in which the field work is carried out and one year formulating.

4.6.3 The Final Plan

Following consultation and agreement, a final plan is prepared. The main bulk of this plan is an expansion of the items in the draft plan, including the following:

(i) geographic information;

(ii) nature historical information;

(iii) district historical information;

(iv) statement of boundary dispute problems;

(v) summary of growth patterns and expected increment;

(vi) inventory of special features in the district e.g. gravel, houses, lakes, seed procurement, camping sites, conservation areas, picnic areas, etc.;

(vii) details of felling and replanting phases by sub compartment;

(viii) details of timber categorization such as pulp and sawlog;

(ix) this chapter carries out the economic analysis and estimates costs and revenues for the period based on current cost.

Establishment and maintenance costs are estimated, and revenues and costs for harvesting, recreation hunting, lettings plus an account of general revenues and costs are calculated. Finally, a profit/loss account for the district for the planning period is prepared, together with a statement of the value of the asset at the beginning of the period plus the increment and the value of the asset at the end of the period. An assessment is then made of the cost and savings within the period.

4.6.4 Changes in the Plan

The final area of the plan is reserved for expected changes that may occur in the period. Any other changes that the district wants to make have to be agreed in writing with the planning office and then inserted into the plan as an amendment.

4.7 The Budget Process

At the beginning of each year monies are allocated to each district on the basis of the information in the plan. While the plan is designed for a long time period, the units in the plan are physical units i.e. hours, m^3, and they can easily be converted into money each year. When the budgets are agreed, the districts take ownership of them. At this stage, there is no room for further discussion. The District Manager then has the freedom to manage the district according to the plan within the budget.

5. Conclusions

The Danes have experience of planned forestry since 1762. Since that time they have amassed a lot of information on forest management and planning. They have developed a silvicultural system to suit their own climate and conditions.

Today, there is in Denmark a very valuable forest resource which provides raw material for a well developed wood industry exporting mainly hardwood finished products. Denmark has

also managed to develop a niche market for Christmas trees and foliage in Europe.

Although Denmark has predominantly good soils capable of growing most tree species where frost is not a problem, it has also managed to develop good silvicultural practices for tree development in the heathlands. When the initial pioneer species are gradually removed, a system of internal shelter belts is developed by using a variety of tree species. The great gales of 1967 and 1981 have taught the Danes the importance of developing shelter systems.

In Denmark there has been a planning ethos in public and private forestry for over 200 years. This has helped to bring about an orderly development of the industry. Taking land out of agriculture and transferring it to forestry has environmental advantages such as reducing the use of fertilisers. The quality of ground water in Denmark is a major environmental issue.

With the concept of multiple use forestry in Denmark, the public perceive forestry as a positive force in the environment. The Danish public use the forest a lot for recreation and are very appreciative of the efforts of forest owners, public and private, in providing literature for the public. The development of urban forestry has also helped to educate urban dwellers of the value of forestry.

The formal consultation process which has developed parallel with the planning system has also helped to explain to the public the direction and importance of the forest industry. While there has been some recent opposition from farmers and their representatives to the proposals to plant farmland, the Danes are confident that with further consultation their programme of afforestation can be achieved amicably.

"With the concept of multiple use forestry in Denmark, the public perceive forestry as a positive force in the environment. The formal consultation process which has developed parallel with the planning system has also helped to explain to the public the direction and importance of the forest industry."

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Douglas fir in France

Jean de Champs

1. Historical review

After its discovery by the Scot Archibald Menzies two centuries ago on Vancouver Island, Douglas fir was first planted in Europe in England in 1827 and in Germany in 1829. In France the first Douglas fir was planted in 1842 in Brittany and further specimens were planted in the Centre, Normandy and Limousin Regions. It was planted as an ornamental species, in parks and gardens. Large scale planting of Douglas fir began in 1872, in the Beaujolais area. Its use as a commercial species really dates from 1946 when the FFN (National Forestry Resources) was created. Today Douglas fir accounts for 26% of all French afforestation.

2. Statistics

(The source of most of the statisti-

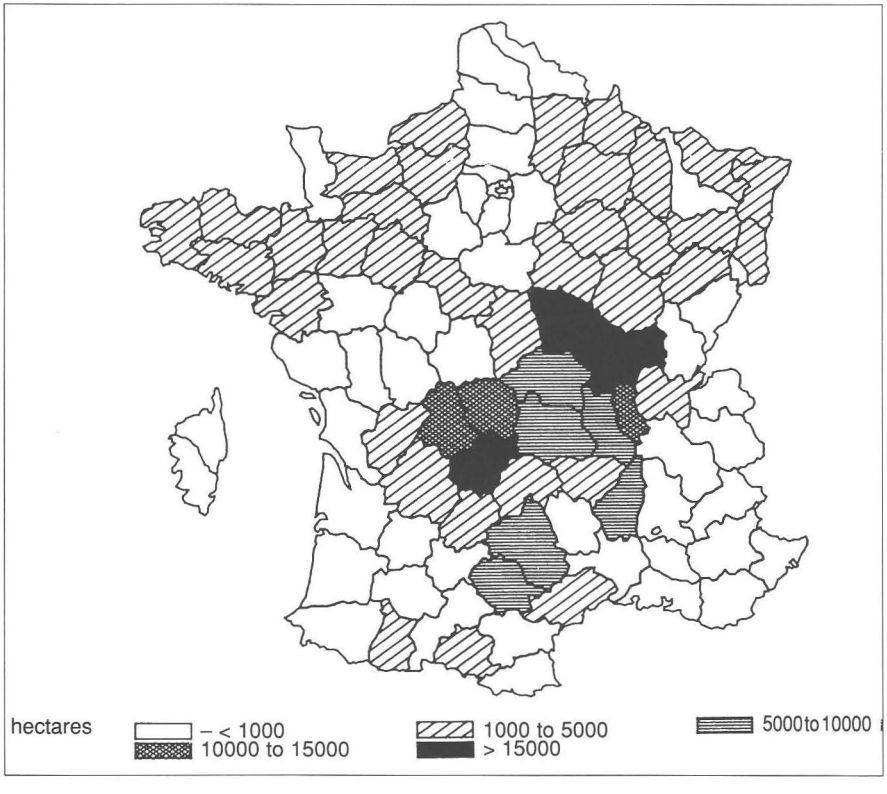

Fig. 1 *Proportionate distribution of Douglas fir plantations in France*

cal data that follow is IFN (National Forestry Inventory)).

As far as forest areas are concerned the data refers to the end of 1992. We have in France 304,000ha of Douglas fir plantations (about 2.1% of the forest area), 209,000ha (69%) are concentrated in five Regions which have more than 30,000 hectares each, and 95,000ha in the other 15 Regions. By Departement, 14 have more than 5,000 hectares (see Figure 1). Figure 2 shows the age class distribution, and it can be seen that we have very few Douglas fir plantations older than 50 years. Furthermore as can be seen in Figure 3 the amount of Douglas fir being planted has reduced in the past 20 years but this is true for all species.

The growing stock and its increment are presented in Table 1. The harvested volumes have been forecasted using a 'high' and 'low' scenario. In my view the high harvest scenario is the most likely to occur.

Component	*Millions of cubic metres*
Standing volume	20.4
Annual Increment	2.1
Forecasted harvest 2000	2.2-3.3
Forecasted harvest 2010	3.3-4.3

Table 1. *Douglas Fir inventory and forecasted harvest*

3. Provenance selection

Provenance choice is very important. In France we have 814ha of approved seed stands, 17ha of controlled stands and 14ha of seed orchards. However, seed years occur only one year in five or six and so very often we do not have enough seed and we must import from the recommended seed-zones in Washington and Oregon, in all cases from stands that occur below 500m.

4. Nursery practice and plantation establishment

Plants are raised in the nursery over a period of three years using a 1 + 2 or 2+1 regime, to reach a height of 60cm. Containerised plants are rarely used.

Spacing at establishment varies, there is still a lot of debate on this point, but the overall trend over the past 20 to 30 years is to increase spacing. The forest administration (FFN) recommends a planting density of between 600 and 1,600 plants/ha. At AFOCEL we plant between 800 and 1,000 plants/ha. The site is usually prepared using a bulldozer or power shovel to remove coppice growth where it occurs. In most cases the site is completely cultivated because we get better establishment and early growth and the amount of cleaning is reduced. Fertilisation is very commonly practised, especially with phosphate as this is very important for good growth. As an example we have the following result from a cultivation by fertilisation field trial (Table 2).

Controlling competing vegetation is very important during the first three to four years after planting as Douglas-fir is very susceptible to competition.

	No fertiliser	*Fertiliser*
	Mean height after ten growing seasons (cm)	
No cultivation	410	487
Cultivation	450	554

(*) Applied at a rate of 120kg/ha P_2O_5/ha (before ploughing) or 30/40g/plant in the form of 'natural' phosphate (30% P_2O_5) at 400kg/ha or superphosphate (25% P_2O_5) at 480kg/ha.

Table 2. *Effect of cultivation and phosphate* application on the growth of Douglas fir*

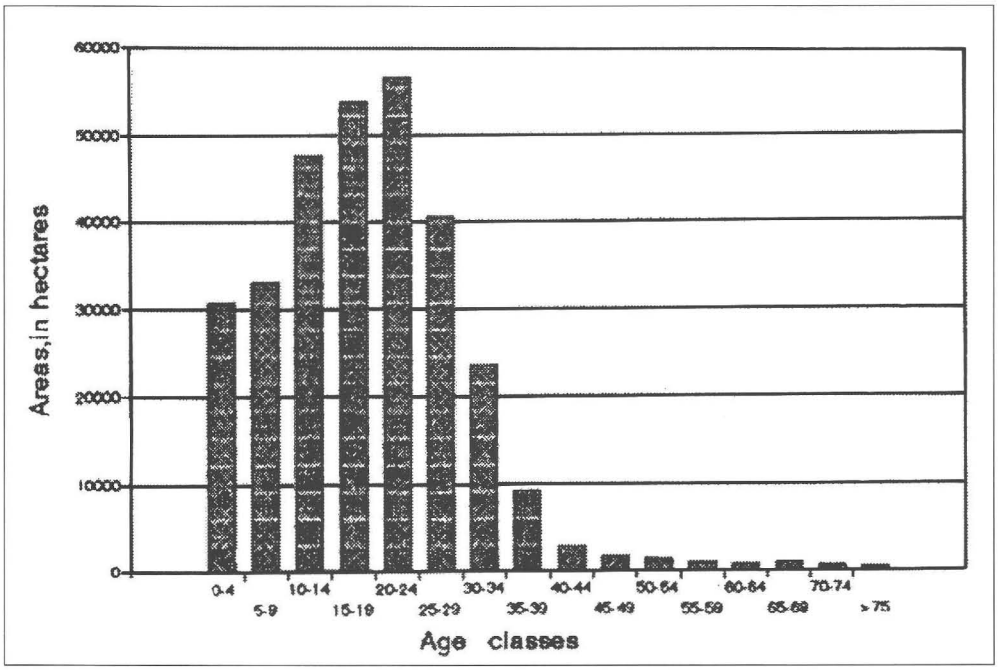

Figure 2. *Areas of Douglas fir in France by age class (1992 data)*

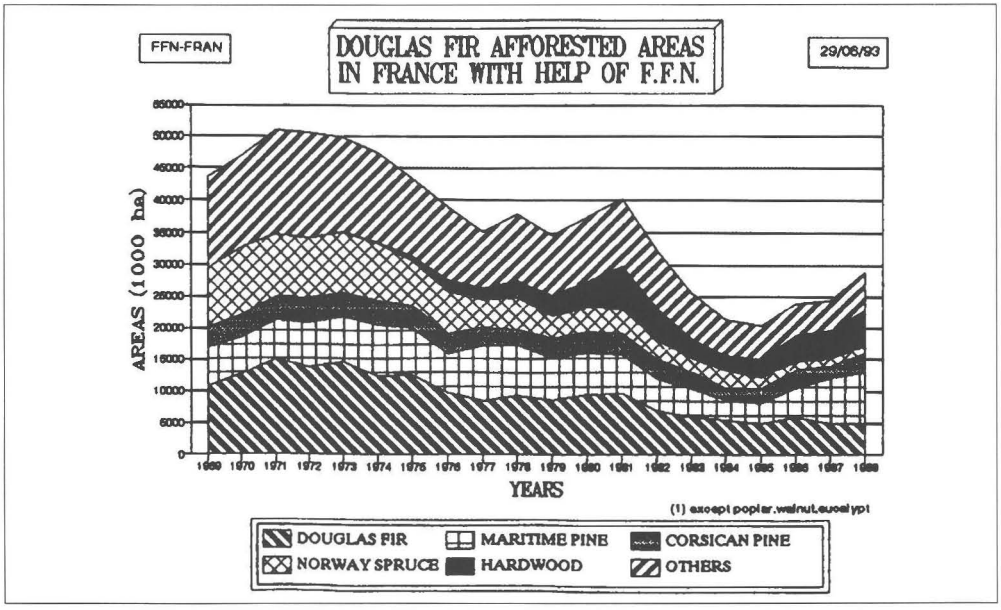

Figure 3. *Areas of plantations established under grant aid from FFN (apart from eucalyptus, poplar and walnut)*

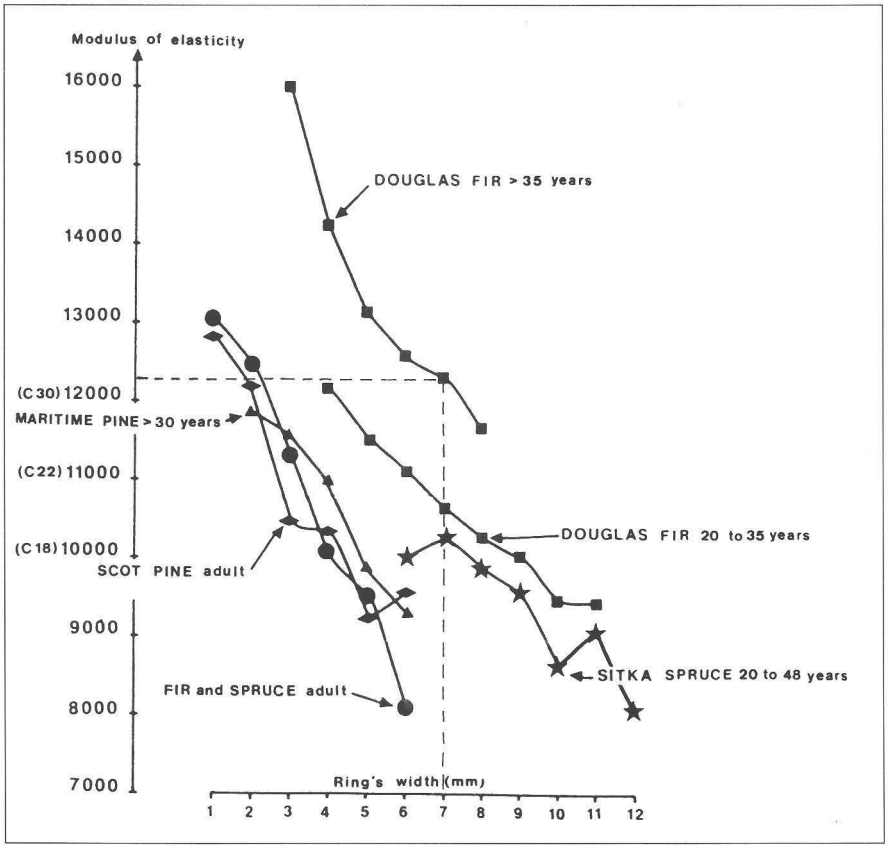

Figure 4. *Correlation between modulus of elasticity and ring width for some conifers*

We often use chemical weed control with herbicides such as triclopyr.

5. Silviculture

The conventional French 'yield table' silviculture is not applied as the regime for Douglas fir is quite different from the normal. The number of thinnings, for example, is more numerous and the plantation density and number of stems removed at first thinning is quite different from the conventional. In practice starting at about 1,000 stems/ha it is possible to go to 300/ha in only two or three thinnings. This results in a more uniform ring width, gives better stand stability and optimises the discounted cash flow.

First thinning is often systematic (one row in three or one in five), subsequent second and third selective thinnings remove from 20 to 30% of stems. First and second thinnings are more and more mechanised.

Crops are clearfelled at from 40 to 50 years of age, when the stocking varies from 300 stems/ha (tree volumes up to 1.5m^3), to 225 stems/ha (tree volumes up to 2.5m^3). Pruning is now practised extensively, to a height of 6m. It is done either at first thinning

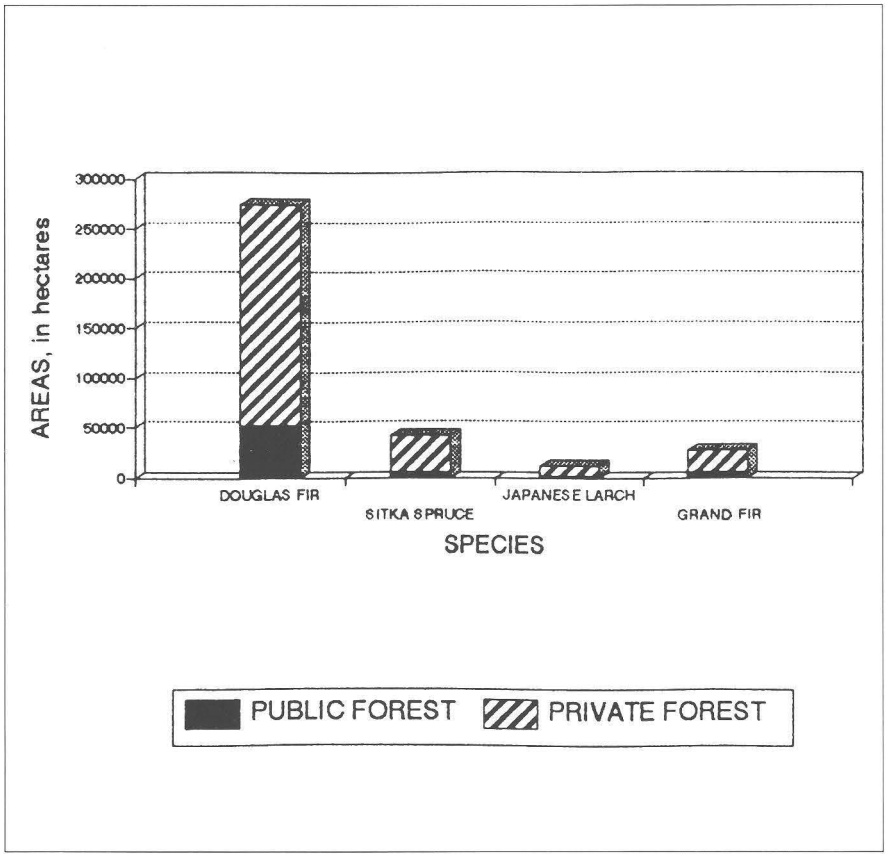

Figure 5. *Development in France of four exotic softwods*

stage or a few years before. Two hundred stems/ha are selected and pruned using either the conventional pruning saw or a pneumatic secateurs. Pruning machines are rarely used.

6. Protection

As far as diseases are concerned "Swiss rust" (*Phaeocryptopus gaeumannii*) is common but it is easy to counteract with NP fertilisation. The occurrence of *Fomes annosus* is exceptional. The principal insect is *Hylobius abietis*, frequent after pine clearfelling. It affects all species but treatment is easy with insecticidal sprays.

Frost damage is avoided and reduced by the use of late flushing provenances. Wind damage risk is often over-estimated, Douglas fir is not very susceptible to windthrow (provided the height/dbh ratio is less than 75). It is certainly less susceptible than many other species, particularly Norway spruce.

The species is palatable to deer and in France we have problems with roe deer where they are too numerous.

7. Yield

The yield table for West Massif-Central gives production over height (Table 3).

Of course these are theoretical production levels but we can easily enough have 75 to 80% of these in practice.

Site class	*Height (m) at 50 years*	*Cumulative production (m^3/ha) at 50 years*
1	34.1	1049
2	31.2	928
3	28.3	808

Table 3. *Volume production/top height relationship for Douglas fir*

8. Wood quality and uses

The wood of Douglas fir is excellent, even where the diameter growth is fast. For the same annual ring width, mass per unit volume, modulus of elasticity and tensile strength are higher than for other conifers. As shown in Figure 4 for a 7mm ring width the modulus of elasticity is greater than 12,000 Newton/mm^2 (1200 MPascals) and the wood therefore qualifies for the top strength C30 structural grade. So our silviculture which will give this type of diameter growth is certainly a good compromise between growth, stability and profitability.

What are the uses for Douglas fir wood?

- small trees (dbh 10-15cm): pulp, fibre-board, or particle-board
- medium trees (dbh 20-25cm): pallets, small sawlog applications
- big trees (dbh 30+): carpentry, joinery or peeled veneers (if pruned).

9. Research

At AFOCEL Douglas fir research is concerned with:

- breeding
- clonal propagation techniques
- afforestation techniques
- silviculture and growth modelling
- wood quality.

10. Who plants Douglas fir?

Private forest owners were the first to plant the species and today they own 81% of Douglas fir plantations. You can see from Figure 5 that of the four main exotic conifers planted in France that Douglas fir is by far the most predominant, despite the fact that all four were at more less the same level 50 years ago.

11. Why plant Douglas fir?

Douglas fir has five main qualities:

- it is a fast growing species as early as the second year after planting
- it has very few diseases and is wind-firm
- it has high productivity
- it has high wood strength
- it leads to no soil degradation

And it qualifies for a subsidy ! So, now you know why I think that Douglas fir is the best conifer in the world!

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New woodlands in lowland Britain

P. M. Tabbush

Summary

Advances in technology will mean that significant quantities of arable and grass land will become surplus to agricultural requirements in Britain over the next 20 years. This represents a real opportunity for the creation of new woodlands. A programme carried out by the Forestry Authority Research Division to facilitate the creation of new farm and urban woodlands is briefly described, and the main recommendations discussed.

"Advances in technology will mean that significant quantities of arable and grass land will become surplus to agricultural requirements in Britain over the next 20 years"

Introduction

British Forestry Policy, and the silvicultural research which supports the policy, evolved rapidly in the 1980s. This was the result of the development of a new broadleaves policy, and a new emphasis on the non-market and public benefits of trees and woodlands, especially near centres of population. The Community Forest supplement to the Woodland Grant Scheme aims specifically to secure public access. This reflects the current government view that public money should be used to provide public benefits, and that timber production *per se* is not automatically regarded as conferring public benefit. Inevitably attention has

"Production *per se* is not automatically regarded as conferring public benefit"

focused in the lowlands of England where there is the greatest population density, the most fertile land, and a predominantly broadleaved woodland landscape. The following key issues now pre-occupy the research programme:

- Farm Woodlands – the creation of multi-purpose woodlands on land surplus to agricultural requirements.
- Urban and peri-urban initiatives, including "community forests".

In this paper, I shall take a closer look at these land-use changes, and at the silvicultural issues which have been raised as a result.

Agricultural surpluses

Agriculture surpluses are the result of improvements in technology, for example the increase in the average yield of wheat from 2.5 tonnes/ha in 1947, to 6.4 tonnes/ha today (McCleod, pers. comm.), whilst demand is projected to be more or less static (North, 1990). Table 1 shows agricultural land-use in Great Britain projected to 2015 on the basis of the application of existing technology, and predicts 5-7 million hectares of land surplus to requirements, mostly taken from sheep and cereals.

Areas in millions of hectares:

	1985	*2015(1)*	*2015(2)*
All Cereals	4.0	1.5	1.6
Dairy	2.2	0.6	2.4
Beef	1.9	1.4	1.4
Sheep	8.1	6.2	6.2
Other	1.0	0.9	0.9
Total	17.2	10.6	12.5

(1) Efficient; (2) Restricted Nitrogen Input.

Table 1. *Forecast land-use budget for Britain. (after North 1990).*

In contrast, Great Britain is only 10% forested, and only produces 12% of its consumption of wood and wood products, with imports worth £6.3 billion in 1992 (Anon, 1993).

"Great Britain is only 10% forested, and only produces 12% of its consumption of wood and wood products, with imports worth £6.3 billion in 1992"

Farm woodlands

The Farm Woodland Scheme, which offered planting grants and annual payments in compensation for loss of agricultural revenue for woodlands planted (mainly) on arable land, failed to meet its target of 36,000ha of new woodlands over the 3 years that the scheme operated. A final total of 13,908ha was approved and 11,672ha have actually been planted. The planting grants for broadleaves were worth twice as much as those for conifers, and this is reflected in the figures for species planted (10.4 million broadleaves, and 5.7 million conifers to May 1990).

Experiments on arable land

A series of experiments were set up on farms during the 1980s (Williamson, 1992a) to investigate methods for establishing new farm woodlands. At the time, it was felt that arable land might offer fewer problems than upland pasture, while allowing for a greater range of species and silviculture options. As might be expected, arable land proved to have a set of problems of its own:

- Weed growth is luxuriant, and weed control methods developed for upland forestry are inappropriate.
- Much of England's arable land overlies chalk and limestone, and arable agriculture disturbs the soil profile so that the soils may have a pH>7 right to the surface.
- Heavy, fine-textured clays are subject to waterlogging in winter, drought in summer, and deep fissures can appear which expose the roots of planted trees.

The work has led to a set of practical recommendations (Williamson, 1992a). To summarise:

- Cultivation greatly stimulates weed growth and if possible grass swards and arable stubbles should be left undisturbed. However, many of the sites have a plough-pan which must be disrupted by ripping.

- Specific weed control prescriptions are necessary. A range of herbicides known to farmers have been tested on trees, and given off-label approval for use in farm-forestry (Williamson, 1992b).

- At 3 x 3m spacing, mechanical equipment can be used, but large areas between the rows of trees are unproductive during the early years of establishment and a range of vegetation treatments, including wild flower mixtures and kale for game cover, have been tried as alternatives to mowing the vegetation between the weeded rows.

Poplars and energy forests

The new Belgian poplar clones, which offer outstanding growth and disease resistance, are likely to find a place on surplus arable land, and low-lying grass land. They may be managed using a variety of spacings and rotation lengths, depending on the desired end-product:

Initial spacing	*Rotation length*	*End product*
1m x 1m	2-5 years	Energy chips
3m x 3m	8-15 years	Pulp/fibre/ energy chips
8m x 8m	20-25 years	Veneers

The main thrust of the research programme is disease screening and the evaluation of new clones, including yield in relation to site. The programme is part financed by the Energy Technology Support Unit, and part by two small EC contracts.

Woodlands around towns

The three lead Community Forests have now produced their strategic plans, and the scope of these is much wider than a classical forest working plan. There is strong emphasis on recreation, amenity and community relations, and rather less on basic land use facts which might be useful in attaining a significant expansion of forest cover with the designated areas.

"The new woodlands should not be limited by unduly rigid adherence to ideas of 'naturalness'. New woodlands around towns serve a function intermediate between that of a garden, and that of 'wild-space'. Above all they must be attractive."

The Forstry Authority Research Division has been active in establishing fairly large (1-20ha) demonstration woodlands, first to demonstrate what can be achieved and how to achieve it, and second to gain experience of the issues involved. To summarise:

- Much urban land is damaged to some degree. In Thames Chase Community Forest, for example, which extends to over 30 square miles, 16% of the area overlies landfill. The specifications for reclamation rarely envisages a woodland after-use, and some of this land is

quite unsuitable for the creation of new woodlands.

- The new woodlands should not be limited by unduly rigid adherence to ideas of 'naturalness'. New woodlands around towns serve a function intermediate between that of a garden, and that of 'wildspace'. Above all they must be attractive.

- Exotic tree species, capable of thriving on difficult and damaged soils, and offering the many benefits that trees can bring to the lived-in environment, will often find a place.

"The grant schemes allow maximum payment at the minimum stocking of 1,100 stems per hectare. This may be adequate for restocking woodland sites but is unlikely to result in high quality timber production when applied to the afforestation of agricultural land"

- Urban planting schemes specified by some landscape architects are excessively expensive and inappropriate for the creation of new woodlands.

- Trees need to be planted at relatively narrow spacing, using inexpensive forestry-type planting stock. Plantings of this nature are more robust than plantings using expensive whips and standards, over-protected with lots of wire and woodwork. They can withstand minor losses, and are less likely to attract vandals.

Spacing

Initial spacing has proved to be an important issue in the creation of both farm and town woodlands. The grant schemes allow maximum payment at

"The creation of new woodlands in the lowlands under the Woodland Grant Scheme and Farm Woodland Scheme has largely employed native broadleaved species."

the minimum stocking of 1,100 stems per hectare. This may be adequate for restocking woodland sites where volunteer woody growth provides a degree of shelter and side-shade, but is unlikely to result in high quality timber production when applied to the afforestation of agricultural land, especially with species with weak apical dominance like oak and beech. Unfortunately, such is the power of financial incentives that planting at this density has been widespread, and indeed our current recommendations for the establishment of farm woodlands assume tractor access. The use of treeshelters to protect against animal damage, and also to allow the use of non-selective herbicides, becomes prohibitively expensive for larger schemes at narrow spacing. On the other hand,

narrower spacings confer the following advantages:

- Earlier suppression of weeds and hence lower maintenance costs.
- Greater tolerance to animal and climatic damage.
- Flexibility to manage the stand to meet variation in site conditions, people pressure, etc.

Recommended stocking densities for the production of high quality broadleaved timber are given in Forestry Commission Handbook 9 (Kerr and Evans, 1993).

Native broadleaves

The British Government's Broadleaves Policy has heightened interest in the management of existing broadleaved woodlands. The creation of new woodlands in the lowlands under the Woodland Grant Scheme and Farm Woodland Scheme has largely employed native broadleaved species. The importance of our small remnants of ancient semi-natural woodlands (less than 1% of woodland cover) has been highlighted by Rackham (1980) and Peterken (1981). For these reasons, a new research effort is being put into the ecology of native broadleaves and the creation of new native woodland.

Conclusions

Land use change in Britain has already begun and is gathering pace. The land which is becoming available for afforestation presents a new challenge which will require the development and communication of a new set of silvicultural recommendations. Foresters will need to understand, as always, the needs of the land owner and the public, and the ecology of the tree species they choose to plant.

There is much scope for the expansion of forestry in the lowlands, and silviculturalists will need to remain close to policy makers, since the structure of grant aid will be the single most important factor in deciding the nature of the new woodlands created.

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Ireland – changes in agricultural policy and their impact on private forestry

Michael Bulfin

Summary

The reform of the Common Agricultural Policy has introduced a number of possibly conflicting schemes in the area of land use. Many of these schemes impinge on the forestry programme. All land that goes to forestry is dependent on the decisions of individual farmers to sell or to plant themselves. The level of farmer forestry, indeed, the whole level of new afforestation may be controlled by the interaction of these schemes. Coillte will continue to plant new land probably of better quality than that of the Forest Service in the past. The investment companies are not likely to be major players in new afforestation unless there is a change in investor type. There is an increasing tendency for farmers to plant their own land. If farmer forestry is to become a major component in the afforestation drive then the level of grants and other supports must be competitive – or somewhat more attractive – than those which allow a farmer to remain in agriculture.

Introduction

The reform of the Common Agricultural Policy (CAP) and its effect on Irish agriculture is difficult to measure precisely. The reform measures themselves, superimposed on the measures that are already there, form a complex intertwined network of quotas, restrictions, subsidies and direct payments. While their intent as individual EU/Irish Government Regulations may be clear, their impact as a group (of possibly conflicting supports and requirements) in practice may have a combined effect greater or less than that originally intended. Only after the first year or so under the reformed CAP regulations will the pattern of effects become clear. The major thrust of the reform measures are to reduce agricultural output, reduce direct price support for a wide range of agricultural products, and, through direct payments to farmers, to support the producer and not the product.

It must be clearly understood that the measures in the CAP are designed to impact on agriculture. Forestry and the promotion of forestry, in as much as it enters into the CAP, is seen purely as an alternative use to remove land out of agricultural production. The EU does not have a forest policy as such, it has an agricultural policy. Also, while some measures – such as the Forestry Operational Programme – definitely promote forestry, others – such as the extensification measures and the arrangements for set-aside or the workings of the retirement scheme –

definitely militate against encouraging farmers into forestry. The likely impact of these regulations is to increase farm income without increasing output. This makes these schemes very attractive to farmers. EU measures conflict – or counterbalance each other – and farmers may hesitate to plant.

It would appear that the confidence that is currently there in the private forestry scene, while not ephemeral, is a very brittle and insubstantial thing – heavily dependent on grants and premia. It is also important how these grants and premia compare to other alternative EU agricultural supports. Forestry – but particularly afforestation – is at the crossroads. Those who make the key decisions must act swiftly and decisively, to knit the threads of the current complex web of measures into a coherent package to promote forestry. This should be simplified now that all the players are in the one government department for the first time in 60 odd years. The momentum that has been built up can just as easily be dissipated – confidence among farmers is a tenuous thing that can be destroyed by hesitation, parsimony or delay.

"Forestry and the promotion of forestry, in as much as it enters into the CAP, is seen purely as an alternative use to remove land out of agricultural production. The EU does not have a forest policy as such, it has an agricultural policy."

Afforestation is no longer a matter for state officials to act as purchasers of last resort and planters of marginal land. This role has now been inherited by Coillte whose estate now acts as the bedrock of Irish forestry. Coillte, however must assess each purchase on its economic or strategic merits and so will seek the most productive land it can afford to buy. Thus the most marginal lands are likely to be left unplanted. The private forestry sector, which state officials now directly 'control', is equally if not more important for the future direction of Irish forestry. Private but especially farmer forestry is particularly 'market led'. On the financial side, in the case of farmers, it is not so much Internal Rate of Return or Net Discounted Revenue that is important but annual "cash flow" through the grants and premium that influence decisions about land use. But there are many more complex reasons including: farm size, farm enterprise, stage in life cycle, age, location in the east or west of the country, and degree of dependence on state welfare or other supports, which may have a greater influence on farmers decisions about forestry.

This paper looks at a number of issues relating to the potential level of private but more specifically farmer forestry. As the figures will show farm forestry, whatever its faults and drawbacks, is now a major third element, with the potential to be the major force in the afforestation programme. The other two elements are Coillte and the large private investment funds. It is likely that farm forestry will, in the future, form a greater portion of private afforestation than all types of investment forestry.

	1987 Ha/An
Benelux	200
Denmark	300
Germany	500
Greece	4,000
Portugal	5,000
Ireland	8,500*
France	10,000
Italy	19,500
UK	23,358
Spain	67,000

*Omits reforestation

From 1987 to 1992, Ireland planted the largest percentage of land in the EU. Afforestation rates for 1989, 91 and 92 were 15,220, 19,250 and 16,740 ha respectively

The relatively high afforestation rates for the UK in 1987 have not been maintained – there has in fact been a large decrease in subsequent planting figures due to change in tax law.

Table 1: *Net afforestation rates for the EU*

Place of new afforestation in Europe

Currently Irish forestry amounts to only one percent of the total EU forest area. Even if we double our area of forestry we will control only a very insignificant area of European forestry. While our total area of forestry may not be impressive, our rate of planting certainly is (Table 1). Next to Spain we are now planting the greatest total area of land of the 12 EU countries. On a percentage of total land area we have the fastest planting rate – planting some one third of one percent of our total land area per annum – this, indeed, may be one of the fastest planting rates in the world.

The CAP reform measures are designed to be effective at European wide level. While the agricultural measures will impact over most of the community the ability for certain countries to adopt forestry measures is more limited. Belgium currently has a variety of legal restrictions which make afforestation particularly difficult for any landowner (Lust, N., and Muys, B., 1993). Holland has little area to contribute to forestry and most of this goes towards amenity and recreational purposes to cater for the needs of the huge population (Swellengrebel, E. J. G., 1993). Germany may find it difficult for a wide number of reasons to increase their forest area except in the former German Democratic Republic (Weber, 1993). Other countries, while putting strenuous efforts into increasing their forest area, may have particular problems. Very small holding sizes and fragmentation of holdings, on a scale unknown in Ireland, pose problems for certain areas in France, Italy, Spain and Portugal. If the forestry measures are seen to falter in those countries, like the UK, Spain, Portugal, France and Ireland, where most is expected, then the efficacy and utility of afforestation measures, as a means to reduce agricultural output, may be called into question at Commission level.

Building confidence

It is imperative that the momentum of Irish private afforestation be maintained. If this requires changes in grant levels or duration, targeting of

grants at specific regions or species, improved advisory services or more vigorous promotion then this should be done. Confidence in Irish forestry must not only be maintained in Ireland but also in Brussels. It is vital that the socio-political decisions on rural welfare, which are made in Brussels, include and continue to support forestry. Kearney has shown how the new CAP measures act to make forestry less competitive – they must be counteracted as quickly as possible (Kearney, B., 1993). We cannot let a climate of doubt or delay allow a reduction in the momentum that has been built up. Once farmers lose confidence in forestry then that confidence will be harder to restore than it was to build originally.

Ownership of future forest land

All land which is afforested in Ireland is or was owned by farmers or their inheritors. Whether this land is sold to Coillte, investment institutions or other private investors or whether the farmer himself plants his land there is still a major change of land use. Analysis of the wider implications of such a change is essential information on which to base any policy for the wider use of land. If land use policy is not driven by fact then it will be driven by sentiment.

There have been considerable changes in the ownership pattern of newly afforested land since 1980. An analysis, however rudimentary, of these changes may give some clue as to the future trends in forest ownership. The effect of the various grants and support schemes can also be traced in their influence on the various categories of planters. If we are to meet the government's target of 30,000 hectares per annum then we must mobilise all organisations and individuals and maximise the areas they plant

Two tables are presented in this section analysing trends in the period 1982-1985 and 1986-1992. This section will concentrate on the 'private forestry' sector – the figures from the Forest Service/Coillte are included in as much as they shed light on the overall transfer of land to forestry. Two aspects of these tables throw some light on the future development of ownership patterns of new afforestion. The first point of interest is the relationship of 'farmer' to 'investor' planting for each of these years. Secondly, the proportion of farmer planting in relation to the total area afforested is of interest.

The period 1982-85 has been dealt with in a paper published in 1986 (Bulfin and Connolly, 1986). One table taken from this source has been modified for this paper and gives a detailed breakdown of the various types of own-

Table 2: *Private afforestation assisted by The Western Package Grant Scheme 1982-85*

Year	*Investor*	*Other*	*Farmer*	*Farmer as % of Private Planting*
	Ha	*Ha*	*Ha*	*Ha*
1982	15	85	88	47
1983	35	51	74	45
1984	67	108	110	38
1985	246	129	235	38

Source: Bulfin and Connolly, 1986

ers who planted in those years. The table, (Table 2), while dealing with quite small areas planted, has a better breakdown of detail between investor and 'other' categories. In this table 'investor' can be taken to indicate mainly the larger institutional investors, while 'others' covers all other non-farmer investors either absentee owners, local business persons etc. The table shows that over the period, farmer afforestation accounted for 41 percent, investors for 29 percent and others for 30 percent of the area planted. Overall the private sector only accounted for 8.7 percent of the total area planted as the Forest Service was still the major planting agency. Farmer planting accounted for 3.6 percent of the total land area planted. The major grant scheme in force at this time was the Western Package Scheme which was confined to the twelve western counties. This scheme, as well as the various agricultural supports it offered, included a grant scheme aimed at private afforestation particularly by farmers. The scheme became generally operational during 1981 and was to last for ten years. There was a planting target of 25,000 hectares set – a yearly target of 2,500 hectares.

By 1985, the half way mark had almost been reached in the Western Package Scheme operational period and only 2,060 hectares of private forestry had been planted. Farmers, who were the prime target of the programme, were accounting for only 40 percent of Western Package planting.

Farmer planting

While some commentators may state that plantation forestry is only another form of farming, most farmers do not see forestry in that light. In The Leitrim Resource Survey of 1978 it was clearly stated that there were severe problems facing small farmers going into forestry as they would lose their annual income, however small, from agriculture as well as put at risk eligibility for state supports such as social welfare and health entitlements. The Leitrim Resource Survey Report, which was the first major agricultural/rural development survey to look seriously at forestry as a farm enterprise, advocated some form of annual payment for farmers. This payment, called the Annuity Purchase Scheme, which was based on the expected Yield Class of the forest crop, was to be paid by the state or some other agency, such as a pension fund. In return the state or funding agency would get a major portion of the crop at harvest (Bulfin, 1978). In 1986 Bulfin made the same

Year	*Total*	*Coillte*	*Private*	*Farmer*	*Farmer as Percent of Private*	*Farmer as Percent of Total*
1986	7249	4689	2560	461	18	6.3
1987	8608	5395	3213	771	24	9.0
1988	12376	7122	5254	1839	35	8.8
1989	15224	6625	8595	3868	45	25.4
1990	15886	6670	9216	3963	43	24.9
1991	19256	7855	11410	7981	70	41.4
1992	17182	7565	9617	5385	58	31.3

Source: Forest Service

Table 3: *Coillte private and farmer afforestation 1986-1992*

arguments to the major European-wide study by the then EU's Forecasting and Assessment in Science and Technology (FAST) Programme on Forestry, entitled 'Forestry – The Challenge of the Future' and these were incorporated into the final FAST Reports (FAST, 1986). In 1987 further proposals for the development of farm forestry were made as part of the final report of a research project commissioned by the EU entitled 'Determining The Role Of Private Forestry On Highly Productive Forest Sites In Agriculturally Disadvantaged Areas'. The basic supports as seen by this Report that were necessary to stimulate farmer forestry were:

- increased planting grants,
- an active advisory service,
- demonstration farm forests,
- a forestry co-operative support network,
- but the most essential element was seen as some form of annual income.

(Bulfin, 1987).

Table 3 deals with the period 1986 to 1992 and shows a very different pattern emerging in the private forestry sector. With the restrictions on agricultural production increasing and prices decreasing farmers were beginning to look seriously for alternative enterprises. EU policy was beginning to offer incentives to help farmers to move into alternative enterprises. The Compensatory Headage Payments, to farmers who switched land to forestry, were the first faltering steps in this direction. But the headage payments, which are payments to farmers in disadvantaged areas to supplement their income, required that a farmer reduce his stock numbers before qualifying and had other restrictive elements. The payments were fixed at £70 per hectare and would not replace income lost in complying with the required reduction in livestock numbers. Compensatory Headage Payments were aimed at reducing farm surpluses rather than encouraging forestry. The scheme was modified almost every year for the next few years but was never really attractive to farmers. The Compensatory Headage payments were too little and ran counter to the instinctive urge of farmers to produce agricultural goods.

"There is a move away from the most marginal of soils and towards better quality land – perhaps a better quality of marginal agricultural land."

The Premium Scheme introduced in the 1989/90 period was the first successful attempt to put a real annual income into the hands of farmers who planted. The whole series of new supports introduced in the Forestry Operational Programme 1989-93 have had a major influence on the afforestation programme. The structure of the grants also indicate that there were the beginnings of a land use policy being formulated by the Forest Service as indicated in the direction being adopted in the grants. There is a move away from the most marginal of soils and towards better quality land – perhaps a better quality of marginal agricultural land. The supports, both planting grants and premia also favour the use of broadleaves. As these grants are familiar to all through the excellent brochures issued by the Forest Service they need not be detailed here. Suffice

it to say we now have an active advisory service, a series of demonstration farms, the beginnings of a network of forestry co-operatives, a rapidly developing Timber Growers Association, improved and more directed grants and a respectable forestry premium scheme.

The combined effect of all these supports has been dramatic. Farmer planting has gone from 770 hectares in 1987 to 8,000 hectares in 1991. The really dramatic increases began in 1989 when the new supports were coming on stream. This represents some 70 percent of all private planting and 40 percent of all planting including Coillte – a very substantial contribution to the afforestation targets. Also of significance is the substantial drop in farmer planting to 5,300 hectares in 1992, part of which may be attributed to farmers holding off planting while waiting for the new grants to be introduced.

Not all farmers were eligible for the premium because between 1989 and 1991 there was an upper income limit of £11,000, which included spouse's income. This excluded some farmers especially in the better-off areas of the country, where many farmers would have greater incomes. In the western areas income from off-farm employment would push farmers above the limit. However, the limit was increased to £14,300 by 1991 and farmers whose income exceeded this level were eligible for a reduced premium of £50 per hectare rather than the full premium of £116 per hectare. In analysing the figures for the Farm Premium scheme, du Quesne (1993) stated that this revision has had an effect on premium applications. In recent years the number of beneficiaries rose from 21 in the second half of 1990 to 319 in 1991 and 643 in 1992 (du Quesne, 1993). In a further analysis, Table 4, of the area funded under the Premium scheme some interesting facts emerge about the type of land that is being supported under the premium scheme.

Table 4 emphasises even more, the implied effect of the increase in allowable income level and the reduced premium for those over the allowable limit for full premium. What is also of interest is the extent of 'unenclosed' land that is being planted. This is running at some 36 percent of the total conifer area. While this is a considerable improvement from the situation within the state forestry planting programme, even a few years ago, the intention of the Forest Service to encourage farmers to plant more of

Forest Type	*1990 Ha*	*1991 Ha*	*1992 Ha*	*Total Ha*
Conifers	175	2831	6313	9319
of which Enclosed	97	1937	3971	6004
Unenclosed	78	894	2343	3315
Unenclosed as % of Total Conifer	45	32	37	36
Broadleaved	10	27	122	159
Total Forestry Premium	185	2858	6436	9479

Source: Adapted from du Quesne, (1993), p 31

Table 4: *Area approved for the Forest Premium Scheme*

their 'enclosed' land has not been fully realised. An optimum ratio of one hectare of unenclosed land for every 9 hectares of enclosed land planted is suggested in this paper as an acceptable and achievable target.

The most important message to be taken from these figures is that farm forestry can be a sizeable contributor to the afforestation programme. However, farmers are extremely sensitive to the financial returns from forestry. But the financial returns they look to are the annual 'cash-flow' in the form of the premium. Net Discounted Revenue and Internal Rate of Return are of very little interest or significance to a farmer. Not that farmers are unaware of the growing capital asset which forestry represents but they have to be more pragmatic and weigh up their income on an annual basis. Their prime concern is to maximise their benefits from their land. Their main comparison is weighing up any losses from their reduction in agricultural output from the land transferred to forestry against the immediate gains under the premium. Of significance is that farmers are very responsive to grants but they are also a far more volatile group than any of the other players in the afforestation scene. Also whether they plant themselves or sell their land to others for afforestation is going to be of major importance to both Coillte and other investors. There is a finite amount of land available to come onto the market for afforestation each year – how much actually does will depend on the combined decisions of a very diverse group of farmers/ landowners.

Afforestation by investors

The attitude of the investor and institutional market to forestry was succinctly summarised by John Bruder of AIB Investment Managers in replying to Brendan Kearney's paper "Economic Issues in Irish Forestry" to the Statistical and Social Inquiry Society of Ireland in March 1993 (Bruder, 1993). In his presentation Bruder made three major points from an investors point of view.

(1) The Internal Rate of Return (IRR) to forestry (YC 20), estimated by Kearney at 5.1-6.6 percent depending on assumptions, was not considered good enough for investors, at a time when 'risk free' investments (Government gilts – early 1993) are yielding in excess of 7.5 percent. This would indicate a real rate of return in the short term of 4-5 percent when current inflation is taken into account. There is, therefore, no really sizeable financial attraction in forestry for the major investors.

(2) He indicated that from an investor's point-of-view there were major problems with forestry investment at present. Apart from the lack of real return there is also the problem that there is little or no market in immature (or for that matter semi-mature) forest properties. This lack of 'liquidity' or ability to realise assets quickly in forestry investment is a major problem for investment managers. Property investment, which also has a certain illiquidity to the cautious investment manager, needs to return 3-5 percent above the risk free rate of gilts. It is obvious that forestry, which is outside the everyday ken of investment managers and which would be regarded as a relatively risky investment, would need a considerably greater premium over risk free gilts. It is unlikely, therefore, that institutional

investors will play a major role in private forestry.

(3) However, Bruder did not rule out institutional investors investing in forestry. The flow of returns in forestry can prove acceptable for some types of investment portfolios. However, the percentage of any institution's portfolio devoted to forestry is likely to be very small. Bruder considers that forestry should not exceed more than one percent of a balanced investment portfolio. While such a percent may appear small in portfolio terms, if all investment managers were to follow suit then there would be a considerable impact on the land and afforestation markets. Yet most investment managers have not as yet gone into forestry and seem unlikely to do so in the future.

"The economics of scale require that properties of a certain minimum size are needed before investment can be considered. AIB currently sets this minimum size at 40 hectares. A glance at the farm-size figures for most of the country indicate that there are very few farms in this category especially in the marginal land areas most often targeted for forestry."

Property size was also a major stumbling block for investing institutions. The economics of scale, from their point of view, require that properties of a certain minimum size are needed before the investment can be considered. AIB currently sets this minimum size at 40 hectares. Bulfin has shown that there are considerable difficulties with such size limitations (Bulfin, 1987a, Bulfin, 1993). To acquire blocks of this size whole farms must be bought or smaller farms amalgamated. A glance at the farm-size figures for most of the country indicate that there are very few farms in this category especially in the marginal land areas most often targeted for forestry. Normally the larger farms are the most viable and would be most capable of supporting a farm family and their removal from farming is least likely to happen. The exception to this is on the more marginal climatic peats and mountain areas, where larger farm units exist and occupants have in many cases been forced to seek off-farm employment. However, the afforestation of these areas has considerable drawbacks for investors, with longer rotations, poorer yields and greater risks.

Other possible major investors

While conventional pension fund investors are unlikely to make a great impact on future afforestation there remains two other possible sources of relatively large scale holdings being built by investors/processors. Hegarty (1993) in comments to Kearney's paper indicated that large EU forest investment companies may be interested in building up holdings in what they perceive to be a country with rapid growth rates and a rapidly developing forest infrastructure. This type of investor, who is more familiar with the forestry production cycle, may be more likely to invest for the long haul.

However, they will, in most cases, have to invest through the current management companies and will be competing for the same pool of land as Irish investors. These investors, who are familiar with forestry, are likely to require a better quality of forestry investment and will tend to seek a higher quality and more diverse estate management than just pure Sitka spruce. Most such investors will require a sizeable proportion of broadleaves and possibly an estate suitable for hunting and shooting. They look not just to the cash IRR but also to the value of the non-wood benefits such as the amenity, recreation and aesthetic value of their estate.

The second possible source of investors, with forestry based backgrounds, capable of building up holdings of significance, comes from the advent of new wood processors into the market. In some cases, whether for technical reasons of manufacture, or security of supply they may wish to build up a holding of forestry. It is more likely, whether they are trying to buffer or protect the continuity of their supply or provide a different type of processing material, that the type of forestry these investors will engage in will be based on shorter rotations – possibly with broadleaves. An example of this type of contingency planning was the poplar plantations planned by Rauma for their proposed new plant in Northern Ireland.

"The second possible source of investors, with forestry based backgrounds, capable of building up holdings of significance, comes from the advent of new wood processors into the market."

Overall large scale investors are likely to account for not more than 10 percent of private forestry planting. Other 'investors' such as absentee owners, local business and professional people, and farmers themselves buying other farms for planting are likely to account for 20-30 percent of planting. Therefore, it is estimated that farmers planting their own land will account for 50-70 percent of all private planting. Thus, the total level of private planting will be greatly dependent on the rate of farmer planting.

Conclusion

If national planting targets are to be met then a considerable increase in farmer planting must be stimulated. This requires continuous monitoring, not just of the forestry supports but of their comparative attractiveness vis-à-vis their agricultural equivalents. The level playing field will be hard to achieve against the weight of the agricultural lobby. Of particular concern apart from the greatly increased rate of direct payments is the new extensification premium, the retirement scheme and the current set-aside regulations. Considerable efforts will need to be made in the support services to farmer forestry with a pro-active advisory service, educational opportunities for all those contemplating a forestry enterprise. It may also be necessary to provide certain essential services similar to the management, inventory sale packaging and marketing from a central source either through a co-op structure or through the expanded activity of the Forest Service.

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Augustine Henry Memorial Lecture, 1993

The use of trees and woodland in early medieval Ireland

Aidan O'Sullivan

Introduction

Trees and woodland are peripheral to the main concerns of early medieval historical studies today. In a sense, this is an outcome of the contemporary image created by medieval urban writers who rejected woodlands as dark, wild places, full of beasts and unknown dangers. Ironically, modern archaeologists tend to have much the same opinion. In many archaeological studies, woodland is only seen as a kind of economic 'black hole', being a place in the landscape that first needed to be cleared before it could be useful for agriculture. The use of woodland resources continues then to be seen as only of marginal importance for economic history.

It is not the purpose of this paper to over-emphasise the importance of woodland, a position that would be at variance with well-established evidence. The wealth of early medieval Dublin, for example, was based on a regional and maritime trade of hides, leather, wines, fine metalwork, amber jewellery and slaves. It is also clear that the early medieval Irish agricultural economy was highly structured with roadways, field-systems and settlements distributed throughout a landscape hardly more forested than today's. There is no room in such models for vast tracts of dark, primeval woods, populated by mythical Irish squirrels wandering large distances from leaf to branch. It has been said that wood was the oil of the middle ages. Archaeological excavation has abundantly illustrated that wood provided fuel for warmth, the underwood and timber for houses, pathways and waterfronts and the raw material for an array of domestic and industrial crafts (O'Sullivan, 1990). The importance of woodland resources as an aspect of a complex economy in both rural and urban landscapes needs to be assessed.

Pollen evidence

A reconstruction of the role of woodland in early medieval Ireland (6th-12th century AD) can best be carried out through a combination of historical, archaeological, palynological and dendrochronological evidence. In terms of assessing the actual character and extent of woodland, of primary importance is the analysis of pollen cores taken from raised bogs and lake muds. Pollen evidence from such sites as Garrandrean, Co. Wexford has been taken to indicate large scale clearance in woodland cover between the fifth and eighth centuries AD, due to increased tillage and agriculture (Culleton & Mitchell, 1976). Thereafter, the landscape would have been generally open, with only scattered oakwoods (*Quercus sp.*). Ash (*Fraxinus excelsior*) and hazel (*Corylus avellana*) would have been common in hedgerows and secondary woodland.

Willow (*Salix sp.*) and alder (*Alnus sp.*) would have been present on wetland margins, while other trees such as yew (*Taxus baccata*), holly (*Ilex aquifolium*), elder (*Sambucus nigra*), hawthorn (*Crataegus spp.*), blackthorn (*Prunus spinosa*), birch (*Betula sp.*) and rowan (*Sorbus aucuparia*) would also have been widespread (Mitchell, 1986, 165-166). Scots pine (*Pinus sylvestris L.*) may have survived in isolated pockets throughout the period, while elm (*Ulmus sp.*) seems to have nearly disappeared as a timber tree. Such species as beech (*Fagus sylvatica*), lime (*Tilia europaea*), hornbeam (*Carpinus betulus*) and sycamore (*Acer pseudoplatanus*) were absent from medieval Ireland.

Cartographic and placename evidence

Yet if we turn to placename and literary evidence, paradoxically we receive a picture of more extensive woodland cover. The Old-Irish word "*doire*", denoting oakwood, is a very common element in Irish placenames. Placenames with the roots "*doire*", "*eo*", and "*beith*" are widespread signifying the presence at these places in the early medieval period of either single trees or woods of oak, yew and birch. Idiomatic historical phrases can also be intriguing. We could take for example the fourteenth-century "*Caithréim Thoirdhealbhaigh*" which describes cattle being hidden from raiding armies in Slieve Aughty's "dense woods of lofty foliage", a region in Co. Clare which has a great number of townland names derived from "*doire*". Thence some regions may well have retained a largely woodland character into the late medieval period. One Tudor map completed in c.1563 shows the midland counties of Laois and Offaly and depicts named woodland in river valleys, on isolated bog islands and lower mountain slopes (Smyth, 1982, viii-ix). In contrast, cartographic research by Oliver Rackham on the more reliable Civil Survey maps indicates that by 1654 the percentage of woodland cover had fallen in some counties to as low as 2.1 per cent (Rackham, 1986, 116).

Woodland in the landscape

Whatever their extent, the exploitation of these woodlands can still be traced for the earlier period in the historical annals, saints' lives and early Irish law-texts that were being compiled by contemporary monastic scholars in the eighth and ninth-centuries AD. These record, as incidental detail, an immense wealth of social and economic history. It is clear from these texts that woodland could be owned, exchanged and managed in a variety of ways and was treated as a distinct, valuable zone within a highly structured agricultural landscape (O'Sullivan, 1992). According to one seventh-century law-text beginning with the words "*cis lir fodla tire*" the presence of 'legal standard woodland' (defined as being enclosed by a ditch or fence) could increase the value of agricultural land (Mac Niocaill, 1971, 85). A type of fence used in enclosing such woodland was described in the late seventh-century "*Bretha Comaithchesa*" as the "*dairime*" or oak-fence. This may have been made by partially felling young trees in a line and bending them over to create a laid hedge. Such a dense construction would be more efficient at keeping out browsing animals and may be indirect evidence for the practice of woodland management (O'Corrain, 1983, 250).

The presence of ash trees, which prefer well-drained, medium quality soils, was one means of recognising

land as 'upland cultivable land'. Overgrown land that needed an axe in its clearance formed another category of land type (Mac Niocaill, 1971, 85). In this context, it is interesting that the *"boaire"*, as described in the eighth-century *"Crith Gablach"*, must own a hatchet, an adze, saw and augur (MacNeill, 1923, 291). In common with other types of land, woodland was typically owned by the family kin-group but all law-abiding members of the *"tuath"* had certain rights within the wood. These included rights to the collection of firewood or nuts and the cutting of a certain amount of rods for wattling.

An insight into the relative values of different species can also be seen in the seventh-century tree list preserved in the *"Bretha Comaithchesa"*. This lists twenty-eight different native species and classifies them into four groups (Kelly, 1976). Significantly these classifications are based on economic rather than botanical properties. The first grade, the *"airig fedo"* or the 'nobles of the wood' includes oak because of its acorns, its size and appearance, hazel for its nuts and rods, holly possibly for the use of its leaves for winter fodder, yew for the production of fine or 'noble' wooden artifacts and apple for its fruit and bark. There is also evidence of the symbolic importance of some individual trees, especially oak and yew (Lucas, 1963). These sacred trees or *"bile"* could be associated with tribal groupings at royal inauguration sites. Their destruction during the frequent cattle raids of the time by neighbouring rivals was seen as a gross affront. Named sacred trees could also be associated with individual monastic centres or saints. Thus the value of trees was not always an economic one.

Pannage and wood-pasture

It is also likely that animals were maintained in selected areas of woodland. The medieval Irish annals typically provide a dry, laconic account of various battles, deaths and ecclesiastical or political successions. But references are also included to climatic or other natural phenomena. Between AD 672 and 1155 there are as many as twenty-three separate annalistic references to prodigious annual harvests of acorns (mast). For example in AD 836 the crop of mast was so heavy it blocked streams, in AD 969 eight bags were collected from beneath each tree. In AD 985 the crop was so great it lasted until the following year, while in AD 1038 the annals record that the crop was so abundant that even the runts of the swine were fattened. It has traditionally been believed by historians that these crops of mast were primarily used for fattening pigs, although the unpredictability of the harvests must have occasionally presented problems (Rackham, 1980, 119). Certainly pig-meat in the form of fresh pork and salted bacon was very popular amongst the medieval Irish. Cattle were also occasionally kept in woodland for winter grazing or for protecting them from cattle-raiding expeditions.

Fruit and nuts

A reference in the Annals of the Four Masters for the year 1031 AD gives a clue to another likely use of the yearly harvests of woodland fruit and nuts. It reads as follows; *"a measure of oaten grain, or a third of black-red sloes, or of the acorns of the brown oak, or of the nuts of the fair hazel hedge, was got without stiff bargaining, at Armagh for one penny"* (O'Donovan, 1856, 823). It may be that such berries and nuts were

being used as a cash crop to be sold at town markets. Certainly apples were particularly highly valued, monasteries had their own orchards and secular tenants who moved from their property could be compensated by law for the apple trees that they had sown (O'Corráin, 1972, 53). Despite the perception of the value of woodlands, there seems to be little other evidence for the deliberate plantation of trees, the origins of modern forestry. This contrasts with later evidence from medieval England, where impyards for the nursing of seedlings and small saplings were established at least by the 12th century AD. For example the wood of Beauforest, near Winchester, was planted in 1276 AD with a bushel of nuts bought for 8d while 2,000 hazelnut plants were bought for 4s 1d in 1335 AD in Oxford (Harvey 1981, 15, 86). After the establishment of towns proper in the tenth century, the bulk of trade in most woodland materials must have been with the major centres such as Dublin, Cork, Waterford and Limerick. Excavations in early Dublin have discovered large quantities of blackberries, apples, sloes and hazelnuts (Bradley, 1988, 52) while the species of mosses that were used for personal hygiene in latrines could only have been specially gathered from the shaded tree-trunks, rocks and soils of deciduous woodlands (Dickson & Dickson, 1987, 29).

Underwood

The house walls, property fences and wooden pathways of early medieval Dublin were typically of woven hurdle panels and these would have required vast amounts of straight, narrow rods for their construction. Indeed it has been estimated that over the life-span of these houses (10-15 years) these walls would have been renewed several times (Wallace, 1988, 147). This would have required huge amounts of underwood, a fact that itself demands systematic coppicing rather than exploitation of areas of ordinary scrub. Such underwood could have been valued in areas of land, indirectly related to the labour required to crop it. As late as 1340 AD the Holy Trinity Priory in Dublin paid two men a shilling a day to crop underwood in the woods of Clonken only five miles south of Dublin (O'Neill, 1987, 100; Mills, 1891, 64). However increasing attention is being paid to the actual wood itself, recovered by archaeological excavation in areas of waterlogging.

Deer Park Farms, Co. Antrim

The most important recent archaeological research on this subject has been carried out by Marie Neill on the wood found in an excavation at Deer Park Farms, Co. Antrim. The site was an early medieval ringfort or settlement, at the base of which waterlogging had preserved a number of circular wooden houses dated to the seventh-century AD. These had double walls of post-and-wattle in which a highly complex basketry-like weave was used. This technique would have required about six thousand rods for the largest house, with varying amounts for the other structures. The upright posts were simply chosen for size from mixed woodland, with alder, birch, ash, oak and holly all being used. In contrast the horizontal rods were entirely of hazel and tree-ring analysis has shown that these were possibly being taken at eight year intervals. It is probable that small areas of scrubby woodland at the margins of the farm would have provided the

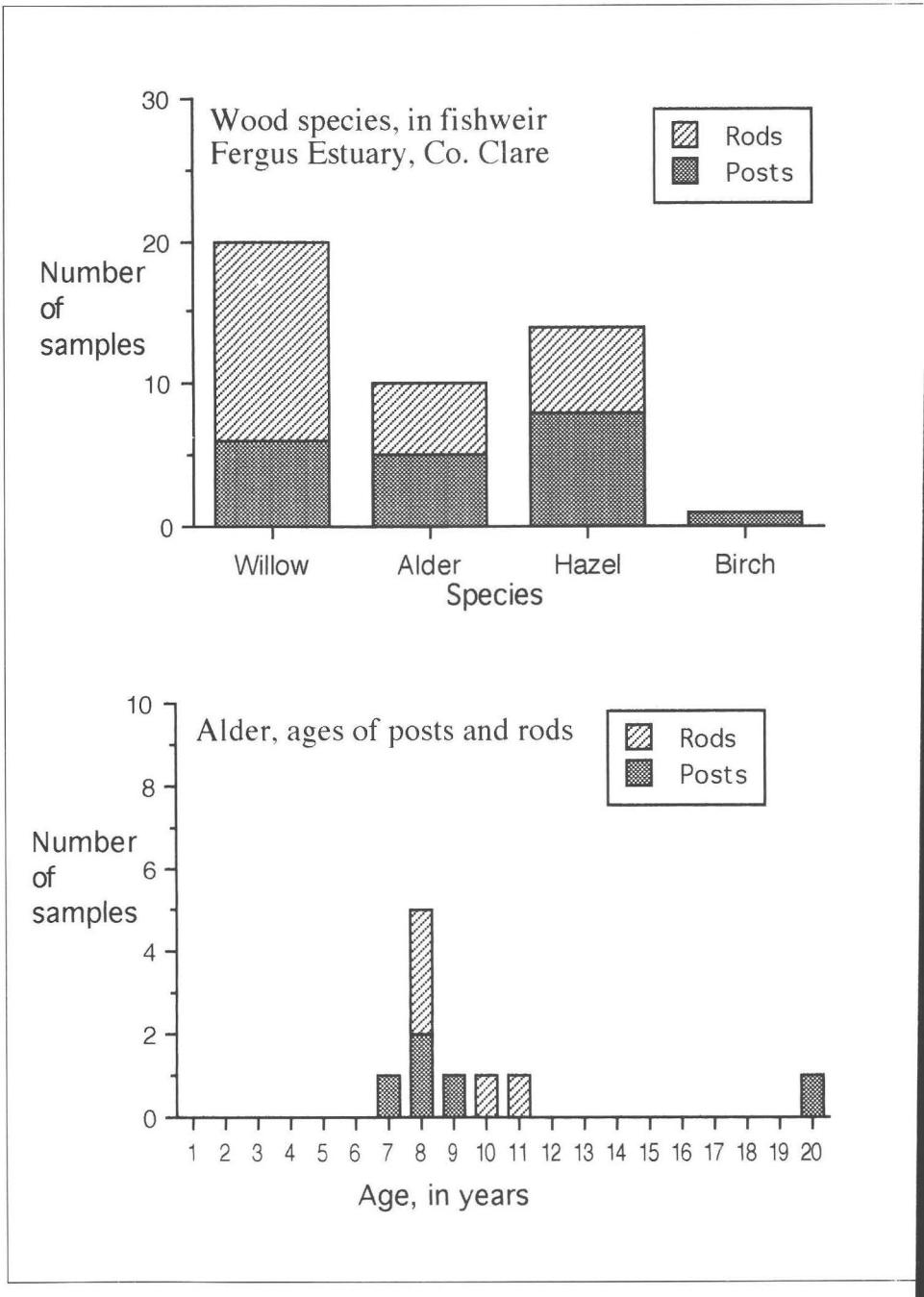
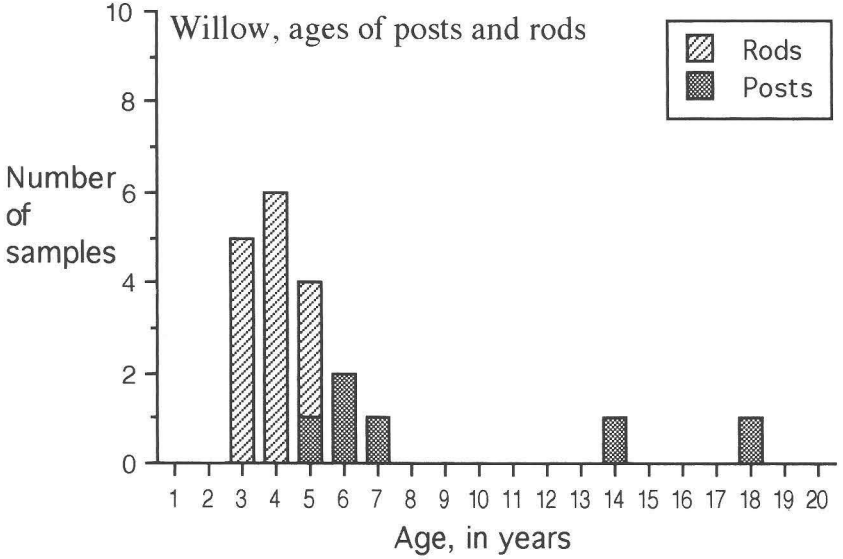


Figure 1
Fergus estuary


Willow, ages of posts and rods
Rods
Posts
Number of samples
0
2
4
6
8
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Age, in years

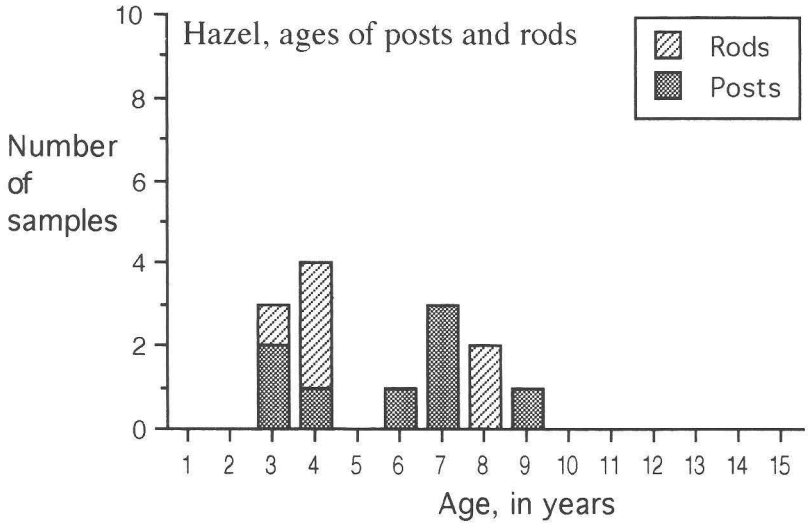
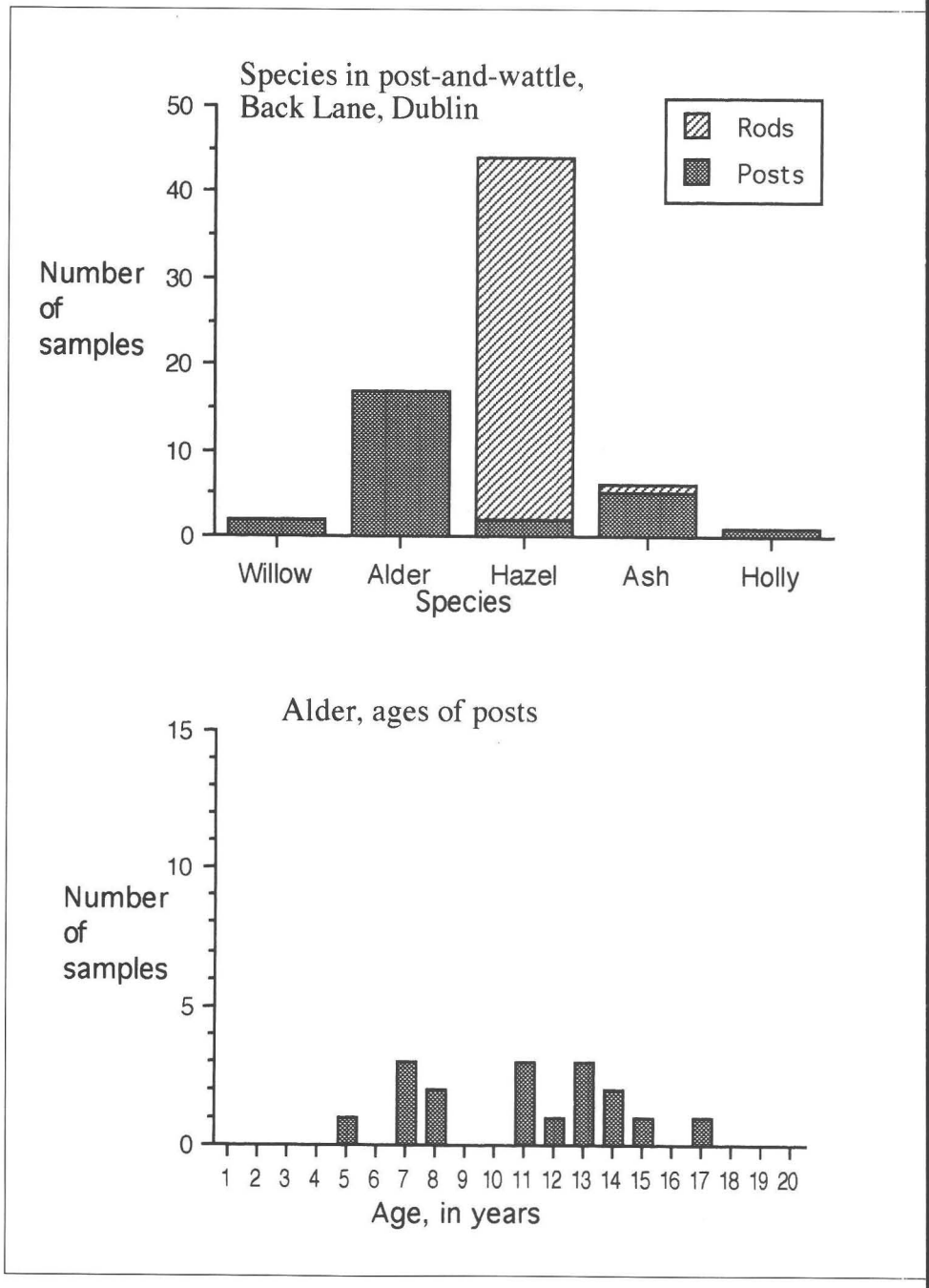
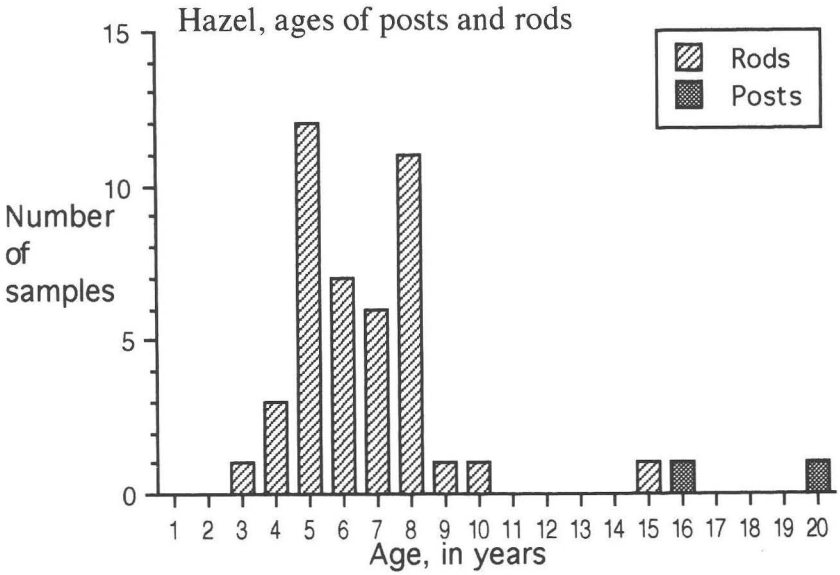
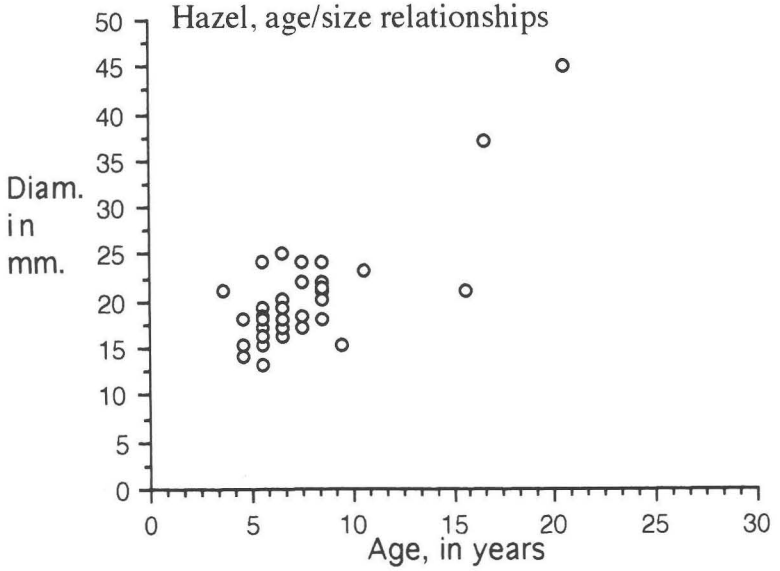

Hazel, ages of posts and rods
Rods
Posts
Number of samples
0
2
4
6
8
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Age, in years

Figure 2
Back Lane




Hazel, ages of posts and rods
Rods
Posts
Number of samples
0
5
10
15
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Age, in years


Hazel, age/size relationships
Diam. in mm.
0
5
10
15
20
25
30
35
40
45
50
0 5 10 15 20 25 30
Age, in years

neccessary underwood (M. E. Neill, forthcoming, pers. comm.).

Fergus estuary fishweir, Co. Clare

It is also possible to trace the use of woodland growing on more marginal land. Recent intertidal archaeological surveys on the mudflats of the Fergus estuary have lead to the discovery of early wooden fishweirs, one of which has been recently dated to the sixth-century AD (O'Sullivan, 1993, 1994). This structure comprised a sturdy post-and-wattle fence designed to guide fish swimming down with the tide into a net or trap. The predominant species used for the posts and rods in this structure have been identified as willow, alder and hazel (Figure 1), giving an insight into the original appearance of the surrounding landscape. The willow and alder would most likely have grown in a fen carr growing at the fringes of the salt-marshes. Tree-ring analysis of the wood suggests that immature willow, hazel and alder branches were simply being selected for size from adventitious growth. Such woodland would have produced sufficient raw material for such occasions, even without careful management.

Back Lane, Dublin

The evidence for woodland exploitation by urban settlements provides a contrasting picture. Huge amounts of wood were obviously needed daily for fuel, structures and specialist crafts. Recent excavations at Back Lane, in Dublin by Claire Walsh uncovered amongst other structures, a rectangular house dated to the early thirteenth century. Close attention was paid during the excavation by the author to the recording of the surviving post-and-wattle walls and preliminary analysis of the wood samples has been completed. The house can be classed as a Dublin Type 1 house, with internal roof supports and tripartite dividing walls. This is the classic house type from medieval Dublin, being built from the earliest Viking origins up to the Anglo-Norman period (C. Walsh, pers. comm).

Clearly a range of species were being used for the upright posts, including willow, alder, hazel, ash and holly (Figure 2). When the tree-ring or age patterns of these various species were examined, no concentrations were apparent. Seemingly these posts were again simply being taken from suitably sized poles of any species from mixed woodland, although alder does predominate. In contrast, a clear preference for hazel was exhibited in the sample of horizontal rods. The distribution of ages in these hazel rods is also interesting, peaks can be seen at five and eight years, with over eighty per cent of the sample falling between these ages. The age/size distribution illustrated in the scatter diagram also suggests the rods were both of similar age and size.

The combined growth and age patterns indicates that hazel underwood, of a narrowly restricted size, was being cropped between eight and five years growth. The evidence would seem to suggest that some formal and complex system of woodland management was being carried out, of a shorter rotation than more recent practices (Rackham, 1982, pers. comm.; Crone, 1987). The Back Lane material confirms that the vast amount of underwood required by the settlement of early medieval Dublin was being supplied from areas of coppiced woodland.

Timber

The second important use of woodland involved the growth, felling and conversion of large trees into timbers for making houses, trackways, waterfronts, watermills and a variety of other structures. Oak was the most preferred species in early medieval Ireland, the strength and durability of its wood made it especially suitable for loadbearing and architectural tasks. Indeed the eighth-century wisdom text "*Uraiccecht Bec*", describes the status of the 'accurate wright of oaken houses' as being equivalent to the lowest grade of nobility (Binchy, 1958, 48). But it is more difficult to say if standard oaks were being grown within a managed system. Indeed by the tenth century it appears that timber quality oaks were in widespread shortage (Mallory and Baillie, 1988) possibly explaining the preference for ash as a structural timber in the houses of Viking Dublin. Certainly the unique value of oak was recognised in the law-texts. Damages up to the value of two milch cows were due to the owner of a tree if its branches were removed or if it was felled without permission. Fines of a cowhide were imposed on anybody illegally removing oak bark for tanning leather.

Woodmen

The felling and transport of timber from source to the medieval towns could have involved a class of specialised woodmen. The process of felling large trees by specialised craftsmen for use in timber seems to be described in one passage in Cogitosus's seventh-century *Vita Prima Sanctae Brigitae*. In the account, a large, tall tree was felled 'by those who used to ply their trade in a timber forest' and thereafter specialised equipment or 'skilled devices' were used to drag it out of the wood to the 'appointed place' (Connolly and Picard, 1987, 21). In the undated *Life of St Samthan*, carpenters are stated to have transported pine poles long distances home in carts drawn by oxen. Woodsmen would have been the first link in the chain of timber trade, involving vehicles and draught animals to transport roughly prepared planks and beams to a construction site. The conveyance of timbers across large distances could also have been accomplished by boats. Adomnán's seventh-century *Life of Columba* (Anderson 1961, 452) describes how pine was imported onto the island of Iona from mainland Scotland in the following terms, "*when dressed timbers of pine and oak for a long ship were being drawn overland, and timbers were conveyed from the great house, as well as for ships . . . with boats and currachs to tow the timber through the sea*".

Bradley (1988, 53) has suggested that for early Dublin at least, Hiberno-Norse settlers in the countryside would have managed such trade. In later periods the trade of timber was managed by the native Irish. Indeed the Civil Regulations of Waterford implied that the "wode bote men" were troublesome, so much so that by AD 1458 an oath of loyalty was required from "*bene maistres of wod botes and botemen*" (O'Neill, 1987, 99). The Holy Trinity Priory records in Dublin also account for the purchase for 20d of nine couples of oak for building a barn including nails, wattles and the hiring of a carpenter (Mills, 1891, 38)

Anglo-Norman carpentry at Woodquay

The best evidence for the use of timber in early medieval Dublin are the wooden river waterfronts at Woodquay, the earliest of which has

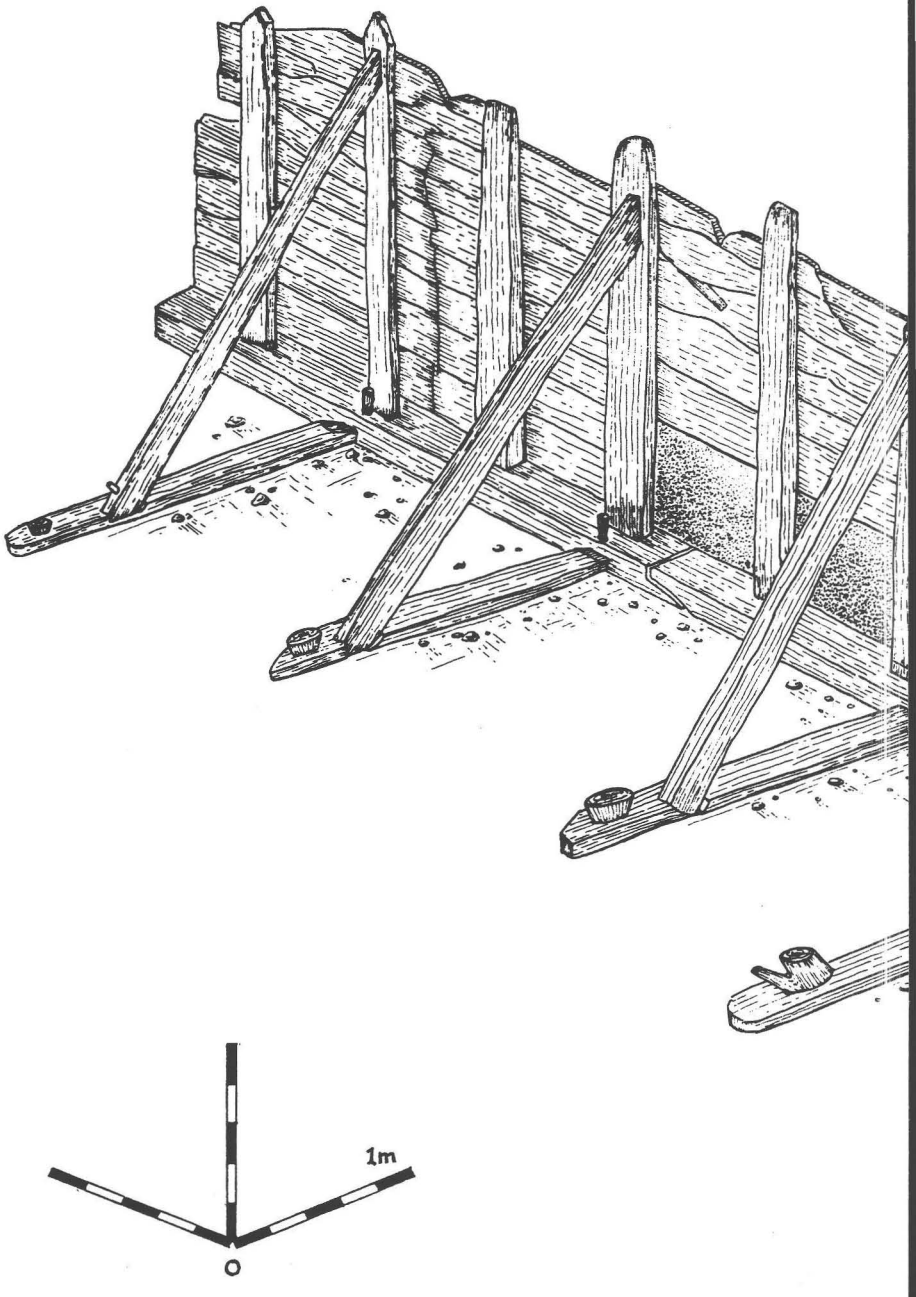
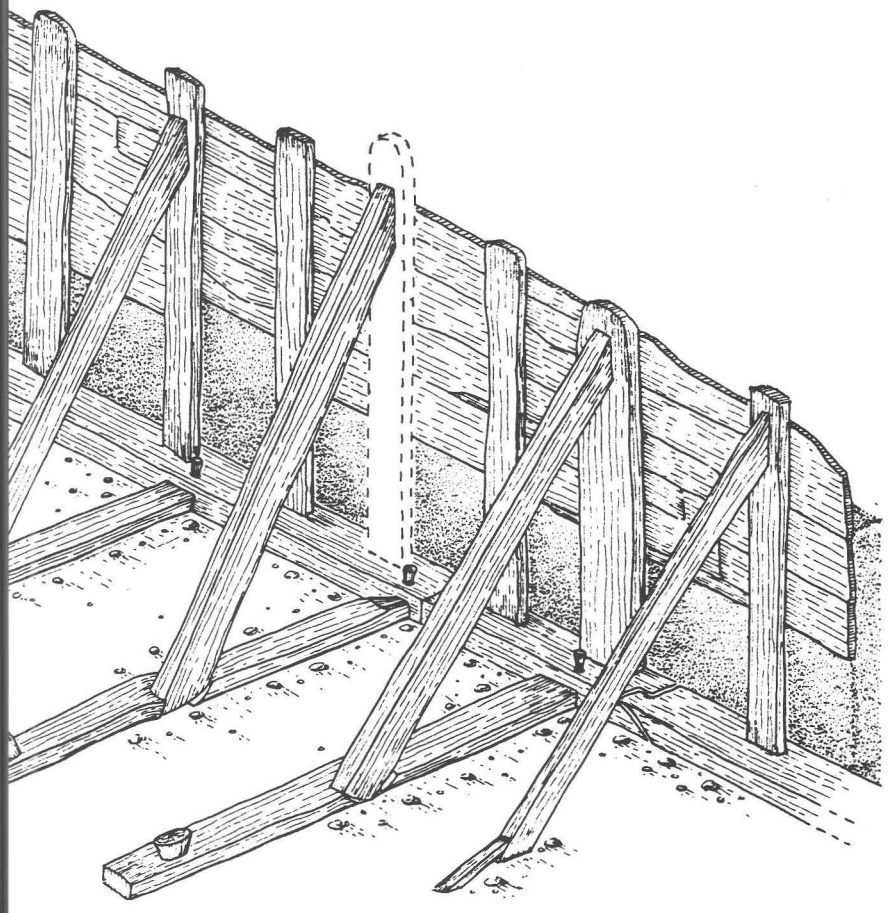


Figure 3. *Reconstruction drawing of Anglo-Norman waterfront, Winetavern St., Dublin. (Drawing by G. Rennie)*



been dated to 1210 AD. By this time native Irish carpentry styles were beginning to be used in an urban context, with the introduction of mortise and tenon joints, through-splayed scarfs and heavy hewn timbers. These structures have been well described by Dr. Pat Wallace and can be placed firmly within the north European tradition of front braced waterfronts (Wallace, 1982). Their construction involved a series of braced oak uprights in a horizontal baseplate supporting a vertical wall of planks which held back the estuarine clays, gravels and urban deposits dumped behind.

Excavations carried out recently on Winetavern Street by Andy Halpin revealed further evidence for these waterfronts (Figure 3). These excavations have enabled an examination by this author of the timbers used in the waterfronts from the point of view of woodsmanship. Particular attention during the recording process was paid to species identifications, ages, growth rates, position of sapwood, knots and general appearance of the wood. With this information it is now possible to tentatively evaluate the types of trees used and the appearance of the original woodland (Figure 4).

The first thing to notice is the manner in which the largest timber possible was taken from each tree, there was little or no waste. Oak was probably

Figure 4 *Suggested parent trees for Winetavern St. waterfront baseplates, uprights, planking and ships timbers. (Drawing by A. O'Sullivan*

expensive and the carpenter had to get the most out of his raw material. The main baseplates were hewn from straight grained trunks, so only a few side branches had to be trimmed off. These trunks typically were aged between 80-150 years, and initially grew very fast for the first 20 years. The sapwood was left on the edges of the timbers therefore it is possible to estimate the size of the original trees. They were usually narrow, not much more than 40cms in diameter. These were possibly mature standard oaks, grown within a mixed hazel-oak managed woodland.

The subsidiary baseplates and uprights were taken from slightly smaller trees, aged 30-40 years, and had been half-split or radially split and hewn to a boxed heart section. The sapwood and even the bark was still present on the edges. These smaller timbers were probably taken from either fast-grown young oak saplings or mature coppiced oak-wood. Trees of this type are best found in periodically felled woodland. There were also a number of ships' timbers found in the excavations which came from different types of trees, with slightly wider trunks with heavy top branches. The complex 'stems' and 'knees' for the framing of the boats were taken from naturally curved and crooked side branches from the topwood of wide mature oaks. Such trees are typically found in hedgerows or in open land.

Conclusion

In brief summary, woodland resources were important elements in the early medieval Irish economy. Woodland may have been valued, maintained and even included in land exchanges. Livestock such as cattle and pigs may have been foddered in woodland. Fruit, nuts and mosses could have been gathered for sale in urban markets, while underwood and timber could have been coppiced and safe-guarded, felled at chosen times and transported over long distances for use in various types of structure. Further research in early Irish history, archaeology and environmental sciences will hopefully elucidate some of these questions.

Acknowledgements

I would like to thank the Society of Irish Foresters for their invitation to present the Augustine Henry Memorial Lecture in the Agriculture Building, University College, Dublin, in March 1993. The lecture was entitled *The use of trees and woodland in early Ireland*. This article is a development of the main themes that were raised on that occasion. I would also like to thank Mary Deevy for carrying out wood-species identifications and for commenting on the text. I am also very grateful to Andy Halpin, Claire Walsh and Georgia Rennie who prepared Figure 3.

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Society of Irish Foresters 1993 study tour in the Black Forest, Germany

Monday 11th October 1993

Following breakfast we assembled at the Forestry Faculty of Freiburg University, situated in the middle of the old quarter of the city. Dr. Jürgen Huss, Professor of Silviculture and the leader for the week, welcomed the Society to Freiburg and gave an introduction to the faculty and an overview of German forestry. The faculty has 17 professors working on all aspects of forestry and is one of the oldest in the world, having been established in 1787.

Freiburg is located in the Rhine Valley, on the divide between the European maritime and continental climatic zones. The surrounding area has a wide annual range of temperature and rainfall. The western slopes of the adjacent Black Forest have a predominately maritime climate while the gently sloping eastern side is affected by continental extremes.

Germany was originally almost completely tree covered, apart from the highest mountain tops. Two thirds of the forest area comprised broadleaved species while the remainder was coniferous. Human exploitation of the forest began 3,000-5,000 years ago starting at the North Sea coast. Over time the human influence moved southwards, following the river valleys. In the intervening centuries clearance for agriculture drastically reduced forest cover. By the early 1800s serious erosion was occurring on land laid bare of forest cover. The state had to take action and landowners were encouraged to plant trees on part of their holdings. This was the beginning of private forestry in Germany.

In the meantime the advent of coal mining reduced the need for charcoal, and with thousands of people emigrating to America, pressure on forests eased. In the hundred years from 1850 to 1950 large scale afforestation resulted in a forest composition of 70% conifers and 30% broadleaves. The low proportion of broadleaves can be explained by the fact that the land that became available for afforestation during the period was generally of low quality.

Today, forests cover 30% of the land area of Germany, ranging from less than 25 % in the lowlands to over 30% in the highlands. The great majority of the forest area is high forest, and of this 60% comprises two or more species. Beech is the most common broadleaf followed by oak: Norway spruce and Scots pine are the commonest conifers, followed closely by silver fir. The proportion of the different forest types and their associated standing volumes is as follows:

Forest type	*Percentage cover*	*Average Standing Volume m^3/ha*
High Forest	92	299
Selection forest	1	334
Coppice with Standards	1	187
Coppice	1	126
Not regularly managed	2	—
Unstocked	3	—
Weighted mean		298

Over the past ten years there has been a steady increase in the broadleaf content of forests. This has been due to a number of factors such as calls for more diverse stands and the high prices paid for top quality beech, oak, walnut and cherry.

Since around 1880 there has been a history of storm damage on a large scale. The storm of early 1990 caused serious and widespread windthrow. The high volume of timber salvaged flooded the market bringing prices down and they have not recovered (October 1993).

With a high population density (around 80 million), Germans put a very high recreational value on forests. In many areas timber production is secondary to recreational use. People have a very close association with the forest. German law stipulates that every forest must be open to the public for recreation. It is seen as an important right.

There are three types of forest ownership: state (with a management structure similar to Coillte), community (generally managed by the state) and private.

After the presentation it was time to head outdoors. Professor Huss and Dr. Schölzke led us on a bus journey to Schauinsland, south-west of Freiburg.

Tourism is a very important year-round economic activity. Many of the traditional wooden houses provide tourist accommodation. Farmers are subsidised for keeping their land open and working it in a way beneficial to tourism. It was interesting to hear that cattle are just kept for show – tourists like to see them in the fields here and there!

After a twisty route up a narrow valley (typical of those on the west of the Black Forest) we arrived close to Schauinsland, from where a short walk led to the summit tower, erected in 1980 and constructed from locally grown 80 year old Douglas fir. Schauinsland means "view into the country" and at 1,300m it offers just that. The Black Forest alone runs north-south for 200km and east-west for 60-100km. From the summit there are views over the Rhine Valley to the Vosges mountains and as far as the Swiss Alps. To the south-east, at an elevation of 1,493m, lay Feldberg, the highest summit of the Black Forest.

In recent years forest dieback has been a big talking point in German forestry. To monitor this situation, the university set up an experimental plot in 1981, a short distance down from the Schauinsland. Originally it was thought that the cause of the die-back was acid rain, then high ozone levels were implicated but the latest hypothesis is that it is caused by a nutrient imbalance in tree foliage brought about increased nitrogen levels in the soil. This increase has in turn been caused by higher nitrogen levels in rainfall due to car and other vehicle exhausts. Elevated nitrogen levels are increasing the growth rate of many forests throughout

Germany, but on nutrient poor soils these elevated levels can cause imbalances in tree nutrition. The term for the phenomenon is now "new type forest decline" and it affects both conifers and broadleaves.

With a long walk in prospect for the afternoon, lunch was thoroughly enjoyed. The walking tour, some 12km, brought us downhill through the different forest zones. Thankfully, the day remained dry and thus we were able to enjoy the magnificent colours of the forest, so striking at this time of year.

Not long after setting off, the path cut through a crop of 30 year old Norway spruce. As mentioned previously efforts have been made to increase the broadleaved content. Here naturally occurring beech and rowan have been given light and space to develop by cutting away surrounding spruce. The route continued through a fine stand of mature beech. We paused adjacent to a pile of recently extracted logs. It is customary in Germany for the forest owner to fell and extract his produce leaving it measured on the roadside for sale. Cutting had been done by contract, which emphasises the changing employment scene in these forests.

Forest workers undergo a three year apprenticeship, after which they are skilled in all operations. Nowadays however, it is proving difficult to get new workers because conditions of work and wages are more favourable in other industries. Contract work has gradually increased, much of it being done by unskilled foreign labour. It is not considered the ideal situation.

With recreational and environmental needs high, some normal forest operations prove uneconomic. Loss of revenue is made up from government subsidies. In the wider context, having forests which favour recreation increases tourism, benefiting the whole community indirectly.

Next to storms, roe deer are the most important hazard as far as the growth of forests are concerned, and their numbers have to be controlled. Hunting is well managed and generates considerable revenue. Roe deer densities are still very high and vary from 10-50/100ha.

The final section of the walk was through high production forests of silver fir, Norway spruce and beech. It also included a stand of Douglas fir, an uncommon species in the Black Forest. Planted in 1896 it has produced stems 20m high with diameters of 80cm. It would appear to have good prospects for more extensive planting. However, as an exotic species, its has a poor public acceptance. This again emphasises the point how people have a close association with their forests and how they are managed.

Expressions of relief could be seen across many faces when we arrived at the end of the walk at the "Klosterwaldhutte" located in the middle of the forest and reserved for visits such as ours and other social functions. The unfortunate thing was that time prevented us from walking back up to Schauinsland!

Local staff had organised a very welcome meal along with local liquid refreshment. The Vice-District Forest Officer of Freiburg, Herr Giesel, joined us at the meal. He welcomed the Society to the Black Forest and he spoke about the management of his area. The role of the forest has changed from that of wood production to one of protection and recreation. To carry out these functions costs almost 6 million DM (IR£2.5 million) and revenue falls far short of this figure. This situation causes serious financial problems

which can only be bridged with state funding. Public attitude towards forests may change. The situation would be better when they see that production of timber and recreation can go together. Our President, Eugene Hendrick, thanked all those concerned for organising an interesting and enjoyable day. With that we left the candlelit cabin and made for the bright lights of Freiburg.

Richard D. Jack

Tuesday 12th October 1993

Community Forest of Unterkirnach, Baden-Württemberg

On the second day of the tour we visited the community forest of Unterkirnach where we were met by the Forest Director, Herr Härle. In Germany as a whole 25% of the forests are community owned but in south-west Germany the proportion rises to almost 40%. At Unterkirnach Herr Härle manages 7,000ha, comprising 6,000ha of community forest and 1,000ha of privately owned forest. A staff of 50 is employed – 40 forest workers, 7 forest rangers and 3 clerical staff.

In 1992, the forest made a profit of IR£125,000, or IR£21/ha. This profit could have been higher – up to IR£290,000 – if the community had used the administration and management services which are available on a contract basis from the State Forest Service. However, the Town Council has decided to retain its own independent management and administrative staff in the forest. Their reasons are that they will be independent from outside, mainly political, influences in deciding the forest management objectives and in selecting staff. In this part of the Black Forest region tourism plays a very important role in the local economy – Unterkirnach has a population of 2,000 inhabitants but last year it recorded 200,000 bed nights in its hotels and many guesthouses. Thus the Town Council wishes to retain a strong local influence in deciding the management objectives of the forest, since the development of its amenity and leisure potential will have an important impact on the local tourism industry.

The forest is situated on the eastern slopes of the Black Forest where the climate is more continental and the risk of storm damage is much higher. For this reason, the forest is managed on a shelterwood system with an average rotation length of 140 years. In practice the rotation length is deterinined by stem size rather than age, with trees of 1.5 to 2m³ being the objective. The species composition of the forest is Norway spruce (66%), silver fir (14%), Scots pine (14%) and broadleaves (6%).

In 1992 the forest produced 42,000m³ (7m³/ha), comprising 35,700m³ sawlog, which sells for IR£40-58/m³ (roadside), 5,000m³ pulp which sells for IR£29-30/m³ (roadside) and 13,000m³ fuelwood which is sold to the people of the town for IR£2/m³ (standing). Harvesting costs are as follows:

Large sawlog: IR£5-6.30/m³ for felling and IR£3.30/m³ for extraction

Small sawlog: IR£12.50-14.50/m³ for felling and IR£8.30/m³ for extraction

Pulpwood: costs approximately IR£29/m³ for felling and extraction – almost as much as its selling price.

Approximately 25% of the harvesting is done by the forest staff themselves, the remainder is done by contractors who are mainly local farmers or forest owners utilising their sur-

plus harvesting capacity. However, in recent months, there has been a growing influx of Polish, Romanian and Czech contractors. The contractors are paid a bonus if less than 2% of the stems in the remaining crop are damaged but they are charged a penalty if more than 5% are damaged and they get the road if more than 20% of the stems are damaged.

All sawlog is sold on roadside by competitive tender while pulpwood is sold at a contract price which is agreed each year between the forest owners association for the State of Baden-Württemberg and the major particle board mills. The community forest supplies about ten small sawmills within a 70km radius. These mills produce construction timber to order. There are also two joinery mills which buy the best quality logs of pine and silver fir. These logs must be of the highest quality and the mills are willing to pay IR£160/m³ for them – more than three times the normal price.

The main issues concerning the community forest of Unterkirnach at the moment are:

- adjusting their forest management practices to take account of the greatly increased importance of tourism in the local economy
- constraints imposed by Germany's very strong environmental lobby
- the threat of an influx of cheap timber from Eastern European countries anxious to get hard currency. Russia is currently offering sawlog to German mills at 1 DM or £0.43m³ standing.

Pat O'Sullivan

Wednesday 13th October 1993

The theme for the day was the growing of high quality broadleaves. The morning was spent in the State Forest District of Ettenheim, with Forstdirektor Bischoff. The district lies in part of the Rhine Valley/Black Forest between the altitude of 160 to 800m. The average annual rainfall is between 500 and 1000mm. The soils are somewhat variable, ranging from sandy to loam, with an abundance of loess (derived from windblown sand) type soils. The mean annual increment is approximately 8 m³/ha. The objective is to grow 50% broadleaves and 50% conifers. The present composition is beech 40%, oak 5%, Norway spruce 20%, silver fir 15%, Scots pine 5%, Douglas fir 8% and others 7%.

During the morning the tour studied various aspects of the shelterwood system. The first stop was at a stand of good quality beech in which natural regeneration had started. Approximately 130 stems/ha of mature beech trees still remained. The number of seedlings varied from 50,000-100,000/ha, which would be reduced manually in the coming year. During the felling of the remaining mature trees, damaged stems were to be removed.

In general the management of the regeneration phase is as follows: between 20 to 25 years after the first regeneration felling, the last remaining trees are removed and the natural regeneration is allowed complete freedom to grow. If gaps exist, they will be planted with ash, spruce, or sycamore. Extraction lines are marked so as to minimise damage. Ground cultivation is unnecessary to achieve regeneration, as mast years are plentiful, on average every five to eight years. Planting is

Tour leader Professor Jürgen Huss with Forstdirektor Bischoff at Ettenheim Forest District

financially prohibitive, due to the large numbers of roe deer.

The second stop was at a stand where the regeneration was from 15 to 20 years old, approximately 5m in height, needing a substantial reduction in numbers. Stocking in natural regeneration is maintained at as high a level as possible; consistent with good health and growth. Ultimately, the objective is a clean straight bole, 10 to 12m long.

The next stop was at a stand about 10m in height. The stocking is further reduced at this stage, by felling to waste, at a cost of approximately 30 hours/ha. This felling realised a revenue from firewood, about 10 DM/ha (IR£4.15).

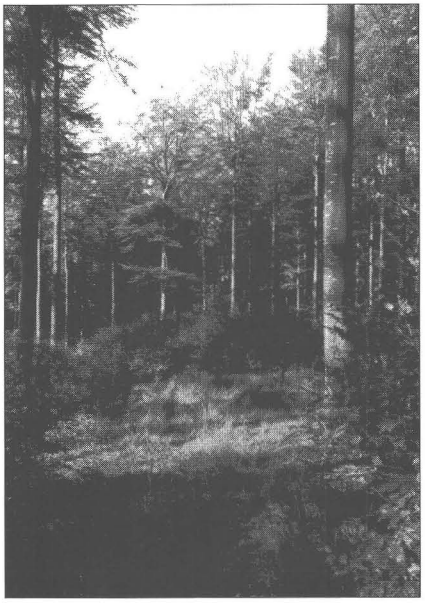
At the next stop in the Fernbach area, a stand of 70 year old beech had been thinned in 1991 to enlarge the crowns and increase diameter growth. The risk of epicormics resulted in a light thinning. This was achieved by marking the final stems, and thinning to favour them. Standing volume was 350 to 400m³/ha. Ultimately, the aim is to have about 100 trees/ha and standing volume 600 m³/ha. This will be achieved just before the beginning of the regeneration phase. Diameters (dbh) between 40 and 60cm are expected. Typical current annual increment for this area is about 7m³/ha. The soils are brown earths, with pHs of from 3 to 4, surprisingly low for such good growth of broadleaves.

In the afternoon the tour moved to the Müllheim State Forest District close by the Rhine valley where the leader was Oberforstrat Zeiher.

During the 19th century and again in the 1920s the Rhine was canalised to stop flooding, causing the water table to drop some 50m. Intensive horticulture and agriculture are a feature of this area, especially in the valleys. Where the soil is suitable, vines are grown on the valley slopes. The higher elevations tend to be devoted to growing oak. At the highest elevations, the oak is replaced by beech, Douglas fir, Scots pine and silver fir. Annual rainfall ranges from 700 to 1,900mm. The geology is granitic with some metamorphic gneiss. Loess, alluvial and gravely soils predominate. The forests of the area have a multifunctional role, one of those is to purify the soil water, thereby mitigating the effects of pollution coming from the valleys. There are over 1,000ha of oak forest in the district, the soils beneath them are highly fertile and highly suitable for agriculture.

These forests have remained as they were a source of wood for the manufacture of wine casks.

The first stop of the afternoon was at an oak stand, planted between 1890 and 1910, with a current stocking of approximately 70 stems/ha. Despite having been underplanted with beech epicormic shoots were present on many of the stems. The beech were overtaking the oak, although it had been planted some time after as an under-storey. This had necessitated a decision as to how to fell and regenerate the stand. At present the oak has a mean dbh of 70cm, 90cm is the maximum desirable, trees of larger diameter tend to be subject to decay. The yield from a typical oak stem is: one third veneer quality, one third sawlog and the balance firewood. The value of the oak was estimated to be three times that of beech.



Quality beech stand at Ettenheim

The second stop was at a site clearfelled in 1980 and planted with oak at a stocking of 5,000 stems/ha. No significant seed year occurred between 1950 and 1982 and planting was thus unavoidable. Filling-in had taken place to the extent of 3,000 plants/ha. The failures were attributed to poor provenance choice, vegetation competition and snow damage. Further expense was incurred in fencing the area against roe deer. By 1991, about IR£35,000/ha had been spent on trying to establish a crop! The use of non-selective chemicals is forbidden, and this greatly increased the cost of vegetation control.

An adjoining area was felled in 1984 and naturally regenerated. To begin with, one third of the mature trees were removed to encourage the onset of regeneration. The second third was removed after germination has successfully taken place, and the remainder were removed when the regeneration had reached knee height. Lanes 1.5m

Oak stand at Müllheim Forest District with beech under-storey

wide had been cut through the regeneration. The cost incurred in this case was about IR£15,000/ha.

Natural regeneration at a very early stage, with no fencing and approximately 315,000 plants/ha was seen nearby. Roe deer were not a problem, and with stocking so high any losses were likely to be beneficial. The costs incurred were IR£7,500/ha, for quite successful regeneration.

The third stop of the afternoon was at a 25 year old stand of oak where a thinning was taking place. The crop had been planted, at 1.0 by 1.5 metre spacing (6,700 stems/ha). The first thinning had reduced stocking to approximately 2,400 stems/ha. Presently the crop has a top height of 12m and a mean dbh of 11cm. An under-storey is slowly developing which will be important in preventing the development of epicormic shoots on the oak. The future prescription is to open up the stand slowly, at between 10 and 15m top height, and ultimately achieve a clean bole of 10-15m long, and a top height of 20m.

Paddy O'Kelly

Thursday 14th October 1993

We departed Freiburg early, heading east for Donaueschingen. Our route took us through the colourful and spectacular "Hells Canyon", an important east-west crossing of the Black Forest. After a journey of an hour or so we arrived in Donaueschingen to start a day visit to the private estate of the Prince of Fürstenberg. Our guide for the day was Forstdirektor Sonntag.

Gathered in front of the Palace of the Prince of Fürstenberg, we were given an introduction to the town and the Fürstenberg estate. Donaueschingen is a town famous for music and hosts a number of festivals. It is also well known for show jumping and, of course, brewing. The source of the river Danube is located adjacent to the palace amid beautiful gardens open to the public. The Prince of Fürstenberg is the second largest land owner in Germany. (By coincidence a German television crew were filming scenes for a news programme. There was great excitement among them when they saw the Society group. They wanted to shoot some footage of this happy group of Irish foresters around the source of the Danube. It went down well and Brian Monaghan's singing brought great cheers and delight from onlookers!)

So to forestry. During the morning we visited the Fürstenberg sawmill and later a harvesting site before having lunch at a forest workers house deep in the forest. The sawmill uses pole-length logs. It is located on the edge of town, contains some of the biggest sawmilling machines in the world. Its hi-tec computer system gives very accurate and high quality end products. In addition there is a log yard where other sawmills can order different size category roundwood. This is tied in with the harvesting operation on the estate so that the whole system operates on a 'just in time' principle.

Our next stop was at a thinning of 120 year old crop of Norway spruce, with a mean annnual increment of $8m^3$/ha. A harvester and skidder were working, felling and extracting between 4 and $8m^3$/hour.

During lunch we were shown the forest maps for the estate. All of these were plotted using GIS (Geographic Information System) technology. The Fürstenberg estate was the first administration in Germany to use GIS. Various maps display different information

such as compartment boundaries, stand age classes, soils, and even species selection maps.

Forest employment has reduced on the estate, as in the country generally, mainly due to increased mechanisation. Manual forest work is not regarded as attractive when compared to jobs in other industries. However, the staff that remain are highly trained and spend three years training in all aspects of forest work, resulting in safe and efficient work of top quality.

During the course of the afternoon we followed the course of natural regeneration of mixed stands of Norway spruce, Scots pine and silver fir. Felling for natural regeneration begins 60 years ahead of final felling age, which is at about 150 years. It begins at the eastern boundary of the area to be regenerated and works westwards, into the prevailing wind. This facilitates seed fall into the areas opened up by strip felling. The canopy is opened up gradually to create gaps for seedlings to grow. Subsequent fellings require a lot of skill to avoid any damage to young plants. Management of natural regeneration is something which has gone on in the estate for generations. Each species has to be treated differently so as to maintain the mix in the end. Silver fir are particularly favoured by browsing deer. A sand and lime mix (a home-made solution) is applied to the tips of the young trees to discourage browsing. Managers aim to maximise timber revenue at the same time as having a mixed forest.

An inventory is carried out every 10 years. They use a system of permanent sample plots throughout the forest. Other plots are used to check incidence of die-back. Any pronounced occurrence is treated by the aerial application of dolomitic limestone.

We ended our afternoon on an his-

The Study Tour group at the source of the river Danube at Doneauschingen

torical note, beside a lake. Like many other lakes it was used as a water supply for specially built channels to "float" logs down to lower country, where they were used to make charcoal. Our excellent guide, Herr Sonntag, finished the visit with a traditional chorus on his hunting horn.

The day finished with a guided tour of the Fürstenberg brewery in Donaueschingen.

Richard D. Jack.

Friday 15th October 1993

We departed Freiburg for the Forest District of Bad Rippoldsau-Schapbach where Forstinspektor Kober was our guide in the teeming rain. Our first stop was the forest area Sandeckwald. The total forest area is 6,920hs; 3,400ha are state owned, 920ha are in community ownership and the remaining 2,600ha are privately owned, comprising 27 holdings between 30 and 150ha. These are larger than the average holdings in Germany and some of the landowners in this area live solely off the forest. This is not typical as most landowners in the Black Forest combine forestry with farming and tourism.

Sandeckwald is 600 to 700m above sea level and the soil is a loamy sand – generally sandstone mixed with loess on the lower slopes with granite on higher ground. Precipitation at 1,400 to 1,500mm is high – even by Irish standards – so growth conditions are good.

Beech and silver fir are the main species native to this area. However, most of the crops comprise Norway spruce/silver fir 50:50 mixture. The crop is managed under the Plenterwald or naturally regenerated selection forest system with a wide variety of age classes present in the stand. Norway spruce was introduced in the beginning of the 13th century mainly for resin production. Beech is absent from the forest due to cattle and roe deer browsing. However it is planned to reintroduce beech to eventually form 60% of the forest cover. Areas underplanted with beech will be fenced to prevent damage from roe deer. Beech and silver fir are an ideal mixture for permanent regeneration as both are shade bearers but Norway spruce, which performs extremely well as a top storey tree, is at best a moderate shade bearer and poses problems as an understorey.

It was also interesting to see how German foresters coped with regenerating light demanders such as oak and Scots pine. Although the problems are not as great in the case of Norway spruce, openings of about $100m^2$ are made in the canopy to ensure adequate regeneration of these species where they occur in Sandeckwald.

While it was difficult to establish actual thinning volumes removed/ha, thinnings seemed conservative by Irish standards. As few as 10 to 20 trees were removed/ha in some instances. However, the average tree size can be two m^3 and more in these fellings and hence volumes as high as $50m^3$/ha are removed in some thinnings. Thinnings are carried out on an eight year cycle, but the grower has the option of waiting until prices are favourable. The system requires intensive silvicultural management in order to achieve the uneven age class distribution and to maintain a given species composition. Minimum standing volume is $150m^3$/ha and can be as high as $500m^3$/ha. Once this has been achieved, the system offers growers flexibility in terms of optimising tree size and date of felling in relation to market prices.

Before felling, trees are selected visually, seemingly without recourse to management tables or yield models. German foresters are confident to trust their visual judgement when making selection decisions. Given their intensive training, experience, continuity of silvicultural practice, high staffing levels and the luxury of working to a silvicultural rather than an economic agenda, this confidence, for the present at least, is well grounded. Farm foresters also share this confidence. They not only enjoy the benefits of a family forestry tradition and silvicultural continuity but forestry forms an important part of their training in agricultural college. In addition many pursue a three year intensive forestry course.

By the time the upper-storey is finally removed the under-storey has undergone a number of thinnings. This eliminates the need for conventional clearfelling. While this is Utopian silvicultural to Irish eyes, it is a system that could be practised in some forests where site conditions and rotation length would favour natural regeneration and/or the introduction of an under-storey.

Traditionally, trees are felled and debarked on site in May when the sap is rising and wood has an attractive cream/yellow colour. There are three main advantages to spring felling: the timber has a chance to dry naturally during the summer period, it allows the felling gangs to return to farming for the summer and extract the timber in autumn and it causes the minimum damage to the under-storey.

Up to the 50s, logs were transported by a series of water channels which were built by the owners in return for land they received from the Prince of Fürstenberg in the middle of the fifteenth century. (Holdings were closed, they could not be subdivided between the farmers' children. As a result, direct links can be traced to the original owners and more importantly the continuity of silvicultural treatment has been maintained. This continues up to the present day: while owners can sell their holdings they cannot divide them.) Water transport was replaced in the 60s by truck transport when a network of

Forstinspektor Kober outlining the operation of the Plenterwald selection forest system in the Sandeckwald

forest roads was constructed. Roading density is between 50 and 100m/ha.

Today, great care is taken when felling thinnings. Highly skilled extraction teams led by master fellers, who are trained in all aspects of harvesting, ensure that as little as 1% of the under-storey is damaged. After felling, damaged and poor quality stems are removed to facilitate the regeneration of the elite trees. Natural regeneration encourages natural pruning. Nevertheless artificial pruning, up to 15m, is carried out in three stages: ground level to 2.2m, 2.2 to 6.0m and finally 6.0 to 15.0m. Pruning is still carried out manually, long handled saws are used to prune up to 6m and ladders are used up to 15m. Obviously, the main objective is to produce quality, knot-free timber, but there are two other important reasons for pruning:

- to reduce ground shade to encourage natural regeneration;
- to facilitate hunting and shooting.

Pruned stands are certified. The price differential between pruned and unpruned trees is considerable, mainly due to the demand for veneer quality logs. Pruned silver fir fetches between 160 and 240 DM/m^3 (IR£67 and IR£100) compared with 40DM (IR£17) for unpruned.

Our second stop was at a small family-run sawmill at Schapbach. The owner, Herr Roth described how a mill with an annual production of only 6,000 to 10,000m^3 could not only survive but provide a comfortable living for his own family and a staff of six. The mill, which the family bought in 1919, is a self contained unit. Up to 1968 it was water powered. They then introduced a diesel electricity generator. This proved to be a wise decision as today their electricity is three times cheaper than the regional grid.

Maintenance operations such as setting of saws are carried out by their own staff.

Wood is purchased from farmers, state, and community forests in lots from 20 to 1,000m^3. They cut only to order, mainly for the construction market. A feature of the mill was a computerised mobile crosscutter on tracks which saws the timber into ordered lengths. These are then transferred to the saw bench where the blades in the frames are adjusted in line with the order. As a result there is no waste or stockpiling of sawn wood.

Our final stop was at the Black Forest open-air museum the Vogtsbauernhof in Gutach on the route between Offenburg and Donaueschingen. This Bunratty style development features original farmhouses and other buildings such as a distillery, bakery, granary, apiary, smithy and sawmill dating back to the 16th century. All but one of the 27 buildings were constructed on the museum site. Most of the dwellings had no outside buildings: the living quarters, stables, cattle feeding area, machines, grain and hay storage were all under the one roof. Up to 1568 these houses were built almost totally from wood and even for a long time after this date – when fire regulations were laid down – only the kitchen walling was constructed in stone.

The sawmill, which was re-erected on museum land in 1963, dates back to 1673. This created considerable interest as it is similar to mills which were in use since 1245. The millwheel is water-powered and this turns the axletree which creates an up and down motion of the saw-frame, slowly cutting

through the log: a six metre length taking three quarters of an hour to saw through. The saw, which is still working, took three years to cut all the wood for a typical dwelling.

Wood was used extensively in mining, smelting and charcoal production. It was also vital to the glass industry which used up to two m^3 of wood to produce one kg of glass. The demand for wood for these industries and for domestic fuelwood was so great that by the 15th and 16th centuries some areas, such as the north-west corner of the Black Forest, were totally denuded of trees.

As well as carpenters and builders, a wide cross-section of craftsmen used wood, including coopers, vat makers, shinglers, carvers and lathe workers. A complete folklore and mystique built up around the forest and associated crafts and industries. As our guide pointed out, the people who lived in houses such as those at Gutach thought more of timber than food. The forest is still a vital aspect of the Black Forest culture, especially for its non-wood benefits such as leisure and hunting.

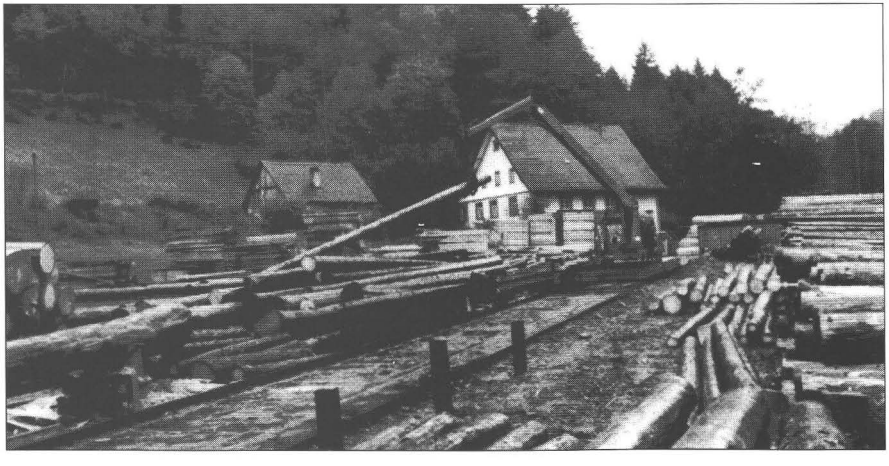
Donal Magner

Society Tour Participants:

President: Eugene Hendrick

Convenor: John Fennessy

John Brady, Maureen Cosgrave, Myles Cosgrave, Tony Crehan, Jim Crowley, Pat Doolan, Charles Farmer, Gerry Fleming, Brigid Flynn, Lily Furlong, Denis Gallagher, Tony Gallinagh, Michael Glennon, George Hipwell, Liam Howe, Jim Hurley, Tim Hynes, Richard Jack, John Kelly, Pat Kelly, Joe Kilbride, Jimmy Lahart, Donal Magner, Gerard Maum, Kevin McDonald, Michael McElroy, P. J. McElroy, Ann McHugh, Jim McHugh, John McLoughlin, Brian Monaghan, Michael O'Brien, Liam O'Flanagan, Paddy O'Kelly, Tim O'Regan, Pat O'Sullivan, Tom Purcell, Gerry Riordan, Martin Ruane, Joe Tansey, Charles Tottenham, Robert Tottenham, Joe Treacy.



Log handling carriage in the Roth family sawmill at Schapbach

Submission by the Society of Irish Foresters to the strategy for the development of the forestry sector to the year 2015

1. Background to the Society

The Society of Irish Foresters was founded in 1942 with the objective : *"to advance and spread in Ireland the knowledge of forestry in all its aspects"*. Three years ago the Society added another objective: *"to promote professional standards in forestry and to promote the regulation of the forestry profession in Ireland"*. Since its foundation the Society has been involved in the evolution of silvicultural policy and practice in Ireland.

The activities of the Society include the publication of *Irish Forestry*, the organisation of field days for members, the holding of an annual symposium on forestry related issues, the organisation of public meetings, the holding of national events such as Wood Ireland and Forestry '88, the holding of an annual Study Tour for members of the Society and the general promotion of forestry and the forestry profession in Ireland. There are over 650 members in the Society, spread throughout Ireland (including Northern Ireland) and the great majority are practising foresters.

2. Strategic plan for forestry

The Society welcomes the initiative of the Department of Agriculture, Food and Forestry in undertaking a study to lead to a strategic plan for the forestry sector to the year 2015. By its nature forestry is long-term and needs an overall direction to achieve its objectives as stated in the terms of reference.

3. Background to the forestry sector

The statistics on expansion of the supply of raw material and on the increase in planting in recent years are well known. Flowing from these facts there are several strategic issues such as the development of outlets for wood and non-wood products, environmental issues and the development of a resource base that will be in the best strategic interest of the industry. Overall there is the need to sustain the forest resource for future generations and to maximise its employment potential within the overall constraint of sustainability.

4. Issues

4.1. An active, well regulated forestry profession is fundamental to the development of the forestry sector over the coming two and a half decades. Foresters will provide the essential skills in:

- plant production
- silviculture
- forest management
- inventory and yield regulation

- forest harvesting
- forest environment
- recreation facilities

In order to sustain the forest resource over the period of the plan and to achieve the objectives listed it will be vital that these and other skills are available and are used wisely.

4.2 The forestry profession has long been committed to the concept of the sustainable management of the forest resource and forest lands. The principle was formally enunciated at the Ministerial Conference in Helsinki in June of 1993: *sustainable management means the stewardship and use of forest lands in a way, and at a rate that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil now and into the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems.*

This principle should inform all decisions relating to the use of the forest resource in Ireland.

"The forestry profession has long been committed to the concept of the sustainable management of the forest resource and forest lands."

4.3 The main value of Irish forests lies in their commercial potential. Within the forest resources of the World's Temperate Zones, Ireland is unique in regarding all her public and private forests as being of "high" value for wood production. "Benefits and Functions of the Forest", Volume 11, UN/ECE publication 1990). This is inconsistent with the aspirations contained in the Ministerial Conference. While wood production is important, and will remain important in the Irish context, our forests have non-wood benefits which must be given expression in their planning, constitution, management and harvesting.

4.4 The Society is at present involved in negotiations with the Institute of Chartered Foresters in Great Britain with the objective of forming closer linkages in the area of common recognition of qualifications and the self regulation of the profession. While these discussions are at an early stage it is envisaged that a common examination structure will emerge. The profession in Ireland, will almost cerainly develop a European dimension which will facilitate the exchange of professionalism throughout Europe in line with EU policy.

"The Society would urge the adaption of national recognition for the role of the professional forester, through either regulation or legislation, in order to protect the public and the resource from non-qualified individuals."

The Society would urge the adaption of national recognition for the role of the professional forester, through either regulation or legislation, in order to protect the public and the resource from non-qualified individuals. This is particularly the case in

ensuring that the considerable state expenditure on private forestry is developed to its full potential.

4.5 Forestry graduates are well trained in silviculture and forest management. There is an increasing need however, for foresters to be skilled in business management, marketing and financial matters. It recommended that business skills be incorporated into the syllabus of the forestry undergraduate programme at University College Dublin and the new Wood Science degree course at the University of Limerick.

4.6 The sustainability of the forest resource is dependent on competent and experienced foresters to manage and regulate it. Given the long-term nature of forest growth there is a essential need for a continual recruitment in order to pass on experience and to introduce new skills. The state sector

"The sustainability of the forest resource is dependent on competent and experienced foresters to manage and regulate it."

has recruited almost no new foresters in the past decade. Both Coillte and the Forest Service have only a handful of staff under forty years of age. This is not a sustainable position, apart from the need for all organisations to have a proportion of young, enthusiastic employees. It is recommended that recruitment by both organisations of foresters should recommence immediately.

4.7 The species range in current afforestation programmes is too narrow. This restricts the industry base that can develop and increases the potentially damaging effect of introduced pests and diseases. The range

"A radical change away from the core species, Sitka spruce could not be justified, particularly as the processing sector has grown around its use."

needs to be extended by including increased planting of Douglas fir, Norway spruce and western red cedar. As far as broadleaves are concerned the emphasis should be on the faster growing species particularly ash and sycamore, and oak and beech among the relatively slow growing species. In order to encourage such a strategic diversification of species there should be a grading of grants to encourage the planting of the more valuable conifers such as Douglas fir and western red cedar on suitable sites. However a radical change away from the core species, Sitka spruce could not be justified, particularly as the processing sector has grown around its use.

4.8 The quality of the Irish Sitka spruce timber restricts its use in some applications. In getting an increased share for this timber in Europe the industry will be faced with stiff competition from eastern Europe, Scandinavia and elsewhere. The quality of the existing resource can be improved by measures such as pruning and early thinning. These operations will involve a financial input from the grower who may be reluctant to com-

mit resources to an operation that does not result in an immediate return. Consideration should be given therefore, to providing incentives or switching a portion of existing incentives to encourage pruning and thinning.

For future plantations, quality can be maintained by strict adherence to planting densities of no less than 2,500 surviving plants per hectare. Consideration should also be given to wood quality issues in tree breeding programmes to select for characteristics such as high density and small branch sizes, which may not always be compatible with increased yield.

4.9 The Irish forest resource overwhelmingly comprises two exotic species, Sitka spruce and lodgepole pine. There is insufficient knowledge of the ecology of these species in Ireland. In order to safeguard the resource there is need to develop a full understanding of the ecological processes in plantations of both species. There is also a need to develop systems of regenerating these species that are sustainable. There is a need therefore to fund, at national level, basic research on the ecology of Sitka spruce and lodgepole pine in Ireland.

"There is a need to fund, at national level, basic research on the ecology of Sitka spruce and lodgepole pine in Ireland."

4.10 The ESRI study by Kearney *et al* (1992) has shown the local benefits that arise from forestry activity. As forestry is a land use it follows that much of the employment in planting, thinning and clearfelling will be generated locally. In the processing area much of the employment resulting from forestry also arises locally. However, wood processing industries are generally large in size and need large inputs to derive the benefits from the associated economies of scale. Given the generally scattered nature of the Irish forest resource it is inevitable that such large scale production facilities will be remote from some of the sources of supply. It is likely that a new large scale wood and residue using industry will not be set up in Ireland until the new millennium. There will be considerable pressure to locate such a plant in the north-west of the country. That area has however, very considerable infrastructural problems and these would need to be addressed by capital investment in secondary and main roads during the coming decade and a half. However before embarking on any investment it is recommended that a cost benefit analysis of road improvement be undertaken and it should be compared with such alternatives as bulk forwarding to collection points.

Given the increasingly integrated nature of the processing industry it is likely that such a plant would be located close to an existing major sawmill.

There is also a need to decide if there should be a target proportion of the land area covered by forest. This would relate to the scale of proposed industries, the need to have a balance between forestry and agricultural use of land, and the impact on the visual and physical environment. It is currently estimated that there are over

400,000ha of poor agricultural land, suitable for forestry and that this area will be supplemented by better quality land which will be planted as a result of the grants that will be available for the next three to four years at least. By the end of the decade it is likely that the forest area will be about 10% of the land area: should this be increased to 15%, 20%?

4.11 The present trend in planting by the private sector and farmers in particular is welcomed by the Society. Many of the plantations established are however, located in areas that will be difficult to access with heavy timber lorries and they are generally small (less than 10ha). If this trend continues there is a danger that the Irish forest estate will become increasingly fragmented. Harvesting and transporting wood from such plantations will increase the cost of delivered roundwood. It is recommended that in order to overcome this potentially serious structural problem that incentives be put in place for forestry co-operatives, where increased grants would be available for areas above a certain size where a group of farmers had agreed a joint planting programme. Also consideration should be given at the planting stage regarding county road access and where this would be extremely costly to upgrade then consideration would be given to reducing the grant level. Such an approach by the state is justified as it reflects the level of return that can be expected from the investment and its ultimate social value.

4.12 Wood processing industries are becoming increasingly automated. Given the need to sell timber and other primary wood products in an open market this trend will have to continue if the primary processing sector is to survive. Given the great national need to provide sustainable employment the strategy should be to put in place skill intensive secondary wood processing industries (in addition to a strong primary sector). These could include products such as SCT (structural composite timbers) and furniture. These industries would also use a high proportion of Irish wood. Competitiveness in this area is driven by innovation (including R&D, design and technology acquisition). There is, however, a high risk associated with such ventures. It is recommended that a well planned innovation programme should be put in place for the secondary processing sector that would be market led and funded by Government.

4.13 At present the Irish sawmilling industry is dependent on a small product range, and on the UK pallet market in particular. This is a particularly price sensitive commodity. New markets for the existing commodity products should be thoroughly investigated and the possibility of manufacturing other primary products that are in demand internationally should be costed and researched.

4.14 Forest regulation will become increasingly important for the period of the plan. The regulation of the annual cut is an important issue in terms of ensuring a steady supply of raw material for industry and in preventing the overexploitation of a national resource for short-term gain. It will be an important national issue especially given the large numbers of private growers now involved. It is essential therefore that the methodology to oversee and regulate the annual

harvest is put in place by the Forest Authority.

4.15 Government grants for planting are likely to continue to 1997. If grants are suddenly stopped or phased out at that time it could have a very damaging effect on activity in the growing sector in particular and will eventually work its way down the supply chain to the processing sector. It is recommended that a policy be put in place to examine the implications of such a change and to prepare strategic plans in the event of the grants being curtailed or stopped.

4.16 The harvesting of Ireland's forests will be one of the major challenges of the coming decade and in the period beyond. We must ensure that we are competitive in this regard and must strive to develop techniques and systems that ensure that this is so. Two areas in particular need attention. The first is the area low ground pressure extraction systems. The second is systems to access forests that are on poor county road networks or have poor internal access. It is recommended that Government R&D funding should be targeted in this area over the next five years in particular. Also there is a need to ensure that areas which are not accessible to forwarder extraction are thinned. The technology of cable logging needs to be re-examined and cost competitive systems brought forward. Also the environmental impact of harvesting on the physical and visual environment needs to be fully investigated.

4.17 The Irish taxpayer has made an investment of over £1 billion in Irish forestry since the foundation of the state. The advent of Coillte put most of this investment under commercial management. The Society was, and is, fully in favour of this development. However, there will be demands to privatise the whole or parts of the forest estate and its associated human and capital resources. The Society's view is that any such decision must first take into account the sustainability of the forest for present and future generations. In this regard the exclusion of areas that are relatively unprofitable from any new entities would represent a serious undermining of the sustainability of such areas and would not in general be welcomed by the Society.

4.18 Since the last rapid expansion of the forest estate in the late 1950s research has played a key role in the development of Irish forestry. In addition, work by the Forest Products Department of Forbairt has helped to achieve the recognition and widespread use of Irish timber. In recent years this effort has been scaled back, despite the rapid expansion of planting and processing to their current levels. Increased investment in research in all sectors of the industry, especially in the harvesting and processing sectors, is a key strategic need in order to develop an industry that is sustainable.

Eugene Hendrick
President
Society of Irish Foresters

Book Reviews

Exotic guide

Whence Our Trees
by Scott Leathart,
Foulsham, Yeovil Road,
Slough, Berkshire SLI 4JH,
1991 pp250, 106 colour
and 11 black and white plates.
Price £19.95. ISBN 0572-01675-1

John McLoughlin

In this work Scott Leathart, former editor and secretary to the Royal Forestry Society, England, Wales and Northern Ireland, provides us with fascinating descriptions and details of the performance of 105 exotics since their arrival in Britain. Not since the great works of Loudon published in 1838 and Elwes and Henry between 1906 and 1913 has there been any attempt to update and consolidate the record of trees.

Scott Leathart gives us a description of the natural distribution and habitat of the trees, their associates in the forests, their life histories, aesthetic merits and timber uses; the dates and means of their introduction to Britain and their subsequent performance. The foreword is by the Prince of Wales and he says that the book will become a substantial reference work for foresters and gardeners. He also nails his colours to the mast on conifers when he says "that many (exotics) we have come to regard as our own, while others, such as Sitka spruce (*Picea sitchensis*) some of us might have wished, on purely aesthetic grounds, would have remained in their own homelands".

In the first chapter, we are taken through the life and times of the plant hunters. The chapter brings to life names like Kaempfer, Cunningham, Douglas, Jeffrey, and others we are familiar with only as latinisms. He also, of course, includes our own Augustine Henry but unfortunately describes him as Professor of Forestry at Trinity College, Dublin when in fact it was the Royal College of Science, later part of University College, Dublin.

The author says in the preface that the book is not a text book, nor is it an aid to identification. What it does is present a picture to those with a knowledge and a love of trees, showing them in their natural habitat, describing how and where they arrived in their adopted homes and how they fared since their arrival.

The book will be of immense help to foresters who lead forest walks because it also gives information on the uses of trees, both commercial and aesthetic, so instead of consulting several texts on different aspects of a particular tree one can get a full picture from this book.

One is left wondering why he chose the 105 trees included out of a possible 600 exotics on these islands. All in all it is a very useful book and deserves a place on any professional forester or interested lay person's bookshelves.

Computers in the forest

Computers in Forestry: Use of Spreadsheets
by Roy Lorrain Smith
Research Studies Press Ltd.
Taunton, Somerset, England
1993, ISBN 0863-80144-7

Eugene Curran

The publication is presented in the way many user manuals are prepared with spiral binding, a bland cover and no nonsense text. We are told in the editorial foreword that: "Modern technology allows us to offer at a reasonable price, texts tailored to a particular but limited market". At £29.95 sterling it would appear to be quite expensive for what you get.

However, this is the first of a series of books on forestry related subjects, published by the small publishing house, Research Studies Press. Having learned the usefulness of spreadsheets at work and subsequently using them extensively in the preparation of budgets I am familiar on how useful they can be.

Their advantages in forestry are outlined by the author as follows:

Understanding: Managers using spreadsheets will input their own information and as a result will understand their origin better.

Precision: They call for more precise figures rather than "feel".

I would agree with both but I would have added *efficiency* (which I was surprised was not included) as spreadsheets can be updated with the minimum of effort and with the minimum of error.

When one starts to get into the "nitty gritty" of the book, it is quite clear Mr. Lorrain Smith knows his subject and goes to some length explaining the *pros* and *cons* of various formulae in discounting values etc. It is very relevant to forestry applications and would be of interest to the serious pundit. It is not just a crash course in spreadsheets but includes a lot of detail on forest economics.

The book is heavy going and would rate poorly on the bedside reading scale. It is a book designed to be used. There are, however, no diagrams, photographs, graphics or colour. The text is congested and should have been spaced out for easier readability. Also, I feel it has fallen between two stools; the first, a basic step by step manual on spreadsheets and the second an academic foundation in forest economics.

Users of this manual would be advised to familiarise themselves with spreadsheets first as it is not for absolute beginners. The overall assessment is that the book is of value to the practitioner and those interested in forest economics but is poorly presented.

Reviewers:
John McLoughlin: Chief Environmental Officer, Coillte.

Eugene Curran: Inspector, The Forest Service, Department of Agriculture, Food and Forestry.

Trees, woods and literature – 18

Every morning he would leave the house, and scramble under the post and rail fence into the wood, lured by the sound of the axes ringing and the scent of an oak fire in the spring morning. There was a sudden silence; the music of the saw, the language of the axes, was gone, then for a moment came the sound of chopping as the little boy stood listening in the undergrowth. By the time he reached them the woodmen were having their breakfast, a blackened cocoa tin, with a wire handle threaded through holes punched in the edges, hung from a bent hazel wand above a little fire; the men sat side by side in a row on the ground with their backs against a stack of faggots, their legs stretched out and their boots soiling the first primroses. They blinked in the bright sunshine and ate with their knives. Benedict sat down on a stump and talked to them about their work. "When are you going to strip the bark from the tree you cut yesterday? Will you build a little tent with it?"

The trunks of the felled trees were all stained a rough brown with the drying sap; beside each of them stood a little tent of brown bark. Benedict was fascinated; at odd times he gathered up handfulls of sawdust and let it run through his fingers; there was a grindstone too with a can of dripping water. When they were finished breakfast a lad turned the handle while one of the woodmen sharpened his axe. Benedict watched so critically that he got called an inspector. "Inspector? That's a funny thing to call me. Why do you call me an inspector?" he asked, but later he accepted the name with pride and spoke of himself as the inspector. "Are you going to make that tree fall down this way or over there? he asked, and when he had been told, stood a little apart with his hands behind his back, watching the men sawing with the great crosscut, and the tree trembling. There came a few strokes with the axe, they took up the saw again, with each cut the fibres cracked, the sawcut gaped, and suddenly, with shouts from all the men, and the sound of a volley from a firing party, the great tree hurled itself headlong to the earth. "Which tree will you cut next?" asked Benedict imperturbably.

In a few days other men were already in the clearing taking measurements and driving in pegs where the woodmen had been, and in another week, the woodmen's work being done, a waggon came for the faggots, and for the oak bark, and on succeeding days the team came with two pairs of wheels on which the oak trunks were separately jacked up and bound with chains.

The waggon made a new cart-track winding between the stumps where one had never been before. Where did it lead?

"There was a sudden silence; the music of the saw, the language of the axes, was gone ..."

From *No Love* (1929) by David Garnett, reprinted by kind permission of A. P. Watt Ltd. on behalf of the executors of the estate of David Garnett. David Garnett (1892-1981) was born in Sussex, son of Edward Garnett, notably helpful to Irish writers as a publisher's reader in London, and Constance Garnett, famous as a translator of major Russian writers.

Garnett studied botany at University, became a conscientious objector during 1914-18 war, and was later a prominent member of the famous Bloomsbury Group of writers and artists. His best known novels are *Lady into Fox* (1922) and *A Man in the Zoo* (1924). He also published three volumes of autobiography.

The tree-felling exercise described in the passage from *No Love* is set in 1898. The location is "a low hill of gravel, which owing to its sterile nature had been abandoned to woodland". The clearance is in order to build a house.

The procedure described is now superseded, but there are still those among us who remember axes and crosscut saws, and even those who once used them. The whole sequence is illustrated in *Forest Images: Father Browne's Woodland Photographs* (Society of Irish Foresters, 1992).

Inspectors, of course, are still a feature of Irish forestry.

(Selection and note by Wood-Kerne)

"By the time he reached them, the woodmen were having their breakfast . . ."

Forest workers at Emo from *Forest Images: Father Browne's Woodland Photographs* by E. E. O'Donnell, SJ (Society of Irish Foresters)

Obituaries

H. M. FitzPatrick 1902-1994

Maurice FitzPatrick, who died in April 1994 in his 92nd year, was a man of exceptional and varied talents which he devoted generously to the cause of forestry and trees throughout most of his lifetime.

Born in Clontarf, Dublin, he completed his secondary education at Belvedere College, after which he entered the British Forestry Commission as a trainee forester and carried out his practical training at Dundrum, Co. Tipperary, and Baronscourt, Co. Tyrone, during those times of conflict before the Treaty in 1922. In reminiscence he would sometimes recall the trauma of the occasional threatening visits of the Black and Tans to the training quarters in Dundrum.

He would talk too of his boyhood visits to Co. Meath. "As a Dublin boy," he recalled, "I got to know trees, flowers and growing things which set my feet on a career which brought me from the cramped city into the woods, the fields and hills".

In the mid-twenties Maurice FitzPatrick entered the College of Science under the renowned Professor Henry, and having completed his Working Plan at the Oak Forest of Troncias in France, proceeded to his forestry degree in due course.

As a postgraduate student Professor Henry gave every encouragement to his gifted student, and in 1929 and 1933 two of what are probably his finest works were published by the RDS: *"Coniferae, Key to the Genera and Species* and *Trees of Ireland, Native and Introduced* respectively. The former is still in use and regarded as the best key available for serious systematic teaching of conifer dendrology, while the latter still stands as an essential reference to foresters and arboriculturalists who study trees and their whereabouts in our country. To complete *Trees of Ireland, Native and Introduced*, he visited 85 estates and arboreta, North and South, mostly on a pushbike, identifying and measuring each tree recorded – a phenomenal achievement of skill and physique.

Maurice FitzPatrick joined the adolescent Forestry Service in the early thirties and served as one of the top inspectors until 1943, when he retired for personal reasons. The loss of his potential at that stage was a blow to foresters and forestry in the difficult times that lay ahead in the Service.

However, his contribution to forestry did not abate. He was a founder member of the Society of Irish Foresters in 1942 and was intimately involved in its formative years. He was President of the Society on five occasions. He was appointed to the onerous task of editing the first *Forests of Ireland*, a quality and comprehensive book published in 1965 and a major achievement in the history of the Society at that time.

At a time when forestry and trees were not much in the news in the late 40s, he was a founding member of Trees for Ireland and was central to its activity. On its behalf he lectured throughout the country and was author of a number of books and booklets – *Ireland's Countryside* 1963, *The Story of our Trees* 1984, *Planting for Profit* 1960-74 (three editions), *Forestry*, *Fuinseog* and some other leaflets.

Also, with Mrs Henry, the widow of Professor Henry, he initiated the Roadside Tree Association and they were instrumental in having the first roadside trees planted on the Stillorgan and Adelaide Roads. He wrote *Roadside Trees in Town and Country* and *Ornamental Prunus* on behalf of that association.

In 1983 he presented the classic

Trees of Great Britain and Ireland, 7 Volumes, by Elwes & Henry to the RDS:this had been a special personal gift copy from Professor Henry to Maurice.

As late as 1985 he was the author of *Trees and the Law* published by the Incorporated Law Society of Ireland.

Apart from his direct contribution to forestry and trees, his interest in the countryside in all its aspects was widespread. He was a founding member of Macra na Feirme, was directly instrumental in devising the most appropriate title for that organisation, and was active in its Co. Wicklow branch.

His knowledge of trees, not just forest trees, was universal and profound. As to the science of forestry, he was unshakeable in his belief in traditional values and that a knowledge of trees in the broad sense and the scientific fundamentals of silviculture were an essential basis for education of foresters, and that the principles of 'Sustained Yield' should be axiomatic to all forest practice.

Maurice FitzPatrick was a kindly and hospitable man and gave great pleasure to many friends, in and outside forestry, in participating at gatherings he arranged from time to time at his beautifully situated home at Nuns Cross near Ashford, Co. Wicklow. He had a prodigious memory for people and names, not only for the adults but also for their numerous children.

It is appropriate to quote from the fine appreciation that appeared in the *Irish Times* shortly after his death: "Despite his age and having suffered the loss of his immediate family, the respect and affection in which he was held by so many former colleagues and others who shared the love of trees caused him to be surrounded by solicitude and attention right up to the time of his death".

By his wish he was laid to rest in the cemetery at Glenealy under the benign shelter of the surrounding hills and forests, and the Wicklow countryside he knew and loved so well. He can share in full measure the epitaph on the memorial stone to Professor Henry at Avondale – "he enriched our knowledge of trees"

May he rest in well deserved peace.

O.V.M.

Dan O'Sullivan 1917-1993

It is with regret that we record the death of Dan O'Sullivan which occurred at his residence on 29th April 1993. Dan was identified with Glenealy Forest which was a showcase for aspects of Irish forestry over the twenty years which he served there.

Dan was born in the Dingle Gaeltacht and spoke only Irish until he was twelve. During his life he retained an affection that fell short of fanaticism for his native tongue. He studied at Athenry Agricultural College and the Albert College, Glasnevin before entering Avondale in 1938. After qualifying he was appointed to Newton Barry Forest and subsequently served at Tullow and Gorey Forests before going to Glenealy in 1963.

At Glenealy he was always ready and willing to greet presidents, ministers and foreign guests: it was at Glenealy that he became well known to many in the then Forest and Wildlife Service. Dan was always courteous and welcoming to visitors, students, foresters on refresher courses, field trips and the annual forest walks. Everyone received his undivided attention and understanding. He always imparted his knowledge willingly, efficiently and authoritatively.

Dan excelled with young students. He was at his most relaxed on a one to one basis as he discussed and imparted

his knowledge on silviculture, a subject in which he had an abiding interest. Glenealy Forest included an important nursery and as well as being a silviculturist, Dan was also an accomplished nurseryman and characteristically shared the technical knowledge which he patiently acquired over the years.

He always had a keen interest in the Society, being a technical councillor during the 1960s. He was the anchor man at Glenealy for the "From the Seed to Sawdust" forestry show organised by the Society in 1966.

Dan will be remembered for the tangible contribution which he made to Irish forestry in the form of prudent land use in the forest and nursery sphere and made a direct and indirect contribution to the education of students and foresters: this twin life achievement makes his contribution to forestry a very valuable one.

Dan was a devoted family man and was very proud of their achievements. One of his singular joys was to see his son Pat (the current Secretary of the Society) follow in his footsteps.

To his wife Carrie and five sons, Maurice, Pat, Barry, Donal and Ciaran, we extend our sincere sympathy.

Ar dheis láimh Dé go raibh a anam Dhilis. Ni behidh a leitheid ar ais aris.

John McLoughlin

David Dickson 1936-1992

Dave Dickson died at the relatively early age of 55 after a short illness which was borne with great courage. He was a Scotsman and he graduated from Aberdeen University with a First Class Honours degree in forestry.

He then came to the Department of Botany at Queen's University in Belfast as a post-graduate student. He completed his Doctoral Thesis on the classification of blanket peat in Northern Ireland, relating the vegetation to the nutrient content of the peat.

He joined the Chemical Research Division of the then Ministry of Agriculture in 1962. Dave was responsible initially for experimentation to determine the nutrient requirements of Sitka spruce on blanket peat. This was important pioneering work, as large areas of blanket peat were being planted in the 1960s. Later in his career, he became associated with experimentation into the effects of ground limestone on the physical and chemical characteristics of peat and the growth of Sitka spruce plantations.

During his 30 years work in research, Dave published a number of research papers in various forestry journals. He was widely regarded as one of the leading research workers in his particular field. He enjoyed showing other research workers and foresters around his experimental areas. He had the ability to explain complex results in a lucid manner, using his many graphs. He always encouraged discussion about his work and enjoyed a good argument, even at a late hour after a day in the field. He was very good company and had a good sense of humour and an infectious laugh.

Dave's other main interest was sailing and he spent many holidays and weekends sailing his boat up the west coast of Scotland, where he had friends in the many ports of call.

He was an active member of our Society and often contributed to seminars and day tours. His passing leaves us with a great sense of loss but we will retain very warm memories of him. To all his family, the Society extends its sympathy.

Bill Wright

Society of Irish Foresters weekend meeting in Connemara

Introduction
Environmental issues featured strongly during the Society's two-day study tour of Connemara on 24-25 September 1993. Locations included Cloosh Valley and Ballinahinch forests and Inchagoill Island, Lough Corrib.

STOP 1
Cloosh Valley Forest
Finnaun property

Location: Situated on the western seaboard approximately 20 kms. N/W of Galway Bay comprising a large contiguous forest block

Geology: Poryphoritite granite

Elevation: 60m-240m

Soil Type: Peat soils of the blanket peat type dominate the area. These vary considerably in depth from 1 to 6m. Rock outcrops are a frequent occurence.

Subject:
Under discussion was a site designed for monitoring of a forest ecosystem under the EU programme on the protection of the community's forests against atmospheric pollution.

The monitoring project that is currently being run in University College Dublin is examining the impact of atmospheric deposition on forests and the effect of forestry on the environment. The project director is Dr. Ted Farrell. The site in Cloosh Co. Galway is a 36 year Sitka spruce stand, planted on blanket peat, Yield Class 18.

The monitoring at this site consists of collection of water samples throughout the various strata of the forest: throughfall, stemfall, water percolating through the forest floor and water extracted from the peat at depths of 25 and 75 cm. Rainwater is also collected from an unplanted area close to the monitoring plot. These water samples are collected weekly and sent to the UCD laboratory for complete nutrient analysis. There are three other forest plots of similar design, also being monitored under this project, which has been running since 1991, in Mayo, Cork and Wicklow.

In general there is very little evidence of atmospheric pollution in Ireland. Of the four sites, the Wicklow site shows most evidence of atmospheric pollution, as it is located on an easterly slope overlooking the Irish Sea. There is an enrichment of ions between the rainfall and throughfall, evidencing dry deposition of elements on the forest canopy. In Cloosh there is a very high input of marine cations, notably sodium and chloride. In the two western sites, nitrogen is being absorbed as ammonium from the atmosphere by the forest canopy.

Gillian M. Boyle

SOCIETY NEWS

The impact of coniferous afforestation on the physical and chemical properties of blanket peat

Reforestation on blanket peat is already underway. This is often ahead of schedule due to wind throw. Establishing second rotation crops is presenting new challenges to foresters. The problems associated with reforestation were discussed throughout the study tour in particular during Stop 2 at Derryclare. The following brief paper explores the impact of afforestation in these areas.

The technological advances of the early 1950s brought about the successful afforestation of peatlands in Ireland. Developments in specialised ploughing equipment and a recognition of the need for phosphorous fertilisation paved the way for large coniferous afforestation programmes, particularly on blanket peatland along the western seaboard. This study was undertaken to determine the impact of this afforestation on the physical and chemical properties of blanket peat.

Two plots were selected for this purpose, one forested and one unplanted. Samples were collected from both plots in 10cm depth intervals, to a depth of 70cm in the open plot and to 40cm in the forest plot. To make allowance for variation in conditions within the forest plot, peat samples were collected from between the plough ribbons, the ribbons and the furrows. Samples of the litter layer were also collected.

A marked reduction in the moisture content and volume of the forested peat was observed. This drying and associated shrinkage resulted in higher bulk density values and subsidence of the bog surface. The fibre content, pyrophospate index and volume weight were all altered by the presence of the trees reflecting the higher degree of decomposition in the forest peat. Significantly higher levels of phosphorous, iron and exchangeable ammonium were found in the peat beneath the trees. Calcium and magnesium contents, on the other hand, were significantly lower in the forest peat. The pH of the planted peat was lower than that of the unplanted peat.

Áine Powell
M.Agr.Sc. (For.), COFORD

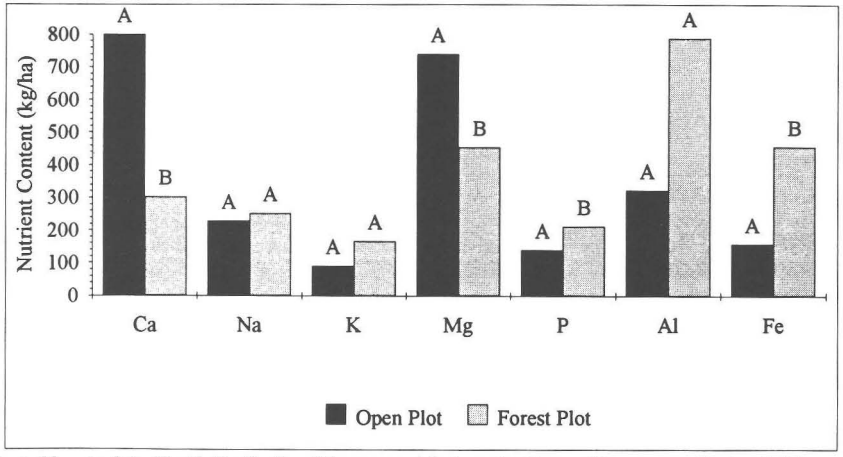


Fig. 1. *Mean total Ca, Na, K, Mg, P, Al and Fe contents of the forest plot (litter and forest peat to 40cm) and of the open plot to an equivalent depth (kg ha^{-1}), (same letters indicate no significant difference between forest and open plots).*

STOP 2
Ballinahinch Forest
Derryclare Property

Location: Situated in the Inagh Valley of the Twelve Pins. Fronted by Lough Inagh to the north and Lough Derryclare to the south. The Maumturk mountains lie to the east.

Elevation: 25-150m

Soil Type: Climate western blanket peat. Soil type of the oak woodland is lake marble.

Plantation: Conifers planted 1960-1967. Oak planted in 1850 and is now designated a nature reserve. 60-40 mixture of pine and SS with LP(L) being the dominant pine species. Approximately 30% of the stand is SS pure.

Cultivation: DMB ploughing

The Lough Inagh Valley is a very important tourist route and the lakes are part of the Ballinahinch/ Owenmore fishery system.

The area was clearfelled in 1993 due to windblow. Part of the clearfell was taken off the nature reserve and will not be reforested.

Long term felling and restocking plan (based on Simon Bell's guidelines) has been drawn up and incorporated into the 1994 thinning and rotation classification. Only 2 ha has been reforested to date.

John McLoughlin, Chief Environmental Officer, Coillte, gave an outline of the proposals for the phased clearfelling of Derryclare forest. He pointed out that the forest itself, although totally artificial, apart from a small area of native oakwood, was a very important component of the existing landscape. The scale of the plantation in the landscape was acceptable and apart from a few alterations to the external margins, the plantation fitted in very well with the landscape.

The problem now was that much of the plantation was reaching the critical height where wind was becoming a major factor. The clearfelling proposals envisaged the removal of the trees in five phases at four to five yearly intervals. The felling coupes would be large in size reflecting the scale of the landscape and they would follow the landform.

The next topic for discussion was Environmental Impact Assessment (EIA) and John McLoughlin pointed out that while the threshold is now 200 hectares for afforestation projects there was every possibility that this threshold would be reduced in the future.

Environmental Impact Assessment (EIA) is an American concept which has been introduced to Europe and was adopted by the European Union (EU) in the form of Directive 337/85. It was introduced to Ireland by means of statutory instruments and became law on February 1st 1990. The Environmental Impact Statement (EIS) is prepared by the developer and then the process of assessment – (EIA) is carried out by the relevant local authority. It will become the function of the EPA, the newly set up Environmental Protection Agency to carry out the assessment in future. All projects requiring an EIS automatically require planning permission and the process is the same as for any planning application with the right of appeal to An Bord Pleanala. There are some minor modifications. For example, with EIAs the local authority has eight weeks for the

assessment phase. The format of the EIS is laid down in statutory instruments. The EIS must have a non-technical summary. It must give precise details of the projects. Base line studies of the existing environment must be carried out. For afforestation projects, the following areas must be studied: geology, soil, climate, flora, fauna and water. Some of these surveys must be carried out at specific times each year, for example, a summer and winter bird count, and this leads to a long time lag between the purchase of the property and commencement of the project. This phase is critical. The base line data must be relevant, sufficient and credible.

The next phase of the report is to detail the likely impact of the project on the environment following the base line study. The potential impacts on the following must be studied: humans, flora, fauna, soil, water, air, climate, landscape and archaeology.

The group then moved to a clearfell site at Ballinahinch Forest and was welcomed by the Forest Manager, J. J. Kelly. He said that the site was clearfelled as a result of windthrow. The clearfell was planned to ensure that the view from the tourist road was not affected.

Three hectares were mounded with silt traps installed to avoid siltation of the lake. An area beside the lake which is a nature reserve owned by the OPW will be left unplanted.

Trevor Champ, Senior Researcher, The Central Fisheries Board, Dublin, emphasised the fisheries value of Derryclare Lake and the fisheries catchment generally for salmon and sea trout.

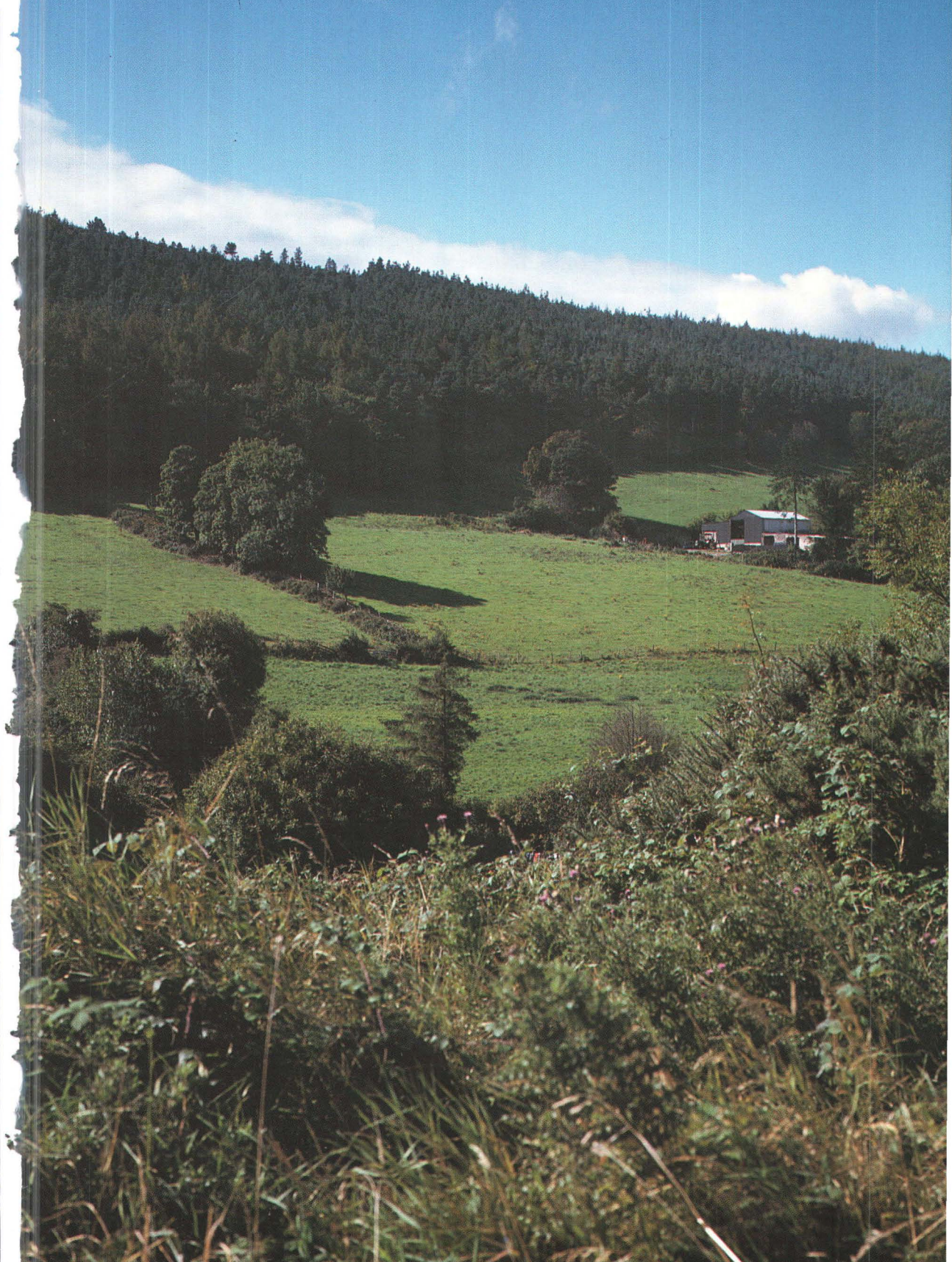
He mentioned the importance of preserving a treeless margin on the verge of the lake. At clearfelling stage it is important to keep the felling coupe small as it limits the extent of drainage required and possible adverse impacts on the aquatic system. Drains should be kept short. This is now possible using the mounding technique. Also, drains should fall short of the lake shore, in order to allow the water to dissipate and drop its silt load.

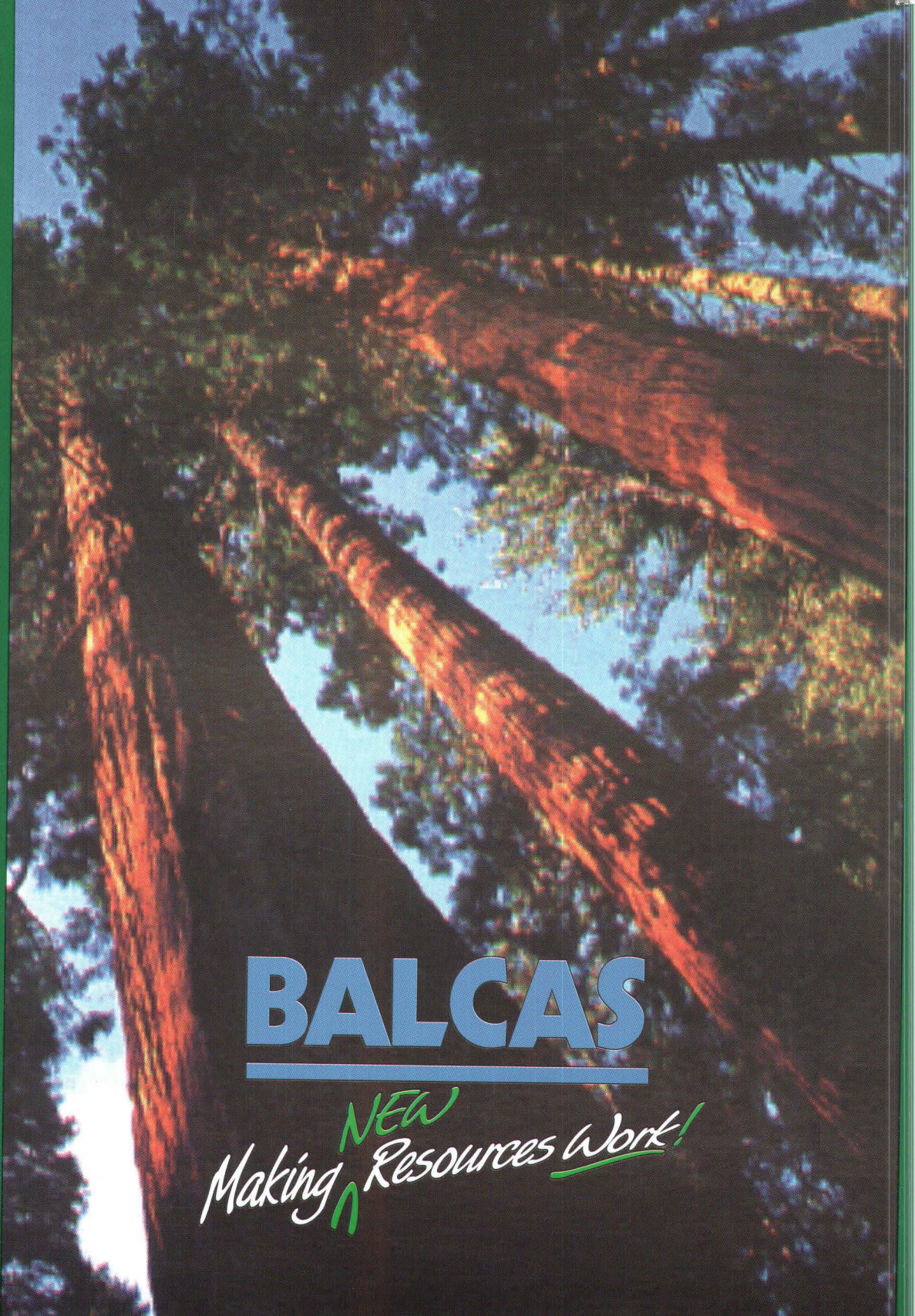
Stop 3
Inchagoill Island

On Saturday morning the group set off for Inchagoill Island on Lough Corrib to look at the archaeological remains on the island. The trip was lead by Edward Bourke, an archaeologist with the Office of Public Works.

The island, which is owned by Coillte also contains the ruins of an early Christian monastery in the ownership of the OPW. Nothing is known of the early history of the monastery, but two churches survive, one dedicated to Saint Patrick, the other known simply as the Saint's Church. Saint Patrick's was originally a simple rectangular church to which a nave was later added. The Saint's Church is a Romanesque style nave and chancel church, with a fine Romanesque doorway decorated with heads on the capitals.

There is one piece of evidence which proves the site is extremely early. A pillar stone with the inscription LIE LUGUEDON MACCI MENUEH – The stone of Luguedon son of Menueh. This inscription dating to the sixth century is written in the latin alphabet, but uses the format of the earlier ogham inscriptions. This makes it the earliest latin alphabet inscription in Ireland.

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