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FOREST TECHNOLOGY, MANAGEMENT AND TRAINING**

Seminar Proceedings

AFFORESTATION IN THE CONTEXT OF SUSTAINABLE FOREST MANAGEMENT

**Ennis, Co. Clare, Ireland
15-19 September 2002**

United Nations Economic Commission for Europe
Food and Agriculture Organisation of the United Nations
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Timber Section

Geneva, Switzerland

Seminar Proceedings

AFFORESTATION IN THE CONTEXT OF SUSTAINABLE FOREST MANAGEMENT

in conjunction with the 24th session of the Joint FAO/ECE/ILO Committee on
Forest Technology, Management and Training

*The seminar was held in Ennis, Co. Clare, Ireland
from 15 to 19 September 2002,
under the auspices of the
Joint FAO/ECE/ILO Committee on Forest Technology, Management and
Training*

Hosted by the Forest Service of Ireland

NOTE

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FOREWORD

Sustainable forest management (SFM) entails the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems.

SFM is an international initiative and is adapted to different areas of the globe according to the regional context. Despite this diversity in implementation, core criteria remain common throughout, and these relate to the forest resource, forest health and vitality, productive capacity, biodiversity, soil and water, and socio-economic issues. Although applicable to all stages of the forest cycle, these criteria are perhaps of greatest importance at the afforestation stage involving the development of new forests on open land. Proper practices at this stage lay a solid foundation for the full implementation of SFM throughout the forest's lifetime and beyond.

Afforestation within the context of SFM extends beyond the simple planting of trees to encapsulate the planting of the right trees in the right places. Given the nature of afforestation as a major change in landuse, the activity impacts greatly on the site and its surroundings. It also has wider implications in relation to, for example, the protection of river catchments, landscape management and the provision of an adequate regional infrastructure. The objective of the International Seminar 'Afforestation in the Context of Sustainable Forest Management' was to discuss best practice which ensures that afforestation proceeds in accordance with SFM.

REPORT OF THE SEMINAR

REPORT OF THE SEMINAR

Introduction

1. The seminar on Afforestation in the Context of Sustainable Forest Management was held in Ennis, Co. Clare, Ireland, from 15-19 September 2002, under the auspices of the Joint Committee and at the invitation of the Government of Ireland. Participants from the following countries attended: Austria, Canada, Croatia, Czech Republic, France, Germany, Greece, Iceland, Ireland, Latvia, Poland, Portugal, Romania, Spain and United Kingdom.

Opening of the seminar

2. Mr. J. Browne TD, Minister of State, with responsibilities for forestry at the Department of Communications, Marine and Natural Resources, Ireland, opened the seminar. The Minister stressed the importance of sustainable forest management (SFM) practice and stated that his vision was that all timber produced for the market should be derived from sustainable managed forests. Messrs. H. Hoefle (Germany), Chairman of the Joint Committee, and J. Najera (UNECE) member of the Joint Committee secretariat welcomed the participants.
3. The seminar was structured around three themes: 1- National and regional strategic planning, structures and practices implemented on a national and regional scale to provide an overall framework to promote afforestation in accordance with the principles of SFM; 2- Local and site planning, an assessment of individual sites at a local and site level in relation to their suitability for afforestation within the context of SFM; and 3- Operational aspects, the practice of afforestation, covering all operations from greenfield sites to canopy closure..

Adoption of the agenda (item 1 of the agenda)

4. The provisional agenda, as set out in the second announcement (TIM/EFC/WP.1/SEM.54/2) was adopted.

Election of officers (item 2)

5. The following discussion leaders were appointed for theme 1, National and regional strategic planning:

Session A	Mr. M. Prendergast (Ireland)
Session B	Mr. J. Connelly (Ireland)
Session C	Mr. H. Hoefle (Germany)
Session D (open discussion)	Mr. E. Hendrick (Ireland)

National and regional strategic planning (item 3)

Session A

6. At this session the following papers were presented: Mr. D. McAree (Ireland) on Afforestation in Ireland; and Mr. F.M. Dunn and Mr. J.J. Farrell (Canada) on Afforestation and Climate Change: A Canadian Perspective.

Session B

7. At this session the following papers were presented: Mr. Eugene Hendrick (Ireland) on The Role of Forest Research and Development; Mr. Tim Crowley (Ireland) on Coillte Practicing SFM in a Commercial Environment; and Mr. Josef Herkendell (Germany) on Afforestation in Europe: The Need for Better Communication and New Partners, the paper was presented by Mr. R. Daamen.

Session C

8. At this session the following papers were presented: Mr. Ray Gallagher (Ireland) on The Role of Co-operatives in Sustainable Afforestation; Messrs. Filip Georgescu and Mihai Liviu Daia (Romania) on Forest Regeneration in Romania; and Ms. Shirley Clerkin (Ireland) on The Forestry Regulatory Framework - an Environmental NGO Perspective.

Session D (open discussion)

9. The management of forests takes into consideration all aspects of the social, economic and ecological principles of sustainability. The discussion emphasised the need for countries to adopt codes of best forest practice and to adapt their legislative framework and guidelines to accommodate SFM.
10. The vast majority of the population lives in urban areas and the number of people directly depending on forest revenue is decreasing. The public, therefore, has limited knowledge and awareness about forests and forestry. Afforestation programmes need to be accompanied by a broad and in-depth communication process in order to increase the awareness of the population about the principles and practice of SFM. This process should be addressed to all stakeholders and include public relations, education and consultation. Without this structured communication process, forests will not be able to provide for the community the full range of potential benefits which flow from SFM.
11. Farm forestry can play an important role in rural development, by increasing farm incomes from marginal lands, creating employment in remote areas and enriching the environment through appropriate landscape structuring and ecological protection.
12. A new Native Woodland Scheme has been implemented in Ireland. The objective of this scheme is to conserve and enhance the indigenous woodland resource. This could serve as an example of an initiative to promote forest biodiversity.
13. Forest certification is a measure of SFM compliance. There is a need for mutual understanding and recognition between the main certification schemes, to gain wider acceptance and avoid the present public confusion.
14. Forest research has an important role to play in implementing SFM in afforestation programmes. Transferring research results into policy and practice is the great challenge for all research and development organisations.
15. Since the ratification of the Framework Convention on Climate Change in 1992 and the advent of the Kyoto Protocol in 1998, afforestation has taken on new economic and environmental dimension and its role in carbon sequestration has gained a higher and more important profile.

Local and site planning (item 4)

Session A – Chairperson: Ms. S. Clerkin (An Taisce - The National Trust for Ireland)

16. At this session the following papers were presented: Mrs. Katerina Trejbalova (Czech Republic) on The Czech Republic: Current Situation and Experiences in the Field of Afforestation; Mr. Damian Allen and Mr. Séamus Dunne (Ireland) on Indicative Forest Strategies: The Irish Experience; and Mr. Tim O'Brien (Ireland) on Private Afforestation in Ireland.

Session B – Chairperson: Mr. J. Lorbach (FAO)

17. At this session the following papers were presented: Mr. Richard H. Ramsauer (Austria) on A Comparison of Central European and Irish Forestry; Mr. Donald Whelan (Ireland) on the role of the Irish Timber Growers Association.

Session C – Chairperson: Mr. J. J. Gardiner (University College Dublin)

18. At this session the following papers were presented: Mr. K. Gunnarson (Iceland) on Planning for afforestation in Iceland; Mr. Stanislaw Dabrowski (Poland) on The National Programme for the Augmentation of Forest Cover; Mr. Tony Mannion (Ireland) on The Society of Irish Foresters; and Mr. Donald Fitzpatrick (Ireland) on Afforestation and Certification – The Contractor’s View.

Session D (open discussion) - Chairperson: Mr. J. Farell (Natural Resources Canada)

19. The themes of delivering economic returns together with rural and social development while restoring forest cover in an environmentally responsible manner were common to most presentations.
20. Restoring forest cover across the rural landscape is an integral component of a broader ecological objective. Decision making concerning species selection and their landscape implications, however, are guided by the current economic and social realities of countries, regions and communities.
21. Consultation and effective mechanisms for participatory decision making at the regional and local level are essential if afforestation is to be embraced by all stakeholders.
22. Efforts must continue to generate sustainable forestry jobs in terms of year round work, competitive wages and progressive working conditions.
23. Expansion of afforestation activities must be associated with clear and quantifiable national target objectives. This must be guided by forest strategic plans which conform to the practice of SFM and a code of best forest practice.
24. Indicative Forest Strategies offer a useful mechanism for engaging with stakeholder groups to identify opportunities and constraints regarding the location and composition of new forests. It should be led jointly by the Forest Authority and Local Authority and should be implementable.

Operational aspects of afforestation (item 5)

Session A – Chairperson: Mr. T. Farrell (University College Dublin)

25. At this session the following papers were presented: Mr. Niall Farrelly (Ireland) on Using GIS and site classification methods; Messrs. I. Abrudan, V. Blujdea, V. Kostyushin, C. Pahtontu, H. Philips, Ms. S. Brown, Ms. M. Voicu (Romania) on Prototype Carbon Fund: Afforestation of degraded agricultural land in Romania, Mr. Philips presented the paper; Mr. Jim Dillon (Ireland) on Coillte Farm Partnership Scheme – A joint venture in commercial afforestation in Ireland; and M. Bulfin, T. Radford and J. Brosnan on The effect of formative shaping on the stem quality and early growth of plantation ash.

Session B – Chairperson: Mr. P. Lehane (Irish Farmers Association)

26. At this session the following papers were presented: Mr. Stephen A. Smith (United Kingdom) on Creating New Native Woodlands in Scotland; Mr. Oscar Barreiro (Spain) on Operational aspects of fast growing species; and Mr. Arne Pommerening (United Kingdom) on Afforestation and continuous cover forestry.

Session C – Chairperson: Ms. A. Coffey (Castlewallen Woodland Partners)

27. At this session the following papers were presented: Mr. Michael Keane (Ireland) on The mechanisation of planting on restock sites in Ireland; Ms. Sanja Peric (Croatia) on Growth of six coniferous species in different bioclimates in Croatia; and Mr. Wojciech Gil and Mr. Jan Łukaszewicz (Poland) on Afforestation in Poland: silvicultural experiences.

Session D (open discussion) - Chairperson: Mr. N. Foley (Forest Service, Ireland)

28. The discussion emphasised that forest management should always take account of the environmental and social impacts of the right tree, in the right place with the right silviculture.
29. The increasing contribution of forest plantations to the production of a renewable and versatile resource was acknowledged. Afforestation strategies should always emphasise the need for a marketing and industrial development plan.
30. Continuous forest cover may provide a useful silvicultural tool to achieve the objectives of SFM. However, further research needs to be done particularly to quantify the costs and benefits of the practice.
31. Economically viable afforestation can be realised using the capacity of forests to sequester carbon. This is demonstrated by a pioneer project based on the sale of carbon to the Prototype Carbon Fund, implemented by the National Forest Administration of Romania.
32. Developing partnerships with the farming community can promote afforestation through facilitating landowners with the necessary forestry expertise, financial securing and marketing expertise.
33. Further research is needed on the establishment of stands of native species on wet, exposed and nutrient poor sites. The establishment of appropriate new native woodlands should be achieved with minimal levels of intervention.
34. Professional foresters, by their training, education and experience, are in the best position to manage forests in accordance with the requirements of SFM and to deliver its many benefits to the forest owner, the community and the environment.

Conclusions and recommendations (item 6)

35. The seminar adopted the following conclusions and recommendations under the Ennis Declaration:

Ennis Declaration

Conclusions

1. Farm afforestation can play an important role in rural development by increasing farm incomes from marginal lands and generating sustainable employment in remote areas. If carried out appropriately, this will enhance the environment, the landscape and biodiversity.
2. In order to achieve SFM, a partnership of land ownership, forestry expertise, financial security and marketing is required.
3. Wood production from afforestation creates a renewable resource that is CO₂ neutral.
4. The National Forest Administration of Romania is to be congratulated for demonstrating that the contribution of forests to carbon sequestration can be realised and used to facilitate economic afforestation.

5. Forests contribute significantly to the urban environment, with benefits including increased air quality, landscape improvement, enhanced opportunities for recreation and environmental education, and the promotion of public health. In an increasingly urbanised world, it is appropriate that SFM includes forests in urban areas.
6. Professional foresters, by their vocation, the history of their profession, their training, education and expertise, are in a pivotal position to manage forests in accordance with the requirements of SFM and to deliver its many benefits.

Recommendations

A. To member countries

1. All afforestation activities should embrace the six criteria of **SFM** as stated within the context of the Ministerial Conference on the Protection of Forests in Europe.
2. The difference between the concept of SFM and the certification process should be clearly understood.
3. Expansion of afforestation activities must be guided by forest **strategic** plans and conform to a code of best forest practice or similar guidelines.
4. Afforestation strategies should be integrated with a marketing and industrial development plan.
5. The increasing contribution of forest plantations to the production of a renewable and versatile resource should be recognised.
6. There is an urgent need to examine more effective ways to foster **communication** between the general public, NGOs and the forestry sector, working towards the common goal of SFM.
7. Consultation and effective mechanisms for **participatory decision-making** at the regional and local level are essential if afforestation is to be accepted by all stakeholders.
8. Indicative Forest Strategies (IFS), which analyse opportunities and constraints to identify suitable areas for forestry, are a useful method for engaging with stakeholder groups to identify the most appropriate location and composition of new forests. It should be jointly led by the Forest Authority and the Local Authority. IFSs should be implementable, and not aspirational.
9. Work already underway on the mutual recognition of forest **certification** schemes by the FAO and other organisations should continue and be accelerated. Certification schemes need to incorporate the needs of small forest owners who may be unable to meet the costs of certification.
10. Species selection and forest management should follow the three 'R' principles – the **R**ight tree, in the **R**ight place with the **R**ight silviculture. Decision making concerning species selection and its landscape implications should be guided by the economic and social realities of countries, regions and communities. The right silviculture recognises environmental, economic and social impacts and is practiced from the time of afforestation throughout the life of the forest.
11. The creation of new native woodlands should be encouraged to achieve the objectives of the Convention of Biological Diversity.
12. There should be an appropriate scheme to ensure that all forest reproductive material use in afforestation programmes is traceable back to source.
13. A greater awareness of the many benefits of afforestation in the context of SFM should be promoted among landowners, interested parties and the general public.

14. Afforestation is a major capital investment that requires to be safeguarded. Adequate integrated forest protection programmes must address major threats from disease, insects, mammals and other damaging agents. Biological methods of control should be favoured.
15. Professional **foresters** should participate in Continuous Professional Development (CPD) to ensure up-to-date awareness of the SFM process. They should also be innovative and learn from forestry practices and experiences in other countries.
16. Afforestation programmes should adapt to the changing expectations and requirements of society.
17. The conservation and enhancement of **biodiversity** must be an integral part of the SFM process.
18. The creation of full time sustainable **jobs** is a priority in terms of SFM. Shortage of forest workers is a major limiting factor to the achievement of afforestation targets. Improved working conditions and competitive wages must be provided to attract and retain more entrants into forestry work. This applies to employed workers as well as to contract labour.
19. All **grant schemes**, programmes and policies relating to landuse should be complementary in nature to avoid conflict.
20. State forest agencies are focused on **regulation**. Separate development agencies should be considered to promote increased afforestation. Over-regulation should be avoided.

B. To the research community

1. The role of afforestation in urban and peri-urban environments should be further promoted. In this context, better ways to communicate the benefits of forests to the urban dweller should be investigated.
2. The contribution of afforestation as a carbon sink needs further study in the context of national forest programmes and sustainable forest management. The potential use of incentives to encourage farmers and landowners to plant and manage forests for carbon sequestration and other forest functions and products needs further elaboration.
3. The sociological implications of increased afforestation programmes should be researched.
4. Continuous forest cover has many silvicultural and environmental advantages. However, more research needs to be done in relation to the socio-economic and ecological consequences of this silvicultural approach.
5. The implications of climate change and its impact on species selection and future afforestation programmes should be further investigated.

C. To the Joint Committee

1. The JC should commission a study into the efficiency and effectiveness of the various afforestation incentive mechanisms (e.g. policies, programmes, payments, tax concessions, regulatory mechanisms etc.).
2. The JC should continue to exchange information on afforestation practices, regulations and supportive financial mechanisms.
3. Another seminar on afforestation should be organised in due course.

Adoption of the report (item 7)

36. The seminar adopted the draft report prepared by the secretariat, and the conclusions and recommendations contained in the Ennis Declaration.
37. For the host country, Mr. D. McAree thanked the participants for attending the seminar, preparing papers, for the lively discussions during the different sessions and for the conclusions and recommendations. Mr. H. Hoefle, on behalf of the Joint Committee, Mr. J. Lorbach (FAO) and Mr. J. Najera (UNECE) thanked the host country for the warm hospitality and the excellent organization of the seminar, and the participants and support staff for their active contribution to the successful outcome of the seminar.

ANNEX

SEMINAR ON 'AFFORESTATION IN THE CONTEXT OF SFM' FIELD EXCURSION

Sunday, 15 September 2002

The technical visit organised in the context of the seminar took place at three different sites each with its own theme:

Theme 1: An Introduction to Afforestation in the Context of SFM in Ireland, Broadford, Co. Clare;

Theme 2: Practicalities of Broadleaf Afforestation in Ireland, Nenagh, Co. Tipperary;

Theme 3: Practicalities of Conifer Afforestation in Ireland, Coillte Farm Partnership Site, Upperchurch, Co. Tipperary.

Theme 1: An Introduction to Afforestation in the Context of SFM in Ireland, Broadford, Co. Clare

Speakers: Noel Kelly, Forest Owner, and Jim Quinlivan and Eamonn Cunningham, Forest Service

Overview of site work

When Noel Kelly, landowner, had considered the options on planting his 60 ha holding in Broadford, Co. Clare, in early 2000, he engaged Donal Fitzpatrick, an approved Consultant Forester. Donal's role was to design a forestry development that would comply with the Forest Service grant procedures while incorporating Noel's long-term plans for future recreation and amenity usage. Following consultation with the local Forest Service Inspector, an application for pre-planting approval (Form 1) was submitted along with a Site Species Map and a Site Cultivation Plan. An application for a Forest Roding Grant was also submitted following a site survey. Approval for Planting was issued in October 2000, subject to strict compliance with the recommendations of the Fisheries Board Inspector as the adjacent Killuran River was classed as a salmonid water and was therefore "sensitive". Approval for the construction of the forest roads was also given by the Forest Service.

Work then commenced on site preparation for planting. This was an exceptionally expensive operation due to the amount of furze (*Ulex*) and other vegetation that had to be uprooted and removed. This involved excavating and dozing into piles that were then burned or buried. Normally this material would have been windrowed into lines and planting carried out in between. A drainage system with silt-traps was excavated and a pond created on a small stream to provide a source of water in the event of fire. This was subsequently landscaped by Noel to make an attractive amenity feature. Mounding was the prescribed method of ground preparation and in some areas the stones and boulders were re-buried to make walking conditions safer. Existing trees were retained wherever possible.

The majority of plants were purchased from Coillte and Noel also purchased a wide range of trees, mainly broadleaf for amenity and biodiversity. The principal commercial species planted were Sitka spruce (52,100), hybrid larch (44,000), Scots pine (17,900), Norway spruce (8,050), Douglas fir (4,500), western red cedar (2,700), common alder (14,600), ash (10,800), pedunculate oak (9,000), sycamore (4,900), beech (3,000) and birch (1,000). These amounted to over 172,000 trees. An additional 12,400 trees were planted for biodiversity and amenity in scattered blocks throughout the site. Species used were sycamore, beech, copper beech, rowan, bird cherry, poplar, *Eucalyptus gunnii*, noble fir, horse chestnut, sweet chestnut, turkey oak, tulip tree, walnut, plane, Sequoia Wellingtonia and hornbeam.

Work was completed by 27 April 2001. An afforestation grant and forest premium were subsequently approved for 16.00 ha of 20% diverse species (GPC3), 30.28 ha of diverse species (GPC4) and 13.56 ha

of broadleaves (GPC5). Stone and gravel was excavated to provide road-making material. The Rooding Grant has not been paid to date. The owner Noel Kelly had direct involvement in the ground preparation, fencing and planting. He also opted to carry out the subsequent maintenance work himself.

Introduction to the Forest Service and the promotion of private planting

Role of the Forest Service: The Forest Service, Department of Communications, Marine and Natural Resources, is responsible for national forest policy, promotion of private forestry, administration of planting and other forestry grant schemes, control of felling and promotion of research in forestry and forest products. All development is to be compatible with the protection of the environment.

Measures of funding for private forestry:

1931 -1981 State funding

1981 - 1989 EU funding - Western Package Scheme

1990 - 1994 EU funding - Forestry Operational Programme 1995 - 1999 EU funding - CAP Reform

2000 - 2005 EU funding - Rural Development Programme

Grants and premiums: Applications are made by an approved forester. These may be referred to one or more of the Statutory Bodies before being referred to the local Forest Service Inspector for his recommendations prior to approval.

Other grants: In addition to the Afforestation Grant and Premium Scheme, the

Forest Service offers a number of other forestry schemes: Reforestation Scheme; Woodland Improvement Scheme; Reconstitution of Woodland Scheme; High

Pruning of Conifers; Formative Shaping of Broadleaves; Forest Roads Scheme; NeighbourWood Scheme; and Native Woodland Scheme.

Forest Strategy: The Irish government forest strategy is set out in the publication *Growing for the Future - A Strategic Plan for the Development of the Forestry*

Sector in Ireland. Its mission statement is "to develop forestry to a scale and in a manner which maximises its contribution to national economic and social well-being on a sustainable basis and which is compatible with the protection of the environment". It sets out the expansion of forestry from 7% of land area to 17% by 2030, and critical mass from 2.2 million m³ to 10 million m³.

Afforestation - Standards and Procedures for Grant Aid

These comprise grant and premium conditions, a prior approval process and an inspection procedure. Grant and premium conditions set out land ownership requirements as well as requirements relating to minimum fertility and the capacity of the site for forestry, the size and width of the site and the requirement that the project, its placement and development are all compatible with the protection of the environment. All grant-aided projects require Forest Service approval before any work commences. An inspection procedure is in place, ensuring that projects are inspected before approval and at various stages after completion of work. The following procedures apply.

Submission of an Afforestation Plan: This is compiled by an approved forester and contains details of cultivation, fencing, fertilisation, fire protection, species composition, vegetation control and ownership details. The plan also draws attention to environmental considerations pertaining to the site as well as to other issues such as access, the tree growth potential of the site, its ability to produce a commercial tree crop and its suitability for growing broad leaf species. A map is attached to the plan.

Environmental issues: These are addressed through consultation and by adherence to published operational standards.

Consultation enables a strategic decision to be made whether or not part or all of a project should proceed. The Forest Service consults with the relevant statutory agencies, requires an Environmental Impact Assessment where appropriate, and engages in public consultation in designated site categories. A protocol must be followed in the case of proposals draining into acid sensitive waters.

Mandatory operational environmental standards are detailed in a suite of guidelines that deal with water, archaeology, landscape, biodiversity and harvesting. The *Code of Best Forest Practice - Ireland* sets out environmental procedures for each forest operation. The consultation procedure may also detail procedures to be followed for specific afforestation projects.

Inspection procedure: All afforestation plans are examined by a Forest Service Forestry Inspector. Site inspections take place prior to approval and in the following phases after the work is completed: (i) on completion of afforestation operations; (ii) four years after completion; and (iii) randomly thereafter.

Penalty system: A penalty system is in place. There are financial penalties for silvicultural and environmental infringements as well as for false declarations relating to land type and land title.

Theme 2: Practicalities of Broadleaf Afforestation in Ireland, Nenagh, Co. Tipperary

Speakers: Michael Sweeney, Peter Alley and Paddy Bruton, Forestry Services Ltd., Ireland

Grant aid was applied for on 8 January 2001, and sanctioned on 27 March 2001. Preparatory work started almost immediately, and all works were completed by 15 May 2001. All Forest Service guidelines were adhered to; unplantable areas under ESB lines observed; a 15 m buffer zone left unplanted and fenced-off around the one recorded monument; minimum distances from adjoining buildings with the owner's written permission; and set back distances from roads were strictly adhered to.

The owner, Michael Flannery, owns approximately 46 ha and concentrated mainly on tillage and sheep farming pre-planting. Both his sons are working in Dublin, and are not interested in pursuing a career in farming. Mr. Flaherty has planted 21 ha, giving him a current tax-free income of ~10,316. He has let the remainder of his land and is availing of the Farm Retirement Scheme. He is also very conscious of the appreciating value of his tree crop. The soil is nutrient-rich and free-draining. The site has an elevation of 80 m and a southerly to neutral aspect, and is not exposed. Stocking levels for the ash, sycamore and alder are 3,300 stems/ha at a spacing of 2 m x 1.5 m. The site is not subject to frost, except for one section where alder has been planted. Ground preparation for the oak has been undertaken with an agricultural plough, the remainder was planted with the coolmore plough.

Theme 3: Practicalities of Conifer Afforestation in Ireland, Coillte Farm Partnership Site, Upperchurch, Co. Tipperary

Speakers: Jim Dillon, Daithi de Forge and Jim Fogarty, Coillte The Irish Forestry Board, Ireland

Planted area: 42.2 ha
Year of planting: January 2002
Species planted: 25.2 ha Sitka spruce
6.3 ha Japanese larch (mostly planted in intimate mixture with Sitka spruce)
6.7ha Ash
2.0 ha ESB powerlines (area retained as 'open space') Pedunculate oak and birch used for enhancement of internal hedgerows
All stock were bare-rooted
Plant details: Sitka spruce, Washington, 30-50 cm, 2+1s
/seed origins: Japanese larch, Hokkaido Island, 40-60 cm, 1 +1s
Ash, Ireland, 50-80 cm, 1u1
Pedunculate oak, Netherlands, 50-80 cm, 1u1
Birch Ireland 50-60 cm 1 u1
Soil type: 80% grey brown podzolic; 20% gley (sandstone derived)
Elevation: 200-310 m
Aspect: North east
Exposure: Sheltered to moderate Stability rating: S21
Yield class: 20-24+ m3/ha/yr
Cultivation method: 70% mounding; 30% agricultural ploughing (adapted)
Features: Archaeological feature (not shown on SMR maps) found during site development stage and preserved within plantation area. Old house and out buildings preserved as part of 'Area for Biodiversity Enhancement'. Important hedgerows strengthened by supplemental broad leaf planting to create habitat corridors through the plantation. Areas of heavy broad leaf scrub also retained.

Acknowledgements

The Forest Service wishes to thank the landowners Noel Kelly (Theme 1), Michael Flannery (Theme 2) and Patrick Quinn (Theme 3) for allowing access to and use of their properties for the purpose of the field excursion. The Forest Service also thanks the following individuals for their help in organising and running the field excursion, and for their input into this handout: Noel Kelly, Donald Fitzpatrick, Michael Sweeney, Peter Alley, Paddy Bruton, Jim Dillon and Daithi de Forge.

RAPPORT DU SÉMINAIRE

Introduction

1. Le Séminaire sur le boisement dans le contexte de la gestion durable des forêts s'est tenu à Ennis, comté de Clare (Irlande), du 15 au 19 septembre 2002, sous les auspices du Comité mixte et à l'invitation du Gouvernement irlandais. Y ont assisté des participants des pays suivants: Allemagne, Autriche, Canada, Croatie, Espagne, France, Grèce, Irlande, Islande, Lettonie, Pologne, Portugal, République tchèque, Roumanie et Royaume-Uni.

Ouverture du Séminaire

2. M. J. Browne, Ministre d'État irlandais chargé des questions relatives à la foresterie au sein du Ministère des communications, de la marine et des ressources naturelles, a prononcé l'ouverture du Séminaire. Le Ministre a souligné l'importance que revêt la pratique d'une gestion durable des forêts et a déclaré qu'il souhaitait voir se développer une production de bois à des fins commerciales entièrement issue de forêts gérées durablement. M. H. Hoefle (Allemagne), Président du Comité mixte, et M. J. Najera (CEE-ONU), membre du secrétariat du Comité mixte, ont souhaité la bienvenue aux participants.

3. Le Séminaire s'articulait autour de trois thèmes, à savoir le thème 1: la planification stratégique aux niveaux national et régional – les structures et pratiques mises en place à l'échelon national et régional pour fournir un cadre général permettant de promouvoir un boisement conforme aux principes d'une gestion durable des forêts; le thème 2: la planification au niveau local et l'étude du site – une évaluation de chaque site du point de vue des conditions locales et du terrain proprement dit pour vérifier qu'il est adapté au boisement dans le contexte de la gestion durable des forêts; et le thème 3: les opérations forestières – la pratique du boisement, ce qui couvre toutes les opérations à effectuer depuis la planification initiale jusqu'à l'achèvement du couvert.

Adoption de l'ordre du jour (point 1 de l'ordre du jour)

4. L'ordre du jour provisoire, tel qu'il figurait dans la deuxième annonce (TIM/EFC/WP.1/SEM.54/2002/2), a été adopté.

Désignation des animateurs de débats (point 2)

5. Les personnes dont les noms suivent ont été désignées pour animer les débats sur le thème 1 «La planification stratégique aux niveaux national et régional»:

Séance A M. M. Prendergast (Irlande)

Séance B M. J. Connelly (Irlande)

Séance C M. H. Hoefle (Allemagne)

Séance D (débat libre) M. E. Hendrick (Irlande)

La planification stratégique aux niveaux national et régional (point 3)

Séance A

6. À la séance A, des exposés ont été faits par M. D. McAree (Irlande), sur le boisement en Irlande, ainsi que par M. F. M. Dunn et M. J. J. Farrell (Canada), sur le boisement et les changements climatiques: un point de vue canadien.

Séance B

7. Les communications ci-après ont été présentées à cette séance: «La recherche appliquée à l'appui d'une gestion durable des forêts plantées en Irlande» par M. Eugene Hendrick (Irlande); «Coillte Practicing SFM in a Commercial Environment» par M. Tim Crowley (Irlande); et «Le boisement en Europe: la nécessité d'une meilleure communication et de nouveaux partenaires», communication de M. Josef Herkendell (Allemagne), présentée par M. R. Daamen.

Séance C

8. Les communications ci-après ont été présentées à cette séance: «The Role of Co-operatives in Sustainable Afforestation» par M. Ray Gallagher (Irlande) et «Forest Regeneration in Romania» par MM. Filip Georgescu et Mihai Liviu Daia (Roumanie).

Séance D (débat libre)

9. S'agissant de la gestion des forêts, il convient de tenir compte des aspects sociaux, économiques et écologiques du principe de la durabilité. Les intervenants ont souligné que les pays devaient adopter des codes de bonne pratique forestière et adapter leur cadre législatif et réglementaire pour y intégrer la gestion durable des forêts.

10. La grande majorité de la population vit dans des zones urbaines et le nombre de personnes qui dépendent directement de revenus forestiers ne cesse de diminuer. C'est pourquoi les connaissances de la population en matière de foresterie et de forêts sont limitées. Les programmes de boisement doivent s'accompagner d'une campagne de communication approfondie et de large ampleur afin de mieux sensibiliser la population aux principes et pratiques de la gestion durable des forêts. Cette campagne devrait viser tous les acteurs concernés et comprendre des activités de relations publiques, d'éducation et de consultation. En l'absence d'une communication structurée, la population ne saurait tirer parti des multiples bienfaits que peut apporter la gestion durable des forêts.

11. L'agroforesterie peut jouer un rôle important dans le développement rural, en augmentant le revenu agricole des terres peu productives, en créant des emplois dans les zones reculées et en mettant en valeur l'environnement grâce à l'aménagement du paysage et à la protection de l'environnement.

12. En Irlande, un nouveau projet appelé «Native Woodland Scheme» a été mis en œuvre afin de conserver et d'enrichir les essences autochtones. D'autres pays pourraient s'en inspirer en vue de promouvoir la diversité biologique des forêts.

13. La certification des forêts est un moyen de contrôle de la gestion durable des forêts. Une compréhension et une reconnaissance mutuelles des principaux systèmes de certification s'imposent

si l'on veut faire en sorte que ces systèmes soient mieux acceptés et éviter la confusion qui règne actuellement dans l'esprit du public.

14. La recherche forestière a un rôle essentiel à jouer dans l'intégration de la gestion durable des forêts dans les programmes de boisement. Pour tous les établissements de recherche et organismes de développement, l'enjeu consiste à traduire en action les résultats des travaux de recherche.

15. Depuis la ratification de la Convention-cadre sur les changements climatiques en 1992, et l'adoption du Protocole de Kyoto en 1998, le boisement a acquis une nouvelle dimension économique et environnementale et son rôle dans la fixation du carbone revêt une importance croissante.

La planification au niveau local et l'étude du site (point 4)

Séance A – Présidente: M^{me} S. Clerkin (An Taisce – The National Trust for Ireland)

16. À cette séance ont été présentés les documents ci-après: «La République tchèque: situation actuelle et expérience en matière de boisement», par M^{me} Katerina Trejbalova (République tchèque); «Stratégies forestières possibles: l'expérience de l'Irlande», par M. Damián Allen et M. Séamus Dunne (Irlande); «Private Afforestation in Ireland», par M. Tim O'Brien (Irlande).

Séance B – Président: M. J. Lorbach (FAO)

17. À cette séance ont été présentés les documents ci-après: «Comparaison des activités forestières d'Europe centrale et d'Irlande», par M. Richard H. Ramsauer (Autriche); un exposé sur le rôle de l'Irish Timber Growers Association (Association irlandaise des producteurs de bois), par M. Donald Whelan (Irlande).

Séance C – Président: M. J. J. Gardiner (University College Dublin)

18. À cette séance ont été présentés les documents ci-après: un exposé sur la planification du boisement en Islande, par M. K. Gunnarson (Islande); le programme national d'accroissement de la superficie boisée, par M. Stanislaw Dabrowski (Pologne); la Société des forestiers irlandais, par M. Tony Mannion (Irlande); un exposé sur le boisement et la certification: l'avis de l'entrepreneur (Afforestation and Certification – The Contractor's View), par M. Donal Fitzpatrick (Irlande).

Séance D (débat libre) – Président: M. J. Farell (Ressources naturelles Canada)

19. La nécessité de concilier la rentabilité économique avec le développement rural et social tout en reconstituant le couvert forestier d'une manière responsable sur le plan environnemental est une thématique qui a été abordée dans la plupart des exposés.

20. Reconstituer le couvert forestier dans le paysage rural participe d'un objectif écologique plus vaste. Les décisions relatives au choix des essences et leurs incidences sur le paysage sont toutefois déterminées par les réalités économiques et sociales du moment à l'échelon du pays, de la région et de la communauté.

21. La concertation et des mécanismes efficaces de participation à la prise des décisions aux niveaux régional et local sont indispensables pour faire adhérer toutes les parties prenantes à l'effort de boisement.

22. Il faut poursuivre les efforts tendant à créer dans le secteur forestier des emplois durables – des emplois à l'année avec des rémunérations compétitives et des conditions de travail progressistes.

23. L'expansion des activités de boisement doit aller de pair avec la définition d'objectifs nationaux clairs et chiffrés. Cette démarche doit être orientée par des plans forestiers stratégiques compatibles avec une gestion durable des forêts et par un code des meilleures pratiques forestières.

24. Les stratégies forestières possibles représentent un mécanisme utile permettant de collaborer avec les groupes de parties prenantes en vue d'identifier les possibilités et les contraintes s'agissant du lieu d'implantation et de la composition des nouvelles forêts. Cette démarche devrait être menée de concert par l'administration chargée des forêts et les autorités locales et les stratégies mises au point devraient être du domaine du réalisable.

Opérations forestières – la pratique du boisement (point 5)

Séance A – Président: M. T. Farrell (University College Dublin)

25. À cette séance ont été présentés les documents ci-après: «L'utilisation d'un système d'information géographique et de méthodes de classification des sites», par M. Niall Farrelly (Irlande); «Fonds prototype pour le carbone: le boisement des terres agricoles dégradées en Roumanie», par M. I. Abrudan, M. V. Blujdea, M. V. Kostyushin, M. C. Pahtontu, M. H. Philips, M^{me} S. Brown et M^{me} M. Voicu (Roumanie), M. Philips a présenté le document; «Coillte Farm Partnership Scheme – A joint venture in commercial afforestation in Ireland», par M. Jim Dillon (Irlande); et «L'effet de la taille sur la qualité du tronc et le développement initial des feuillus», par MM. M. Bulfin, T. Radford et J. Brosnan.

Séance B – Président: M. P. Lehane (Irish Farmers Association)

26. À cette séance ont été présentés les documents suivants: «La création de nouvelles forêts d'essences autochtones en Écosse», par M. Stephen A. Smith (Royaume-Uni); «Operational aspects of fast growing species», par M. Oscar Barreiro (Espagne); et «Boisement et couverture forestière permanente», par M. Arne Pommerening (Royaume-Uni).

Séance C – Présidente: M^{me} A. Coffey (Castlewallen Woodland Partners)

27. À cette séance ont été présentés les documents suivants: «La mécanisation de la plantation des sites de régénération», par M. Michael Keane (Irlande); «La croissance de six essences résineuses dans différents bioclimats de Croatie», par M^{me} Sanja Peric (Croatie); et «Le boisement en Pologne: la sylviculture et les enseignements qui s'en dégagent», par M. Wojciech Gil et M. Jan Łukaszewicz (Pologne).

Séance D (débat libre) – Président: M. N. Foley (Service irlandais des forêts)

28. Les participants ont souligné la nécessité de réaliser la gestion forestière en prenant systématiquement en compte l'impact environnemental et social d'un choix judicieux des essences, de leur emplacement et des modes de sylviculture.

29. Ils ont reconnu la contribution croissante des plantations forestières à la production de ressources renouvelables et se prêtant à diverses utilisations. Les stratégies de boisement doivent systématiquement mettre l'accent sur la nécessité d'élaborer un plan de commercialisation et de développement industriel.

30. Un couvert forestier continu peut offrir un instrument de sylviculture efficace pour parvenir aux objectifs inhérents à la gestion forestière durable. Cependant, les recherches doivent se poursuivre, notamment pour chiffrer les coûts et les avantages liés à une telle pratique.

31. Pour être économiquement viable, le boisement peut être réalisé en utilisant la capacité de fixation du carbone des forêts. Cette possibilité a été démontrée dans le cadre d'un projet-pilote mis en œuvre par l'Administration nationale des forêts de Roumanie et consistant à vendre du carbone au Fonds prototype pour le carbone.

32. Le développement de partenariats avec les agriculteurs peut contribuer à la promotion du boisement en mettant à la disposition des propriétaires terriens le savoir-faire en matière de foresterie, les moyens financiers et les compétences commerciales nécessaires.

33. Il faut continuer à étudier la possibilité de créer des peuplements d'essences autochtones sur des sols humides, exposés et pauvres en éléments nutritifs. Ces nouveaux peuplements d'essences autochtones doivent être créés moyennant un niveau d'intervention minimal.

34. Ce sont les forestiers professionnels qui, de par leur formation, leurs connaissances et leur expérience, sont les mieux à même de gérer les forêts en prenant en considération les exigences relatives à une gestion forestière durable et de faire bénéficier les propriétaires de forêts, la collectivité et l'environnement des multiples avantages qui découlent de ce mode de gestion.

Conclusions et recommandations (point 6)

35. Les participants au Séminaire ont adopté les conclusions et recommandations suivantes, au titre de la Déclaration d'Ennis:

Déclaration d'Ennis

Conclusions

1. Le boisement des terres agricoles peut jouer un rôle important dans le développement rural en augmentant le revenu agricole des terres peu productives et en créant des emplois durables dans les zones reculées. S'il est appliqué correctement, ce boisement améliorera la qualité de l'environnement, le paysage et la biodiversité.
2. Afin de pouvoir assurer une Gestion durable des forêts (GDF), il convient d'associer la propriété foncière, le savoir-faire en matière de foresterie, la sécurité financière et les compétences commerciales nécessaires.
3. La production de bois provenant du boisement crée une ressource renouvelable qui est neutre en ce qui concerne les émissions de CO₂.
4. Il convient de féliciter l'Administration nationale des forêts de Roumanie qui a montré que la contribution des forêts à la fixation du carbone est possible et qu'elle peut être utilisée pour permettre le boisement économique.
5. Les forêts contribuent de manière significative à l'environnement urbain. Parmi les avantages, on compte: une meilleure qualité de l'air et du paysage, davantage de possibilités pour des activités récréatives et une éducation à l'environnement sans oublier la promotion de la santé publique. Dans un monde de plus en plus urbanisé, la GDF devrait également englober les forêts dans les zones urbaines.

6. Les forestiers professionnels, de par leur vocation, l'histoire de leur profession, leur formation, leurs connaissances et leur expérience, ont un rôle essentiel à jouer dans la gestion des forêts conformément aux principes de la GDF et contribuent de manière décisive à l'exploitation des nombreux avantages qui découlent de ce mode de gestion.

Recommandations

A. Aux États membres

1. Toutes les activités de boisement doivent respecter les six critères de la **GDF** tels qu'ils ont été énoncés dans le contexte de la Conférence ministérielle sur la protection des forêts en Europe.
2. La différence qui existe entre le concept de GDF et le processus de certification doit être clairement comprise.
3. L'expansion des activités de boisement doit être guidée par des plans forestiers **stratégiques** et se conformer au Code forestier des meilleures pratiques ou autres principes directeurs similaires.
4. Une stratégie de boisement doit aller de pair avec un plan de commercialisation et de développement industriel.
5. La contribution croissante des plantations forestières à la production de ressources renouvelables et se prêtant à diverses utilisations doit être reconnue.
6. Il est urgent d'étudier des moyens plus efficaces visant à encourager la **communication** entre le grand public, les ONG et le secteur forestier, pour réaliser l'objectif commun de la GDF.
7. Des mécanismes de concertation et des mécanismes efficaces de **participation à la prise de décisions** aux niveaux régional et local sont essentiels pour faire adhérer toutes les parties prenantes à l'effort de boisement.
8. Les Stratégies forestières possibles, qui permettent d'analyser les possibilités et les contraintes en vue de repérer les zones susceptibles d'être affectées à la sylviculture, sont une méthode utile de concertation avec l'ensemble des parties prenantes pour identifier le lieu d'implantation qui convient le mieux et la composition la plus judicieuse des nouvelles forêts, sous la direction conjointe des autorités forestières et des pouvoirs locaux. Ces stratégies doivent relever du domaine du réalisable et non pas se limiter à l'expression de simples aspirations.
9. Il convient de poursuivre et d'accélérer les travaux actuels sur la reconnaissance mutuelle des systèmes de **certification** forestière par la FAO et d'autres organisations. Les systèmes de certification doivent prendre en compte les besoins des petits propriétaires forestiers qui sont parfois dans l'incapacité de faire face aux coûts de certification.
10. La **sélection des essences** et la gestion forestière doivent se faire selon le principe des 3 «B», à savoir, le **Bon** arbre, au **Bon** endroit associé à la **Bonne** sylviculture. Les décisions relatives à la sélection des essences et à ses répercussions sur le paysage doivent être guidées par les réalités économiques et sociales des pays, des régions et des collectivités. Une bonne

sylviculture tient compte de l'impact environnemental, économique et social et s'applique dès le stade du boisement et pendant toute la durée de vie de la forêt.

11. Il convient d'encourager la plantation de nouvelles essences autochtones pour réaliser les objectifs de la Convention sur la diversité biologique.
12. Il doit exister un système de certification adapté pour s'assurer de la traçabilité jusqu'à la source de l'ensemble du matériel de reproduction forestier utilisé dans les programmes de boisement.
13. Les propriétaires forestiers, les autres parties intéressées et le grand public doivent être mieux sensibilisés aux nombreux avantages du boisement dans le contexte de la GDF.
14. Le boisement représente un investissement important en capital que l'on doit protéger. Des programmes intégrés appropriés de protection des forêts doivent être développés pour faire face aux grandes menaces liées aux maladies, aux insectes, aux mammifères et autres agents destructeurs. Les méthodes biologiques de contrôle doivent être privilégiées.
15. Les **forestiers** professionnels doivent participer à des activités de perfectionnement professionnel permanent pour se tenir au courant de l'évolution du processus de GDF. Ils doivent se montrer novateurs et disposés à tirer les leçons des pratiques forestières et des expériences d'autres pays.
16. Les programmes de boisement doivent répondre à l'évolution des attentes et des exigences de la société.
17. La protection et l'amélioration de la **biodiversité** doivent s'intégrer pleinement au processus de GDF.
18. La création d'**emplois** durables à plein temps est une priorité dans le cadre de la GDF. La pénurie de main-d'œuvre forestière est un facteur important qui affecte la réalisation des objectifs de boisement. Il est donc nécessaire d'améliorer les conditions de travail et d'offrir des salaires compétitifs pour attirer et retenir un plus grand nombre de nouveaux forestiers, qu'ils soient salariés ou sous contrat.
19. Tous les programmes et politiques **de subvention** liés à l'utilisation des terres doivent être complémentaires pour éviter tout conflit.
20. Les organismes forestiers publics se concentrent sur la **réglementation**. Il faudrait envisager de créer des organismes de développement distincts pour encourager le boisement. La surréglementation devrait être évitée.

B. Aux chercheurs

1. Il faut continuer de promouvoir le rôle du boisement dans les environnements urbain et périurbain. Dans ce contexte, il convient de rechercher de meilleurs moyens de sensibiliser les citoyens aux avantages que procure la forêt.
2. La contribution du boisement en tant que puits de carbone doit faire l'objet d'études plus approfondies dans le contexte des programmes forestiers nationaux et de la GDF. À ce titre, il

est souhaitable de préciser l'utilisation potentielle de mesures d'incitation pour encourager les agriculteurs et les propriétaires terriens à planter et gérer des forêts afin de fixer le carbone et d'assurer d'autres fonctions et productions forestières.

3. Il convient d'étudier les incidences sociologiques d'une intensification des programmes de boisement.
4. Le couvert forestier continu présente de nombreux avantages sylvicoles et environnementaux. Cependant, il faut entreprendre de nouvelles recherches, notamment sur les conséquences socioéconomiques et écologiques de cette approche de la sylviculture.
5. Les conséquences du changement climatique, son impact sur la sélection des essences et sur les programmes futurs de boisement doivent faire l'objet de plus de recherches.

C. *Au Comité mixte*

1. Le Comité mixte doit commander une étude sur l'efficacité et la rentabilité des divers mécanismes d'incitation au boisement (telles que les politiques, les programmes, les aides financières, les abattements fiscaux, la réglementation, etc.).
2. Le Comité mixte doit poursuivre les échanges d'informations sur les pratiques de boisement, les réglementations et les mécanismes de soutien financier.
3. Un autre séminaire sur le boisement doit être organisé en temps voulu.

Adoption du rapport (point 7)

36. Les participants au Séminaire ont adopté le projet de rapport préparé par le secrétariat, ainsi que les conclusions et recommandations contenues dans la Déclaration d'Ennis.

37. Au nom du pays hôte, M. D. McAree a remercié les participants d'avoir assisté au Séminaire, préparé des documents, rendu les discussions vivantes au cours des différentes séances et adopté les conclusions et recommandations. M. H. Hoefle, au nom du Comité mixte, M. J. Lorbach (FAO) et M. J. Najera (CEE) ont remercié le pays hôte pour la chaleur de son hospitalité et l'excellente organisation du Séminaire. Ils ont également remercié les participants et le personnel des services d'appui d'avoir largement contribué au succès du Séminaire.

Annexe

SÉMINAIRE SUR LE BOISEMENT DANS LE CONTEXTE DE LA GESTION DURABLE DES FORÊTS, EXCURSION
Dimanche 15 septembre 2002

La visite technique organisée dans le cadre du Séminaire s'est déroulée sur trois sites, avec un thème différent pour chacun d'entre eux:

- Thème 1: Présentation du boisement dans le contexte de la gestion durable des forêts en Irlande, Broadford, comté de Clare;
- Thème 2: Aspects concrets des boisements de feuillus en Irlande, Nenagh, comté de Tipperary;
- Thème 3: Aspects concrets des boisements de conifères en Irlande, site du partenariat agricole de Coillte, Uppercchurch, comté de Tipperary.

Thème 1: Présentation du boisement dans le contexte de la gestion durable des forêts en Irlande, Broadford, comté de Clare

Orateurs: Noel Kelly, propriétaire de forêt, et Jim Quinlivan et Eamonn Cunningham, Service des forêts

Aperçu du travail réalisé sur le site

Lorsque Noel Kelly, propriétaire terrien, a envisagé la possibilité de boiser ses 60 hectares de terrain, situés à Broadford, dans le comté de Clare, au début de l'année 2000, il a fait appel à Donal Fitzpatrick, consultant forestier agréé. Le rôle de Donal a consisté à concevoir un plan d'aménagement forestier qui obéisse aux règles en matière d'attribution des subventions du Service des forêts tout en y intégrant les projets à long terme de Noel, qui consistaient à aménager un espace de loisirs et d'agrément. Après consultation avec l'inspecteur local du Service des forêts, une demande d'autorisation préalable (formulaire 1) a été présentée, accompagnée d'une carte des essences du site et d'un plan de mise en culture. Après une étude topographique, une demande de subvention pour la construction de routes forestières a également été déposée. L'autorisation de planter a été délivrée en octobre 2000, à la condition que soient scrupuleusement respectées les recommandations de l'Inspecteur du Conseil de la pêche, car la rivière Killuran, contiguë à la propriété, était classée comme rivière poissonneuse (saumon) et était donc considérée comme «sensible». L'autorisation pour la construction des routes forestières a également été délivrée par le Service des forêts.

Les travaux préparatoires en vue de la plantation ont donc pu commencer. Il s'agissait d'une opération particulièrement coûteuse, compte tenu de la quantité d'ajoncs et autres végétaux à arracher et évacuer. Il a fallu creuser, puis former des tas de branchages qui ont ensuite été brûlés ou enfouis. En principe, ces végétaux auraient dû être alignés et la plantation effectuée entre ces rangées. Un système de drainage doté de pièges à sédiments a été creusé, et un étang a été créé sur un ruisseau pour servir de réserve d'eau en cas d'incendie. Ensuite Noel a aménagé le paysage, de façon à rendre cet espace attrayant en tant qu'aire de loisir. Le buttage a été préconisé comme méthode de préparation du sol et, dans certaines zones, les pierres et les galets ont été à nouveau enfouis dans le sol, de façon à rendre la marche plus sûre. Les arbres existants ont été conservés chaque fois que cela était possible.

La majorité des plants a été achetée à Coillte, mais Noel a également acheté des arbres très divers, essentiellement des feuillus, pour l'agrément du site et le développement de la biodiversité. Les principales essences plantées à des fins commerciales étaient l'épicéa de Sitka (52 100), le larix hybride

(44 000), le pin sylvestre (17 900), l'épicéa (8 050), le Douglas (4 500), le cèdre rouge (2 700), l'aulne glutineux (14 600), le frêne (10 800), le chêne pédonculé (9 000), le sycomore (4 900), le hêtre (3 000) et le bouleau (1 000). En tout, plus de 172 000 arbres ont ainsi été plantés. Par ailleurs, 12 400 autres arbres ont été plantés un peu partout sur le site, à la fois par souci de biodiversité et pour l'agrément qu'ils offriraient. Les essences suivantes ont été utilisées: sycomore, hêtre, hêtre rouge, sorbier des oiseaux, merisier à grappes, peuplier, eucalyptus gunnii, sapin noble, marronnier d'Inde, châtaigner, chêne chevelu, tulipier de Virginie, noyer, platane, séquoia Wellingtonia et charme.

Les travaux se sont achevés le 27 avril 2001. Par la suite, une subvention au boisement et une prime au développement forestier ont été accordées pour 16 hectares comprenant 20 % d'essences diverses (GPC3), pour 30,28 hectares d'essences diverses (GPC4) et pour 13,56 hectares de feuillus (GPC5). Des pierres et des graviers ont été extraits du sol et employés pour construire les routes. La subvention destinée à financer la construction de routes n'a pas encore été versée à ce jour. Le propriétaire, Noel Kelly, a directement participé à la préparation du sol, à la pose des clôtures et aux travaux de plantation. Il a également choisi d'assurer lui-même le travail d'entretien.

Présentation du Service des forêts et de la promotion du boisement privé

Rôle du Service des forêts: Le Service des forêts, qui relève du Ministère des communications, de la marine et des ressources naturelles, est responsable de la politique forestière nationale, de la promotion de la foresterie privée, de l'administration des subventions destinées à favoriser la plantation et d'autres activités forestières, du contrôle des abattages et de la promotion de la recherche dans le domaine de la foresterie et des produits forestiers. Toutes les activités d'aménagement doivent être compatibles avec la protection de l'environnement.

Mesures de financement de la foresterie privée:

1931-1981	Aide financière de l'État
1981-1989	Aide financière de l'UE – Programme «Western Package Scheme»
1990-1994	Aide financière de l'UE – Programme opérationnel pour la foresterie (Forestry Operational Programme)
1995-1999	Aide financière de l'UE – Réforme de la PAC
2000-2005	Aide financière de l'UE – Programme de développement rural (Rural Development Programme)

Subventions et primes: Toute demande doit être déposée par un forestier agréé. Un ou plusieurs organes statutaires peuvent être saisis de ces demandes avant qu'elles soient transmises à l'inspecteur local du Service des forêts, qui formule des recommandations avant approbation.

Autres subventions: Parallèlement au régime de subventions et primes au boisement, le Service des forêts propose un certain nombre de mécanismes d'aide au secteur forestier: programme de reboisement; programme d'amélioration de forêts; programme de reconstitution des forêts; élagage haut des conifères; taille formative (façonnage) des feuillus; programme de routes forestières; programme NeighbourWood; et programme de plantation d'essences autochtones.

Stratégie forestière: La stratégie forestière du Gouvernement irlandais est décrite dans la publication intitulée: «*Growing for the Future – A Strategic Plan for the Development of the Forestry Sector in*

Ireland». L'objectif général de cette stratégie est, en substance, de développer la foresterie de façon à optimiser durablement son rôle dans la prospérité économique et le bien-être social du pays, tout en veillant à protéger l'environnement. Conformément à cette stratégie d'expansion de la foresterie, la superficie boisée devrait passer de 7 % à 17 % d'ici à 2030, et la masse critique devrait passer de 2,2 millions de m³ à 10 millions de m³.

Boisement – Normes et procédures d'attribution des subventions

Ces normes et procédures comprennent des conditions d'attribution des primes et des subventions, un processus d'approbation préalable et une procédure d'inspection. Les conditions d'attribution des primes et subventions ont trait aux critères suivants: prescriptions en matière de propriété foncière, niveau minimum de fertilité des sols et possibilités d'exploiter le site aux fins de la foresterie, superficie du site et respect de la protection de l'environnement dans tous les aspects du projet, de son emplacement à sa mise en œuvre. Pour bénéficier de subventions, les projets doivent impérativement être approuvés par le Service des forêts avant le lancement des travaux. Une procédure d'inspection permet de contrôler les projets avant qu'ils soient approuvés, mais aussi à divers moments après l'achèvement des travaux. Les procédures suivantes sont appliquées.

Soumission d'un plan de boisement: Établi par un forestier agréé, ce plan renferme tous les renseignements relatifs à la plantation, à la pose des clôtures, à la fertilisation, à la protection contre les incendies, à la composition des peuplements, au contrôle de la végétation et au régime de propriété foncière. Il met également en évidence les considérations environnementales propres au site, ainsi que d'autres aspects tels que l'accès au site, le potentiel de croissance des arbres et le potentiel commercial du site et il permet en outre de déterminer si ce site se prête à la plantation de feuillus. Le plan est accompagné d'une carte.

Questions environnementales: Ces questions sont réglées dans le cadre de la concertation, en application des normes opérationnelles en vigueur.

La concertation permet de déterminer, dans le cadre d'une décision stratégique, si une partie, voire l'intégralité d'un projet, doit ou ne doit pas être menée à bien. Le Service des forêts engage des consultations avec les organismes statutaires concernés, requiert, si nécessaire, une évaluation de l'impact sur l'environnement et consulte le public pour certaines catégories de sites. Un protocole particulier est prévu lorsque les propositions comportent le risque de rejets dans des eaux sensibles aux acides.

Les normes environnementales pratiques sont détaillées dans une série de directives traitant de l'eau, de l'archéologie, du paysage, de la diversité biologique et des récoltes. Le *Code irlandais des meilleures pratiques forestières* énonce des procédures environnementales pour chaque activité forestière. La procédure de concertation peut aussi comporter une description détaillée des procédures à suivre dans le cas de certains projets de boisement.

Procédure d'inspection: Tous les projets de boisement sont examinés par un inspecteur forestier du Service des forêts. Les sites sont inspectés avant l'approbation des projets, puis selon le calendrier suivant, après achèvement des travaux: i) lors de l'achèvement des travaux de boisement; ii) quatre ans après l'achèvement des travaux; et iii) par la suite, de façon aléatoire.

Dispositif de sanctions: Il existe un dispositif de sanctions. Des sanctions financières sont prévues en cas d'infraction aux dispositions relatives à la sylviculture et à la protection de l'environnement, ainsi que pour toute fausse déclaration se rapportant au type de terre et au titre de propriété.

Thème 2: Aspects concrets des boisements de feuillus en Irlande, Nenagh, comté de Tipperary

Orateurs: Michael Sweeney, Peter Alley et Paddy Bruton, Forestry Services Ltd., Irlande

Une demande de subvention a été déposée le 8 janvier 2001 et approuvée le 27 mars 2001. Les travaux préparatoires ont commencé presque immédiatement et tous les travaux ont été terminés le 15 mai 2001. L'ensemble des directives fixées par le Service des forêts ont été respectées; rien n'a été planté à proximité des lignes électriques; une zone tampon de 15 mètres sans plantations a été créée et clôturée autour du seul monument recensé; des distances minimales ont été laissées entre les plantations et les bâtiments les plus proches, avec l'autorisation écrite du propriétaire; enfin, les normes relatives aux distances minimales par rapport aux routes ont été scrupuleusement respectées.

Michael Flannery, le propriétaire, possède environ 46 hectares. Son activité était essentiellement concentrée sur le labourage et sur la plantation associée à l'élevage de moutons. Ses deux fils travaillent à Dublin et ne souhaitent pas devenir agriculteurs. M. Flannery a boisé 21 hectares, ce qui lui donne droit aujourd'hui à un revenu de 10 316 livres exonéré d'impôt. Il a loué le reste de ses terres et bénéficie d'une pension au titre du Farm Retirement Scheme. Il est très conscient que ses arbres prennent sans cesse plus de valeur. Le sol est riche en éléments nutritifs et perméable. Situé à 80 mètres d'altitude, le site présente un aspect neutre, voire méridional, et n'est pas exposé. La densité de peuplement du frêne, du sycomore et de l'aulne est de 3 300 arbres à l'hectare, et l'intervalle est de 2 m x 1,5 m. Le site n'est pas exposé au gel, sauf dans un secteur où l'aulne a été planté. La préparation du sol en vue de la plantation des chênes a été réalisée à la charrue agricole, et à la charrue Coolmore pour les autres arbres.

Thème 3: Aspects concrets des boisements de conifères en Irlande, site de partenariat agricole de Coillte, Upperchurch, comté de Tipperary

Orateurs: Jim Dillon, Daithi de Forge et Jim Fogarty, Coillte, Conseil irlandais de la foresterie, Irlande

Superficie plantée: 42,2 ha

Date de plantation: Janvier 2002

Essences plantées:

- 25,2 ha d'épicéa de Sitka
- 6,3 ha de mélèze du Japon (le plus souvent mélangé à l'épicéa de Sitka)
- 6,7 ha de frêne
- 2 ha de zones proches des lignes électriques (maintenues comme «espace libre»), chêne pédonculé et bouleau utilisés pour renforcer les haies intérieures
- Tous les peuplements étaient constitués de plants à racines nues

Détails concernant les plants/origine des semences:

- Épicéa de Sitka, Washington, 30-50 cm, 2+1s
- Mélèze du Japon, île d'Hokkaido, 40-60 cm, 1+1s
- Frêne, Irlande, 50-80 cm, 1u1
- Chêne pédonculé, Pays-Bas, 50-80 cm, 1u1
- Bouleau d'Irlande, 50-60 cm, 1u1

Type de sol: 80 % de sol brun forestier; 20 % de sol à gley (apparenté au grès)

Altitude: 200-310 m

Aspect:	Nord-est
Exposition:	Site abrité ou moyennement abrité Note de stabilité: S21
Classe de rendement:	20-24+ m ³ /ha/an
Méthode de culture:	70 % de buttage; 30 % de labour (adapté)
Caractéristiques:	Objet archéologique découvert durant la phase d'aménagement du site et préservé à l'intérieur de la zone plantée (ne figure pas sur les cartes des sites et monuments). Une vieille maison et des bâtiments annexes ont été préservés comme élément de la «zone de promotion de la diversité biologique». Des haies importantes ont été consolidées en plantant des feuillus supplémentaires, de façon à créer des couloirs d'habitat à travers la plantation. Des zones densément peuplées de broussailles (feuillus) ont également été conservées.

Remerciements

Le Service des forêts souhaite remercier les propriétaires Noel Kelly (thème 1), Michael Flannery (thème 2) et Patrick Quinn (thème 3) d'avoir ouvert leur propriété aux participants lors de l'excursion. Le Service des forêts remercie également les personnes suivantes d'avoir contribué à l'organisation et au bon déroulement de l'excursion, ainsi qu'à la préparation du présent rapport: Noel Kelly, Donal Fitzpatrick, Michael Sweeney, Peter Alley, Paddy Bruton, Jim Dillon et Daithi de Forge.

ДОКЛАД О РАБОТЕ СЕМИНАРА

Введение

1. Семинар на тему "Облесение в контексте устойчивого лесопользования" состоялся в Эннисе, графство Клэр, Ирландия, 15-19 сентября 2002 года под эгидой Объединенного комитета и по приглашению правительства Ирландии. В нем приняли участие эксперты из следующих стран: Австрии, Германии, Греции, Ирландии, Исландии, Испании, Канады, Латвии, Польши, Португалии, Румынии, Соединенного Королевства, Франции, Хорватии и Чешской Республики.

Открытие семинара

2. Семинар открыл г-н Дж. Брауни, депутат, государственный министр, отвечающий за развитие лесного хозяйства в министерстве связи, морских и природных ресурсов. Министр подчеркнул важность практики устойчивого лесопользования (УЛП) и заявил, что, по его мнению, все лесоматериалы, поставляемые на рынок, должны производиться из древесины, которая заготавливается в устойчиво управляемых лесах. Участников также приветствовали г-н Х. Хефле (Германия), Председатель Объединенного комитета, и г-н Х. Наджера (ЕЭК ООН) - сотрудник секретариата Объединенного комитета.

3. На семинаре были рассмотрены следующие три темы: 1 - Стратегическое планирование на национальном и региональном уровнях: механизмы и практика, используемые на национальном и региональном уровнях с целью создания общей основы для осуществления деятельности в области облесения в соответствии с принципами УЛП; 2 - Планирование на местном уровне и уровне отдельных участков: оценка отдельных участков на местном уровне с учетом конкретных лесорастительных условий на предмет их пригодности для облесения в контексте УЛП; и 3 - Организационные аспекты: практика облесения, включая все операции: от закладки насаждения до образования сомкнутого полога.

Утверждение повестки дня (пункт 1 повестки дня)

4. Была утверждена предварительная повестка дня, содержащаяся во втором уведомлении (TIM/EFC/WP.1/SEM.54/2).

Выборы должностных лиц (пункт 2)

5. По теме 1, Стратегическое планирование на национальном и региональном уровнях, были назначены следующие руководители дискуссий:

Заседание А	г-н М. Прендергаст (Ирландия)
Заседание В	г-н Дж. Коннели (Ирландия)
Заседание С	г-н Х. Хефле (Германия)
Заседание D (открытое обсуждение)	г-н Ю. Хендрик (Ирландия)

Стратегическое планирование на национальном и региональном уровнях (пункт 3)

Заседание А

6. На этом заседании доклады представили: г-н Д. Макари (Ирландия), "Облесение в Ирландии", и гг. Ф.М. Данн и Дж.Дж. Фарелл (Канада), "Облесение и изменение климата: точка зрения Канады".

Заседание В

7. На этом заседании доклады представили: г-н Юджин Хендрик (Ирландия), "Роль лесохозяйственных исследований и разработок", г-н Тим Кроули (Ирландия), "Практика УЛП Лесохозяйственного совета Ирландии в условиях коммерциализации", и г-н Р. Даамен, который внес на рассмотрение доклад г-на Йозефа Геркенделла (Германия), "Облесение в Европе: необходимость улучшения системы передачи информации и расширения партнерства".

Заседание С

8. На этом заседании доклады представили г-н Рей Галлагер (Ирландия), "Роль кооперативов в деле обеспечения устойчивого облесения", и гг. Филип Георгеску и Михай Ливиу Дайя (Румыния), "Лесовозобновление в Румынии".

Заседание D (открытое обсуждение)

9. В рамках деятельности по управлению лесами учитываются все аспекты социальных, экономических и экологических принципов устойчивости. В ходе обсуждения было подчеркнуто, что странам необходимо принять кодексы наилучшей лесохозяйственной практики и включить принципы УЛП в свою законодательную и нормативную основу.

10. Подавляющее большинство населения живет в городских районах, при этом число людей, непосредственно зависящих от доходов, источником которых являются леса, сокращается. Поэтому широкие слои населения располагают лишь ограниченными знаниями о лесах и лесном хозяйстве. Программы в области облесения должны сопровождаться широкими и комплексными коммуникационными кампаниями в целях повышения уровня информированности населения о принципах и практике УЛП. К этому процессу следует привлекать все заинтересованные стороны, при этом он должен охватывать такие вопросы, как поддержание связей с общественностью, образование и проведение консультаций. Без такой комплексной программы коммуникационной деятельности леса не смогут обеспечить обществу все те потенциальные блага, которые дает УЛП.

11. Агроресное хозяйство может играть важную роль в деле развития сельских районов, поскольку оно способствует увеличению доходов, получаемых от маргинальных земель, созданию рабочих мест в отдаленных районах и обогащению окружающей среды путем надлежащей структуризации ландшафта и природоохраны.

12. В Ирландии осуществляется новая программа по охране естественных лесов. Ее цель состоит в сохранении и улучшении местных лесных ресурсов. Эта программа может служить примером инициативы, направленной на сохранение биологического разнообразия лесов.

13. Сертификация лесов позволяет судить о соблюдении принципов УЛП. Основным системам сертификации следует достигнуть взаимопонимания и взаимного признания, что необходимо для обеспечения их более широкого применения и избежания непонимания, бытующего среди широких слоев населения.

14. Научно-исследовательской деятельности отводится важная роль в деле обеспечения учета принципов УЛП в программах облесения. Воплощение результатов исследований в политику и практику является важной задачей всех научно-исследовательских организаций.

15. После ратификации в 1992 году Рамочной конвенции об изменении климата и разработки в 1998 году Киотского протокола экономическое и экологическое значение облесения возросло, и сегодня все знают, что эта деятельность играет важную роль в секвестрации углерода.

Планирование на местном уровне и уровне отдельных участков (пункт 4)

Заседание А – Председатель: г-жа Ш. Клеркин (An Taisce – Национальный траст-фонд Ирландии)

16. На этом заседании доклады представили: г-жа Катерина Требалова (Чешская Республика), "Чешская Республика: нынешняя ситуация и опыт в области облесения", г-н Дамиан Аллен и г-н Сиамус Данн (Ирландия), "Целевые стратегии развития лесного хозяйства: опыт Ирландии" и г-н Тим О'Брайен (Ирландия), "Облесение в частных угодьях Ирландии".

Заседание В – Председатель: г-н Й. Лорбах (ФАО)

17. На этом заседании доклады представили: г-н Рихард Х. Рамсауэр (Австрия), "Сравнение лесохозяйственной деятельности в Центральной Европе и Ирландии", г-н Дональд Вилан (Ирландия), "Роль Ирландской ассоциации лесоводов".

Заседание С – Председатель: г-н Дж.Дж. Гардинер (Колледж Дублинского университета)

18. На этом заседании доклады представили: г-н К. Гуннарсон (Исландия), "Планирование деятельности в области облесения в Исландии", г-н Станислав Дабровский (Польша), "Национальная программа увеличения лесного покрова", г-н Тони Мэннион (Ирландия), "Лесохозяйственное общество Ирландии", и г-н Дональд Фитцпатрик (Ирландия), "Облесение и сертификация – точка зрения подрядчика".

Заседание D (открытое обсуждение) – Председатель: г-н Дж. Фарелл (министерство природных ресурсов Канады)

19. Большинство выступлений было посвящено вопросам получения экономической выгоды, а также обеспечению улучшения положения в сельских районах и социального развития при восстановлении лесного покрова на основе экологически ответственного подхода.

20. Восстановление лесного покрова в сельских районах является неотъемлемым элементом более широкой экологической стратегии. Однако решения относительно выбора пород и его последствий для ландшафта принимаются с учетом текущих экономических и социальных реальностей соответствующих стран, регионов и общин.

21. Проведение консультаций и создание на региональном и местном уровнях эффективных механизмов выработки решений с участием широких слоев населения имеют чрезвычайно большое значение для привлечения к процессу облесения всех заинтересованных сторон.

22. Необходимо продолжить усилия в целях обеспечения устойчивой занятости в лесном хозяйстве путем создания постоянных рабочих мест, повышения заработной платы до конкурентоспособного уровня и постепенного улучшения условий работы.

23. Меры по расширению деятельности в области облесения должны осуществляться в соответствии с четкими и поддающимися количественной оценке национальными целевыми показателями. Эти мероприятия должны проводиться на основе стратегических планов развития лесного хозяйства, разработанных с учетом практики УЛП и кодекса наилучшей лесохозяйственной практики.

24. Целевые стратегии развития лесного хозяйства обеспечивают надлежащий механизм для привлечения заинтересованных групп к процессу определения возможностей и препятствий в области закладки новых лесов, в частности в том что касается места их закладки и породного состава. Руководить их осуществлением должны совместно лесохозяйственные органы и органы местной власти, при этом эти стратегии должны быть практически осуществимыми.

Организационные аспекты облесения (пункт 5)

Заседание А - Председатель: г-н Т. Фэррелл (Колледж Дублинского университета)

25. На этом заседании доклады представили: г-н Найелл Фэррелли (Ирландия), *"Использование ГИС и методов классификации участков"*; г-н Филипс, который внес на рассмотрение доклад гг. И. Абрудана, В. Блуйдеа, В. Костышина, К. Пахонту, г-жи С. Браун и г-жи Н. Войчу (Румыния) *"Экспериментальный фонд по продаже выбросов углерода: облесение деградировавших сельскохозяйственных земель в Румынии"*; г-н Джим Диллон (Ирландия), *"Программа развития партнерства с фермерскими хозяйствами Лесохозяйственного совета Ирландии - совместное предприятие по коммерческому облесению в Ирландии"*; и гг. М. Балфин, Т. Редфорд и Дж. Броснан, *"Влияние мер по формированию структуры насаждения на качество ствола и рост плантационного ясеня на начальном этапе"*.

Заседание В - Председатель: г-н П. Лехенн (Ирландская ассоциация фермеров)

26. На этом заседании доклады представили: г-н Стефен А. Смит (Соединенное Королевство), *"Закладка новых лесов с использованием местных пород в Шотландии"*; г-н Оскар Баррейро (Испания), *"Организационные аспекты использования быстрорастущих пород"*; г-н Арне Поммеренинг (Соединенное Королевство), *"Облесение и система лесного хозяйства на основе непрерывного лесопользования"*.

Заседание С - Председатель: г-жа А. Коффи ("Кеслуаллен вудленд партнерс")

27. На этом заседании доклады представили: г-н Майкл Кин (Ирландия), *"Механизация посадки деревьев на участках лесовозобновления в Ирландии"*; г-жа Санья Перич (Хорватия),

"Выращивание деревьев шести хвойных пород в различных биоклиматических зонах в Хорватии";
и г-н Войцех Гиль и г-н Ян Лукашевич (Польша), *"Облесение в Польше: лесоводческий опыт"*.

Заседание D (открытое обсуждение) - Председатель: г-н Н. Фоли (Лесная служба, Ирландия)

28. В ходе обсуждения было подчеркнуто, что в рамках ведения лесного хозяйства следует всегда учитывать экологические и социальные последствия выбора той или иной породы, места посадки деревьев и лесокультурных методов.

29. Было признано, что лесные плантации вносят все возрастающий вклад в обеспечение получения возобновляемых и многоцелевых ресурсов. В стратегиях облесения должна всегда подчеркиваться необходимость разработки плана маркетинга и промышленного развития.

30. Практика непрерывного лесопользования может стать полезным лесоводческим инструментом для достижения целей УЛП. Однако необходимы дополнительные исследования, в частности для количественной оценки затрат и выгод, связанных с этой практикой.

31. Экономическая жизнеспособность деятельности в области облесения может быть обеспечена путем использования способности лесов к секвестрации углерода. Об этом свидетельствуют результаты опытного проекта по продаже прав на выбросы углерода Экспериментальному фонду по торговле выбросами углерода, который был осуществлен Национальной лесной администрацией Румынии.

32. Развитие партнерских связей с фермерами может способствовать расширению масштабов облесения, поскольку будет содействовать получению землевладельцами необходимого опыта в области ведения лесного хозяйства, привлечения финансовых средств и маркетинга.

33. Необходимы дополнительные исследования, посвященные созданию насаждений из деревьев местных пород на влажных, обнаженных и неплодородных участках. Процесс образования соответствующих новых лесонасаждений из местных пород должен протекать при минимальном уровне вмешательства.

34. Профессиональные работники лесного хозяйства в силу их подготовки, образования и опыта находятся в наилучшем положении для управления лесами в соответствии с требованиями УЛП и обеспечения того, чтобы все его многочисленные преимущества использовались в интересах лесовладельцев, общества и окружающей среды.

Выводы и рекомендации (пункт 6)

35. Участники семинара приняли Эннисское заявление, содержащее следующие выводы и рекомендации:

Эннисское заявление

Выводы

1. Облесение фермерских земель может играть важную роль в деле развития сельских районов посредством увеличения доходов фермеров от маргинальных земель и обеспечения устойчивой занятости в отдаленных районах. Если эта деятельность

будет проводиться надлежащим образом, она будет способствовать улучшению окружающей среды, ландшафта и биологического разнообразия.

2. Для достижения целей УЛП необходимо наладить партнерские отношения между землевладельцами, работниками лесного хозяйства, специалистами в области финансового обеспечения и маркетинга.

3. Производство древесины в результате облесения обеспечивает получение возобновляемого ресурса, который нейтрален с точки зрения выбросов CO₂.

4. Следует поздравить Национальную лесную администрацию Румынии в связи с тем, что она смогла наглядно продемонстрировать роль, которую играют леса в деле секвестрации углерода, и возможности использования этого аспекта для обеспечения экономически рентабельного облесения.

5. Леса вносят большой вклад в формирование городской среды, они способствуют повышению качества воздуха, улучшению ландшафта, расширению возможностей для рекреации и экологического образования, а также улучшению состояния здоровья населения. В условиях расширения урбанизации необходимо, чтобы УЛП были охвачены леса и в городских зонах.

6. Профессиональные работники лесного хозяйства в силу своего призвания, профессиональных традиций, подготовки, образования и опыта играют ключевую роль в деле управления лесами в соответствии с требованиями УЛП и обеспечения использования всех связанных с этим выгод.

Рекомендации

A. Для стран-членов

1. Все мероприятия в области облесения должны включать шесть критериев УЛП, которые были провозглашены в контексте Конференции по вопросам охраны лесов в Европе на уровне министров.

2. Необходимо четко понимать различие между концепцией УЛП и процессом сертификации.

3. В рамках расширения деятельности по облесению необходимо руководствоваться **стратегическими** планами развития лесного хозяйства, а также кодексом наилучшей лесохозяйственной практики или аналогичными руководящими принципами.

4. Стратегии в области облесения должны быть интегрированы в план маркетинга и промышленного развития.

5. Следует признать все возрастающий вклад лесных плантаций в формирование возобновляемых и многоцелевых ресурсов.

6. Существует настоятельная необходимость в изучении более эффективных способов **поддержания связей** между общественностью, НПО и сектором лесного хозяйства,

что чрезвычайно важно для проведения совместной работы по достижению общих целей УЛП.

7. Консультации и эффективные механизмы **принятия решений с участием всех заинтересованных сторон** на региональном и местном уровне имеют чрезвычайно большое значение для того, чтобы идеи облесения были приняты всеми заинтересованными сторонами.

8. Целевые стратегии развития лесного хозяйства (ЦСРЛХ), в которых проводится анализ возможностей и трудностей в области выявления площадей, приемлемых для лесохозяйственных целей, являются полезным средством для привлечения всех заинтересованных групп к процессу определения наиболее приемлемых мест закладки новых лесов и их породного состава. Руководителем осуществлением должны совместно лесохозяйственный орган и органы местной власти. ЦСРЛХ должны быть практически осуществимыми, а не декларативными.

9. Работа, которая уже проводится ФАО и другими организациями в области взаимного признания систем **сертификации лесов**, должна быть продолжена и активизирована. Системы сертификации должны учитывать потребности мелких лесовладельцев, которые могут не располагать возможностями для покрытия расходов на сертификацию.

10. При **выборе пород** и управлении лесным хозяйством необходимо руководствоваться тремя принципами "Н": надлежащее дерево в надлежащем месте при надлежащей системе лесоводства. При принятии решения относительно выбора той или иной породы и его последствий для ландшафта следует учитывать экономические и социальные реальности соответствующих стран, регионов и общин. В рамках надлежащей системы лесоводства признаются экологические, экономические и социальные последствия лесохозяйственной деятельности, при этом она применяется с момента облесения и в течение всего жизненного цикла леса.

11. Для достижения целей Конвенции о биологическом разнообразии необходимо поощрять создание новых лесов с использованием местных пород.

12. Должна существовать надлежащая система отслеживания источников происхождения всего посадочного материала, используемого в рамках программ облесения.

13. Следует повышать уровень информированности землевладельцев, заинтересованных сторон и общественности о многочисленных преимуществах облесения в контексте УЛП.

14. Облесение связано с большими вложениями капитала, в связи с чем облесенные участки требуют защиты. Надлежащие комплексные программы в области охраны лесов должны включать меры по их защите от всех основных видов опасности, в том числе от заболеваний, насекомых, млекопитающих и других факторов ущерба. Следует поощрять использование биологических методов борьбы.

15. Профессиональные **работники лесного хозяйства** должны участвовать в программе постоянного повышения квалификации (ППК), с тем чтобы быть в курсе последних изменений, происходящих в рамках процесса УЛП. Им следует также

стремиться к новаторству и знакомиться с практикой и опытом развития лесного хозяйства в других странах.

16. Программы в области облесения должны адаптироваться с учетом изменений, происходящих в чаяниях и требованиях общества.

17. Меры по сохранению и увеличению **биологического разнообразия** должны быть неотъемлемым элементом процесса УЛП.

18. Обеспечение полной устойчивой **занятости** в секторе является приоритетной задачей с точки зрения УЛП. Нехватка лесохозяйственных рабочих представляет собой один из основных факторов, препятствующих достижению целей облесения. Для привлечения в лесное хозяйство большего числа работников и предотвращения их оттока необходимо улучшить условия работы и обеспечить конкурентоспособную заработную плату. Это касается как наемных рабочих, так и подрядчиков.

19. Во избежание конфликта все **системы дотаций**, программы и политика, касающиеся землепользования, должны быть взаимодополняющими.

20. Государственные лесные агентства занимаются **регулированием**. Необходимо рассмотреть возможность создания отдельных органов по вопросам развития с целью оказания содействия расширению масштабов облесения. Излишнего регулирования следует избегать.

B. Для научно-исследовательских кругов

1. Следует продолжать содействовать повышению уровня информированности о роли облесения городских и пригородных зон. В этом контексте необходимо изучить более эффективные способы информирования городских жителей о благах, источником которых являются леса.

2. Вопрос о значении облесения в плане поглощения углерода требует дальнейшего изучения в контексте национальных программ развития лесного хозяйства и устойчивого лесопользования. Дополнительного изучения также заслуживают возможности, существующие в области стимулирования фермеров и землевладельцев к закладке лесов и ведению в них хозяйства в целях секвестрации углерода и использования других лесных функций и продуктов.

3. Следует изучить экологические последствия программ по расширению масштабов облесения.

4. Система непрерывного лесопользования дает многочисленные лесохозяйственные и экологические преимущества. Однако социально-экономические и экологические последствия этого лесоводственного подхода требуют дополнительных исследований.

5. Необходимо дополнительно изучить последствия изменения климата и влияние этого явления на выбор пород и будущие программы в области облесения.

C. Для Объединенного комитета

1. ОК следует обеспечить проведение исследования, посвященного эффективности различных механизмов стимулирования облесения (например, политики, программ, систем оплаты, налоговых льгот, механизмов регулирования и т.д.)
2. ОК следует продолжать осуществлять обмен информацией о практике, правилах и механизмах финансирования облесения.
3. В соответствующее время следует организовать еще один семинар по вопросам облесения.

Утверждение доклада (пункт 7)

36. Участники семинара утвердили проект доклада, подготовленный секретариатом, а также выводы и рекомендации, содержащиеся в Эннисском заявлении.

37. От имени принимающей страны г-н Д. Макари поблагодарил экспертов за участие в семинаре, подготовку докладов, активное обсуждение вопросов на различных заседаниях и выработку выводов и рекомендаций. От имени Объединенного комитета г-н Х. Хефле, г-н Й. Лорбах (ФАО) и г-н Х. Наджера (ЕЭК ООН) поблагодарили принимающую страну за оказанное гостеприимство и прекрасную организацию семинара, а также участников и вспомогательный персонал за их большой вклад в успешное проведение семинара.

ПРИЛОЖЕНИЕ

**ОЗНАКОМИТЕЛЬНАЯ ПОЕЗДКА, ОРГАНИЗОВАННАЯ В РАМКАХ СЕМИНАРА НА
ТЕМУ "ОБЛЕСЕНИЕ В КОНТЕКСТЕ УСТОЙЧИВОГО ЛЕСОПОЛЬЗОВАНИЯ"**

Воскресенье, 15 сентября 2002 года

В рамках ознакомительной поездки, организованной в контексте семинара, состоялось три экскурсии на следующие темы:

- Тема 1: Облесение в контексте УЛП в Ирландии, Бродфорд, графство Клэр;
- Тема 2: Практические аспекты посадки лиственных лесов в Ирландии, Нина, графство Типперэри;
- Тема 3: Практические аспекты посадки хвойных лесов в Ирландии, участок облесения, созданный по линии Программы партнерства с фермерскими хозяйствами Лесохозяйственного совета Ирландии, Апперчёрч, графство Типперэри.

Тема 1: Облесение в контексте УЛП в Ирландии, Бродфорд, графство Клэр

Докладчики: Ноэл Келли, лесовладелец, а также Джим Куинлайвэн и Имон Каннингэм, Лесная служба

Общая информация о работах, проведенных на участке

В начале 2000 года Ноэл Келли, землевладелец, решил изучить вопрос о посадке леса на принадлежащих ему 60 га земли в Бродфорде, графство Клэр, для чего он нанял Донала Фитцпатрика, утвержденного лесоведа-консультанта. Задача Донала состояла в том, чтобы разработать план развития лесного хозяйства, который бы соответствовал требованиям Лесной службы, касающимся предоставления дотаций, и в то же время учитывал долгосрочные планы Ноэла относительно будущего использования этих земель в целях рекреации и сохранения ландшафта. После консультаций с местным инспектором Лесной службы на утверждение была подана заявка относительно проведения работ, предшествующих посадке (форма 1), а также карта посадки различных пород и план лесокультурных мероприятий на участке. После проведения съемки участка была также подана заявка на предоставление дотации для строительства лесных дорог. Разрешение на посадку было выдано в октябре 2000 года при условии строгого соблюдения рекомендаций инспектора совета рыбного хозяйства, поскольку в прилегающей реке Киллурэн водятся лососевые, в связи с чем она отнесена к категории "экологически уязвимых водотоков". Лесная служба также дала разрешение на строительство лесных дорог.

После этого была начата работа по подготовке участка к посадке. Эта работа была связана с чрезвычайно большими расходами ввиду необходимости выкорчевывания и вывозки большого количества утесника (Ulex) и другой растительности. Были проведены крупные работы с помощью экскаваторов и бульдозеров, при этом соответствующий материал сгребался в кучи, а затем сжигался или закапывался. Обычно этот материал укладывается в ряды, между которыми затем производится посадка. Была вырыта дренажная система с отстойниками, а на небольшом ручье был оборудован пруд, который мог бы служить источником воды в случае пожара. Он впоследствии был обустроен Ноэлем, и теперь является привлекательным элементом ландшафта. Устройство насыпи являлось предписанным методом подготовки почвы, при этом на некоторых участках камни и валуны были зарыты, с тем чтобы пешеходные прогулки были более безопасными. Существовавшие деревья были по возможности оставлены.

Большинство растений было куплено у Лесохозяйственного совета Ирландии, при этом Ноэл также купил различные деревья, главным образом лиственных пород, в целях улучшения ландшафта и биологического разнообразия. В числе основных посаженных коммерческих пород можно назвать ель ситхинскую (52 100), гибрид лиственницы (44 000), сосну обыкновенную (17 900), ель обыкновенную (8 050), лжетсугу тиссолистную (4 500), тую гигантскую (2 700), ольху (14 600), ясень (10 800), дуб черешчатый (9 000), явор (4 900), бук (3 000) и березу (1 000). То есть в общей сложности было посажено более 172 000 деревьев. Кроме того, в целях улучшения биологического разнообразия и ландшафта 12 400 деревьев были посажены на участке разрозненными группами. В этих случаях использовались такие породы, как явор, бук, нотофагус, рябина, черешня, тополь, *Eucalyptus gunnii*, пихта благородная, каштан конский, каштан европейский, дуб австрийский, тюльпановое дерево, орех, платан, секвойя и граб.

Работы были завершены к 27 апреля 2001 года. Впоследствии было принято решение о выделении дотации на облесение и лесохозяйственной премии в отношении 16,00 га (20%) смешанных насаждений (GPC3), 30,28 га смешанных насаждений (GPC4) и 13,56 га лиственных насаждений (GPC5). Камни и гравий использовались при строительстве дорог. Дотация на строительство дорог на сегодняшний день пока еще не выплачена. Владелец Ноэл Келли непосредственно участвовал в работах по подготовке почвы, устройстве ограждений и посадке. Он также решил, что последующие работы по обслуживанию будет проводить сам.

Обзорная информация о Лесной службе и мерах по стимулированию посадки насаждений в частных владениях

Роль Лесной службы: Лесная служба министерства связи, морских и природных ресурсов отвечает за осуществление национальной лесной политики, оказание содействия развитию частных лесных хозяйств, управление системами дотаций на посадку насаждений и проведение других лесохозяйственных работ, регулирование рубок и поощрение исследований, посвященных лесному хозяйству и лесным товарам. Все ее функции должны осуществляться в соответствии с принципами охраны окружающей среды.

Меры по финансированию частного лесного хозяйства:

1931-1981 годы:	государственное финансирование
1981-1989 годы:	финансирование по линии ЕС -Схема "Западного пакета"
1990-1994 годы:	финансирование по линии ЕС - Оперативная программа развития лесного хозяйства
1995-1999 годы:	финансирование по линии ЕС - реформа ОСП
2000-2005 годы:	финансирование по линии ЕС - Программа развития сельских районов

Дотации и премии: Заявки подаются утвержденным лесоводом. Они могут направляться в один или несколько регулирующих органов, и лишь затем местному инспектору Лесной службы, который выносит свои рекомендации перед утверждением.

Прочие дотации: Наряду с Системой дотаций и премий на облесение Лесная служба создала ряд других систем: Систему лесовозобновления; Систему улучшения древостоя, Систему лесовосстановления, Систему обрезки деревьев хвойных пород, Систему формирования структуры лиственных насаждений, Систему финансирования строительства лесных дорог, Систему озеленения городов и Систему ведения хозяйства в естественных лесах.

Стратегия развития лесного хозяйства: Стратегия развития лесного хозяйства правительства Ирландии изложена в публикации "*Growing for the Future - A Strategic Plan for the Development of the Forestry Sector in Ireland*" ("*Выращивание леса для будущего - стратегический план развития лесохозяйственного сектора Ирландии*"). Цель этого плана состоит в том, "чтобы масштабы и направления развития лесного хозяйства способствовали максимизации вклада этого сектора в обеспечение экономического и социального благосостояния страны на устойчивой основе и в соответствии с принципами охраны окружающей среды". Согласно этому плану доля лесных угодий в общей площади страны должна увеличиться к 2030 году с 7% до 17%, а запасы древостоя - с 2,2 млн. м³ до 10 млн. м³.

Облесение - нормы и процедуры получения дотаций

Они определяют условия предоставления дотаций и премий, регулируют процесс получения предварительного разрешения и процедуру проверки. В условиях предоставления дотаций и премий регулируются вопросы землевладения, а также содержатся требования относительно минимального уровня плодородия участка, пригодности его использования в лесохозяйственных целях, площади и ширины участка, а также требования относительно того, что в рамках осуществления и развития проекта должны быть соблюдены принципы охраны окружающей среды. Все проекты, предусматривающие предоставление дотаций, подлежат утверждению Лесной службой до начала осуществления каких-либо работ. Существует процедура проверки, предусматривающая осуществление контроля за проектами до их утверждения и на различных этапах после завершения работ. Применяются следующие процедуры.

Представление плана работ по облесению: Он составляется утвержденным лесоводом и содержит подробные сведения об обработке почвы, устройстве ограждения, внесении удобрений, противопожарных мерах, породном составе, контроле за растительностью и собственности. Рассматриваются и экологические аспекты использования того или иного участка, а также другие вопросы, касающиеся, например, доступа, потенциального роста деревьев, возможностей использования участка для производства делового леса и его пригодности для выращивания лиственных пород. К плану прилагается карта.

Экологические вопросы: Учет этих вопросов обеспечивается путем проведения консультаций и соблюдения различных эксплуатационных правил.

Процесс консультаций позволяет вынести решение о целесообразности осуществления части или всего проекта. Лесная служба проводит консультации с соответствующими регулирующими учреждениями и при необходимости запрашивает проведение оценки воздействия на окружающую среду, а также организует консультации с населением в тех случаях, когда речь идет о соответствующих категориях участков. В случае поступления предложений по проектам, предусматривающих обустройство стока в кислотоуязвимые водотоки, должен составляться протокол.

Обязательные экологические нормы подробно описаны в своде руководящих принципов, которые посвящены таким вопросам, как водохозяйственная деятельность, археология, обустройство ландшафта, охрана биологического разнообразия и осуществление лесозаготовительных операций. В *Кодексе наилучшей лесохозяйственной практики Ирландии* определены экологические процедуры, подлежащие соблюдению при проведении каждой конкретной лесохозяйственной операции. Процедуры проведения консультаций могут также содержать подробные требования, подлежащие соблюдению в рамках конкретных проектов в области облесения.

Процедура проверки: Все планы в области облесения рассматриваются лесохозяйственным инспектором Лесной службы. Проверка участков осуществляется до утверждения проекта, а также на следующих этапах после завершения работ: i) после завершения операций по облесению; ii) четыре года спустя после завершения этих работ; и iii) на нерегулярной основе в последующий период.

Система штрафов: Существует система штрафов. Финансовые штрафы применяются в случае нарушения лесохозяйственных и экологических правил, а также при представлении недостоверных сведений о типах земель и праве собственности на землю.

Тема 2: Практические аспекты посадки лиственных насаждений в Ирландии, Нина, графство Типперэри

Докладчики: Майкл Суини, Питер Алли и Падди Брютон, компания "Форестри сервисиз лтд", Ирландия

8 января 2001 года была подана заявка на дотацию, которая была утверждена 27 марта 2001 года. Подготовительные работы были начаты практически незамедлительно, а все работы были завершены к 15 мая 2001 года. Были соблюдены все требования Лесной службы, в том числе относительно недопустимости засадки участков под линиями электропередачи; сохранения и отгораживания 15-метровой буферной зоны вокруг нового зарегистрированного памятника; соблюдения минимального расстояния от прилегающих построек на основе письменного разрешения владельца и обустройства обочин вдоль дорог.

Майклу Флэннери принадлежит приблизительно 46 га, и раньше он в основном занимался вспашкой земель и овцеводством. Его два сына работают в Дублине и не заинтересованы заниматься сельским хозяйством. Г-н Флахерти посадил деревья на 21 га, в результате чего сегодня он получает необлагаемый налогами доход в размере 10 316 ирландских фунтов. Оставшуюся часть земли он сдал в аренду и в настоящее время пользуется услугами системы пенсионного обеспечения фермеров. Он понимает ценность выращиваемых им деревьев. Почва является весьма плодородной, а грунт - водопроницаемым. Высота этого участка над уровнем моря составляет 80 м, экспозиция склона: от южной до нейтральной, участок не подвержен воздействию ветра. Густота посадки ясеня, явора и ольхи составляет 3 300 деревьев/га, а расстояние между деревьями 2-1,5 м. Морозы не воздействуют на этом участке, за исключением одной секции, где была высажена ольха. Подготовка почвы под дуб осуществлялась с помощью сельскохозяйственного плуга, а почва на других участках была обработана с помощью плантажного плуга.

Тема 3: Практические аспекты посадки деревьев хвойных пород в Ирландии, участок облесения, созданный по линии программы партнерства с фермерскими хозяйствами Лесохозяйственного совета Ирландии, Апперчёрч, графство Типперэри

Докладчики: Джим Диллон, Даити де Форж и Джим Фогарти, Лесохозяйственный совет Ирландии, Ирландия

Лесокультурная площадь: 42,2 га
Год посадки: январь 2002 года
Породы: ● 25,2 га - ель ситхинская

	<ul style="list-style-type: none">● 6,3 га - лиственница японская (посажена в основном вместе с елью ситхинской)● 6,7 га - ясень● 2,0 га - линии электропередач (площадь, оставленная под открытое пространство), дуб черешчатый и береза были использованы для формирования живой изгороди● корни всего посадочного материала были обнаженными
Подробные сведения о посадочном материале/ происхождение посадочного материала:	<ul style="list-style-type: none">● Ель ситхинская, Вашингтон, 30-50 см, 2+1s● Лиственница японская, остров Хоккайдо, 40-60 см, 1+1s● Ясень, Ирландия, 50-80 см, 1u1● Дуб черешчатый, Нидерланды, 50-80 см, 1u1● Береза, Ирландия, 50-60 см, 1u1
Тип почвы:	80% - серо-бурая подзолистая почва; 20% - глеевая почва (на базе песчаника)
Высота над уровнем моря:	200-310 м
Экспозиция склона:	Северо-восточная
Ветровая экспозиция:	Подветренная до умеренно стабильной: S21
Класс бонитета:	20-24+ м ³ /га/год
Метод культивации:	70% - окучивание; 30% - плужная обработка (адаптированная)
Характеристики:	Археологические объекты (не показаны на картах SMR), которые были найдены на этапе освоения участков и сохранены на участке посадки. Старый дом и постройки сохранены в качестве элементов "зоны улучшения биологического разнообразия". Участки живой изгороди были укреплены путем посадки лиственных пород с целью создания коридоров - ареалов распространения на плантации. Также были сохранены участки лиственных кустарников.

Выражение признательности

Лесная служба хотела бы поблагодарить землевладельцев Ноэля Келли (тема 1), Майкла Флэннери (тема 2) и Патрика Куинна (тема 3) за то, что они разрешили посетить их владения для целей ознакомительной поездки. Лесная служба также благодарна Ноэлю Келли, Дональду Фицпатрику, Майклу Суини, Питеру Али, Пэдди Брютону, Джиму Диллону и Диати де Форжу за оказание помощи в организации и проведении ознакомительной поездки и их участие в этом мероприятии.

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PAPERS CONTRIBUTED TO THE SEMINAR

National and regional strategic planning

Under this topic the following papers were presented:

Mr. D. McAree (Ireland) on Afforestation in Ireland

Mr. F.M. Dunn and Mr. J.J. Farrell (Canada) on Afforestation and Climate Change: A Canadian Perspective

Mr. Eugene Hendrick (Ireland) on The Role of Forest Research and Development

Mr. Tim Crowley (Ireland) on Coillte Practicing SFM in a Commercial Environment

Mr. Josef Herkendell (Germany) on Afforestation in Europe: The Need for Better Communication and New Partners

Mr. Ray Gallagher (Ireland) on The Role of Co-operatives in Sustainable Afforestation and Promoting Rural Development

Messrs. Filip Georgescu and Mihai Liviu Daia (Romania) on Forest Regeneration in Romania

Ms. Shirley Clerkin (Ireland) on The Forestry Regulatory Framework - an Environmental NGO Perspective

AFFORESTATION IN IRELAND - A CASE STUDY OF SFM IN ACTION

Mr. D. McAree, Chief Forestry Inspector, Forest Service, Department of Communications, Marine & Natural Resources, Ireland

OVERVIEW – FORESTRY IN IRELAND

Forests comprise 9.7% of the land area of Ireland. This area will increase to 17% by the year 2030 if the objectives of the Forest Service Strategic Plan for the Development of the Forestry Sector, described in 'Growing for the Future', are achieved. The plan sets out 'to develop forestry in a scale and in a manner which maximises its contribution to national economic and social well-being on a sustainable basis and which is compatible with the protection of the environment'. Current total allowable cut is 2.8 million m³ of timber, which is projected to increase to a critical mass of 10.0 million m³ by year 2030. Sitka spruce currently represents 60% of the species composition of Irish forests. The balance is a mixture of 20% diverse conifers and 20% broadleaves. New targets have been set to achieve 30% broadleaves, 50% Sitka spruce and 20% diverse conifers by the year 2006.

Ireland's forests are a multi-functional resource benefiting all sectors of society. They provide sustainable employment and a renewable raw material for downstream industry. These forests enhance the Irish landscape and provide many opportunities for recreation for rural and urban communities. They also play a vital role in the enhancement of biodiversity and the protection of water resources. By sequestering carbon, Irish forests contribute significantly to the realisation of Ireland's Kyoto targets.

The Forest Service – Ireland's national forest authority – is committed to working with the forestry sector to implement Sustainable Forest Management (SFM). The Forest Service considers SFM as being essential in realising the widest range of benefits from Ireland's forest estate, while also providing for the needs of future generations.

SFM IN PRACTICE

SFM in Ireland is implemented by the Forest Service through five interrelated measures: Irish National Forest Standard; Code of Best Forest Practice – Ireland; Suite of Environmental Guidelines; Expanded Forestry Inspectorate; and Review of Legislation.

IRISH NATIONAL FOREST STANDARD

The Irish National Forest Standard outlines the basic criteria and indicators relating to the national implementation of SFM. It lists a series of qualitative and quantitative measures by which progress towards the practice of SFM can be monitored under Irish forest conditions.

CODE OF BEST FOREST PRACTICE – IRELAND

The Code of Best Forest Practice sets out for each stage of the forest cycle – from seed to sawlog – those operations and procedures that are in keeping with SFM and the enhancement of the environmental, economic and social benefits of Irish forestry. Each section of the Code describes a particular forest operation and is divided into objectives, key factors, operation description, potential adverse impacts, best practice and other relevant information.

ENVIRONMENTAL GUIDELINES

A suite of environmental guidelines is the mechanism by which the Forest Service ensures that all environmental aspects of SFM are implemented. Adherence to the guidelines is a condition of grant aid and the issuing of a felling licence. The suite of environmental guidelines covers water quality, landscape, archaeology, biodiversity, harvesting and aerial fertilisation. Further guidelines on forest protection and recreation are being developed.

FORESTRY INSPECTORATE

The Forest Service Inspectorate has also been expanded significantly to oversee the implementation of SFM, ensuring that all forest operations at a local level are carried out in accordance with best practice. This Inspectorate is currently being expanded to include a professional ecologist, a landscape architect and an archaeologist, reflecting the evolving nature and role of forestry in Ireland. The Inspectorate is also actively involved in implementing an integrated forest protection strategy to ensure the maintenance of Irish forests' disease-free status. A contingency plan has been drawn up to counteract any major disease or insect threat to the forest estate.

LEGISLATIVE REVIEW

The Forestry Act 1946 is the primary legislative tool by which forestry is controlled. While this Act has served the sector well for over 50 years, a legislative review is now underway to provide a new legal framework based on the core principles of SFM.

FORESTRY IN IRELAND – SFM IN ACTION

The above measures, implemented in full consultation with the relevant statutory bodies, environmental groups and local communities, should ensure that all timber produced in Ireland's forests is derived from sustainably managed forests.

Further information on Irish forestry may be found at the website: <http://www.dcmnr.gov.ie/forestservice>.

AFFORESTATION IN IRELAND

SUSTAINABILITY AND FORESTRY

The accommodation of forestry development within the capacity of the environment to support it without damage or depletion

ROLE OF THE FOREST SERVICE

The Forest Service is responsible for national forest policy, promotion of private forestry, administration of planting and other forestry grant schemes, forest protection, control of felling and promotion of research in forestry and forest produce.

OBJECTIVES OF THE FOREST SERVICE

To develop forestry to a scale and in a manner which maximises its contribution to national economic and social well-being on a sustainable basis, and is compatible with the protection of the environment.

IRISH FORESTS

- 650,000 ha, 9.41% of land area
- Affor rate (1990-99): 17,000 ha/yr
- Average yield class: 16 m³/ha/yr
- High forest health status

BACKGROUND FORESTRY STRATEGIC PLAN – IRELAND

Forest cover

Today: 9.41% land area (650,000 ha)

Year 2030: 17% land area (1,175,000 ha)

World's highest rate of afforestation per capita

Total Allowable Cut

Today: 2.7 million m³

Year 2030: 10.0 million m³

(Critical Mass)

SFM IN ACTION – 5 POINT PLAN

- Irish National Forest Standard
- Code of Best Forest Practice

- Suite of Environmental Guidelines
 - Harvesting
 - Archaeology
 - Biodiversity
 - Landscape
 - Water Quality
 - Aerial Fertilisation
 - Forest Protection
 - Forest Recreation
- Expanded Forestry Inspectorate
- Review of Legislation

CODE OF BEST FOREST PRACTICE

Socially acceptable

Ecologically healthy

Economically viable

Code of Best Forest Practice must be:

- Socially responsible
- Implementable & enforceable
- Monitored and audited
- Continuously evaluated & accountable
- Adjusted and refined
- *Ecologically sound*

PROMOTION OF FOREST BIODIVERSITY – A SPECIFIC EXAMPLE OF SFM IN ACTION

Implement

- International Conventions
- EU Directives
- National Forest Biodiversity Plan
- Hedgerow conservation and enhancement

FOREST SERVICE BIODIVERSITY GUIDELINES

- Leave deadwood
- Control rhododendron / laurel

- Prevent animal trespass
- Retain areas of semi-natural woodlands
- Encourage wildlife
- Protect rare and endangered species
- Abide by Forest Service Guidelines
- Leave open spaces
- Maintain hedgerow linkages
- Take account of areas of conservation
- Vary species / mixtures
- Consult with conservation organisations
- Favour local provenances
- Encourage age / structural diversity

BROADLEAVES

The Target for Ireland by year 2006 is 30% Broadleaf Cover

Currently 21%

NATIVE WOODLAND SCHEME

Protecting and enhancing Ireland's native woodland resource

Two Elements:

- Native Woodland Conservation
- Native Woodland Establishment

30,000 ha of new and existing native woodland to be developed, including 2,000 ha of riparian woodland

FOREST SERVICE CONTINGENCY PLAN FOR FOREST PROTECTION

- Notification – symptoms
- Identification – cause
- Survey – extent
- Source – identify
- Action – remedial
- Monitor – area

A QUALITY ECOSYSTEM APPROACH TO FORESTRY

- Achieves integrated forest management

- Maintains biodiversity
- Ensures sustainability
- Maintains and restores productivity
- Addresses sociological concerns
- Maintains forest health
- Integrates biological, social and behavioural sciences

KYOTO – CARBON

Estimated that by year 2008 Irish forests will be sequestering over 1.5 million tonnes of carbon per year
Important contribution to National Greenhouse Gas Abatement Strategy

“Even if you’re on the right track, you’ll get run over if you just sit there”

Will Rogers

“MISSION STATEMENT”

To ensure that all timber produced in Ireland is derived from sustainably managed forests

AFFORESTATION AND CLIMATE CHANGE: A CANADIAN PERSPECTIVE

Mr. F.M. Dunn, Director, Applied Research & Development Branch, Ontario Ministry of Natural Resources, and

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SUMMARY

Afforestation – establishing tree cover on land not previously forested – might seem a peculiar activity in a country with 417.6 million hectares of natural forest. In the past, afforestation has been primarily focussed on lands that were cleared for agriculture at the turn of the century, determined to be unsuitable for farming, abandoned and were gradually deteriorated through the combined effects of wind and water. Since that time, the pace of afforestation has slowed and has been driven by a mix of objectives including watershed protection, fibre production and site rehabilitation. Since the ratification of the Framework Convention on Climate Change in 1992 and the advent of the Kyoto Protocol in 1998, the prospect of afforestation has new economic and environmental dimensions.

The presentation will offer a perspective of the potential for incorporating carbon sequestration and management considerations into an assessment of the potential for broader scale afforestation on privately held lands in Canada. Offering both a national and regional perspective (Province of Ontario), it will include a brief history of afforestation on private lands, some analysis of trends and their drivers, some policy perspectives of afforestation as an element of a broader strategy in landscape management and the benefits derived from these past activities. Consideration will be given to the need for a comprehensive approach to sustainable forest management to ensure maximum public understanding and support. The paper will then examine the implications of expanded tree cover in the context of climate change and the potential incentives provided under the terms of the Kyoto Protocol. It will include information on the potential suitable land available, examine some of the issues around incentives (both direct and market based) given the alternative options facing landowners for land use, and offer some examples of trials that are already underway. It will profile the suite of benefits – including carbon management – that afforestation may provide in a Canadian context. Finally, it will propose some potential future scenarios for afforestation in Canada.

Boisement et changements climatiques: le point de vue canadien

Exposé de MM. F. M. Dunn et J. J. Farrell

Résumé

La pratique du boisement, à savoir l'établissement d'un couvert forestier sur des terres auparavant exemptes d'arbres, peut surprendre dans un pays qui compte 417,6 millions d'hectares de forêts naturelles. Par le passé, le boisement s'est principalement concentré sur des terres qui, défrichées initialement aux fins de l'agriculture au début du siècle, avaient ensuite été considérées impropres à l'exploitation et abandonnées et s'étaient progressivement détériorées sous l'effet combiné du vent et de l'eau. Depuis, le rythme de boisement s'est ralenti; il a été conditionné par divers objectifs, dont la protection des bassins versants, la production de fibre et la remise en état de sites. Depuis la ratification de la Convention-cadre des Nations Unies sur les changements climatiques en 1992 et l'adoption du Protocole de Kyoto en 1998, les perspectives de boisement revêtent de nouvelles dimensions économiques et écologiques.

Les auteurs envisageront la possibilité d'incorporer des considérations liées au piégeage du carbone et à la neutralisation des émissions dans une évaluation des possibilités de développer le boisement sur les terres relevant du régime de la propriété privée au Canada. Se plaçant dans une perspective tant nationale que régionale (province de l'Ontario), ils dresseront un bref historique du boisement desdites terres et analyseront les tendances et leurs motivations, de même que la possibilité de mettre en œuvre des politiques de boisement intégrées à une stratégie plus vaste de gestion des paysages, ainsi que les effets bénéfiques de telles activités dans le passé. Ils examineront la nécessité d'une démarche intégrée de gestion durable des forêts permettant d'obtenir, de la part du public, une compréhension et un soutien optimaux. Ils examineront ensuite les incidences d'un couvert forestier élargi dans le contexte des changements climatiques et les incitations éventuelles prévues par le Protocole de Kyoto. Ils fourniront des informations sur les terres disponibles qui pourraient se prêter au boisement, examineront certains aspects de la question des incitations (tant directes qu'induites par les forces du marché) compte tenu des autres solutions qui s'offrent aux propriétaires fonciers en matière d'utilisation des sols, et donneront quelques exemples d'essais en cours. Ils énuméreront les avantages – y compris la neutralisation des émissions de carbone – que le boisement pourrait présenter dans un contexte canadien. Enfin, ils proposeront d'éventuels scénarios de boisement applicables au Canada.

Облесение и климатические изменения: точка зрения Канады на перспективу

Основной доклад: г-н Ф.М. Данн и г-н Ж.Ж. Фаррелл

Краткое изложение

Облесение - создание лесного покрова на земле, где раньше не росли леса, - может показаться странным занятием в стране с 417,6 млн. гектаров естественных лесов. Раньше, в начале прошлого века, облесению в основном подвергались земли, расчищенные сначала под сельскохозяйственные угодья, а затем оказавшиеся негодными для занятия земледелием, земли, заброшенные и со временем полностью разрушившиеся под воздействием ветра и воды. Впоследствии темпы облесения замедлились, и облесение осуществлялось только в определенных целях, например для укрепления водоразделов, для производства древесного волокна и для реконструкции земельных участков. После ратификации в 1992 году Рамочной конвенции об изменении климата и подписания Киотского протокола в 1998 году облесение приобрело новое значение для экономики и окружающей среды.

В данном докладе будут рассмотрены вопросы включения секвестрации углерода и управления в оценку возможности широкомасштабного облесения земель, находящихся в частной собственности в Канаде. Обрисовывая перспективу как на национальном, так и на региональном уровнях (провинция Онтарио), доклад будет включать в себя историю облесения частных земель, анализ некоторых тенденций и их причин, некоторые программные перспективы облесения как элемента более широкой стратегии управления ландшафтом, а также преимущества, полученные в результате этой деятельности. Будет рассмотрена необходимость всеобъемлющего подхода к устойчивому лесопользованию с целью добиться максимального понимания и поддержки со стороны общественности. В докладе будут также рассмотрены последствия расширения лесного покрова в контексте климатических изменений и потенциальные стимулы, предусмотренные положениями Киотского протокола. В нем будет содержаться информация о наличии потенциально подходящих земель, рассмотрены некоторые вопросы, касающиеся стимулов (как прямых, так и основанных на рынке), с учетом альтернативных вариантов, имеющих у землевладельцев, по использованию земель, а также будут приведены некоторые примеры уже ведущихся опытов. Доклад обрисует ряд преимуществ - включая управление углеродом, - которые может дать облесение в контексте Канады. И наконец, там будет предложено несколько возможных сценариев будущего облесения Канады.

Across the global forest community there is growing interest in the role of forests and forest practice as they relate to climate change. Foresters are, in increasing numbers, beginning to consider the influence of climate change on their management practices and policies and considering the implications of carbon management. As we collectively consider strategies across the forest sector to reduce emissions and mitigate the effects of greenhouse gases, the prospect of expanded afforestation to re-forest abandoned lands expanding carbon sequestration opportunities, has been greeted with new and considerable interest. This paper provides a broad overview of the state of current discussions on this subject within a Canadian context.

THE CANADIAN FOREST – SOME BACKGROUND

The total land mass of Canada is 921.5 million hectares. Approximately 50% of this area (417.6 million hectares) is classified as forest. In a global context Canada is steward to the third largest forest area in the world, over 10% of the world's forest. Only the Russian Federation at 22% and Brazil at 14% have larger proportions of the planet's forest cover.

The Canadian forest contains 180 different indigenous tree species. The country is divided into ten different forest regions that include maritime, montane, broadleaf, deciduous and of course, the vast Canadian boreal forest regions. Each of these is ecologically different and presents a different array of species and management requirements. On average, the age of the forest increases from east to west and the forest is characteristically subject to significant levels of disturbance from fires, insects, disease, wind throw and, of course, commercial harvest.

This Canadian forest supports a vitally important forest industry. The total value of shipments was \$73.6 billion (1999) while more than 50% of these were exported, \$44.1 billion. Over 81% of these export products were destined for the United States market and Canada continues to be the largest world exporter of newsprint, softwood lumber and pulp. Of the total volume of world exports of forest products, over 19% are Canadian.

The contribution of the Canadian forest is not limited to a direct contribution to the economy in terms of producing traditional wood and paper products. The Canadian forest provides a critical backdrop to a multi billion dollar tourism industry and offers key environmental values in terms of contributing to water conservation and quality, habitat for domestic and migratory species and a vast array of recreational opportunities for domestic and international visitors alike.

With this range of forest area and scale of the current forest industry it is reasonable to question what role or priority afforestation programs might have in the Canadian forest management agenda.

SOME BROAD CONSIDERATIONS

There is an increasing demand for forest fibre. International estimates suggest a 2% annual growth in demand over the next ten to twenty years. At the same time there is a large amount of new production coming on stream in places like New Zealand and Chile. Competition to provide forest products will most certainly increase.

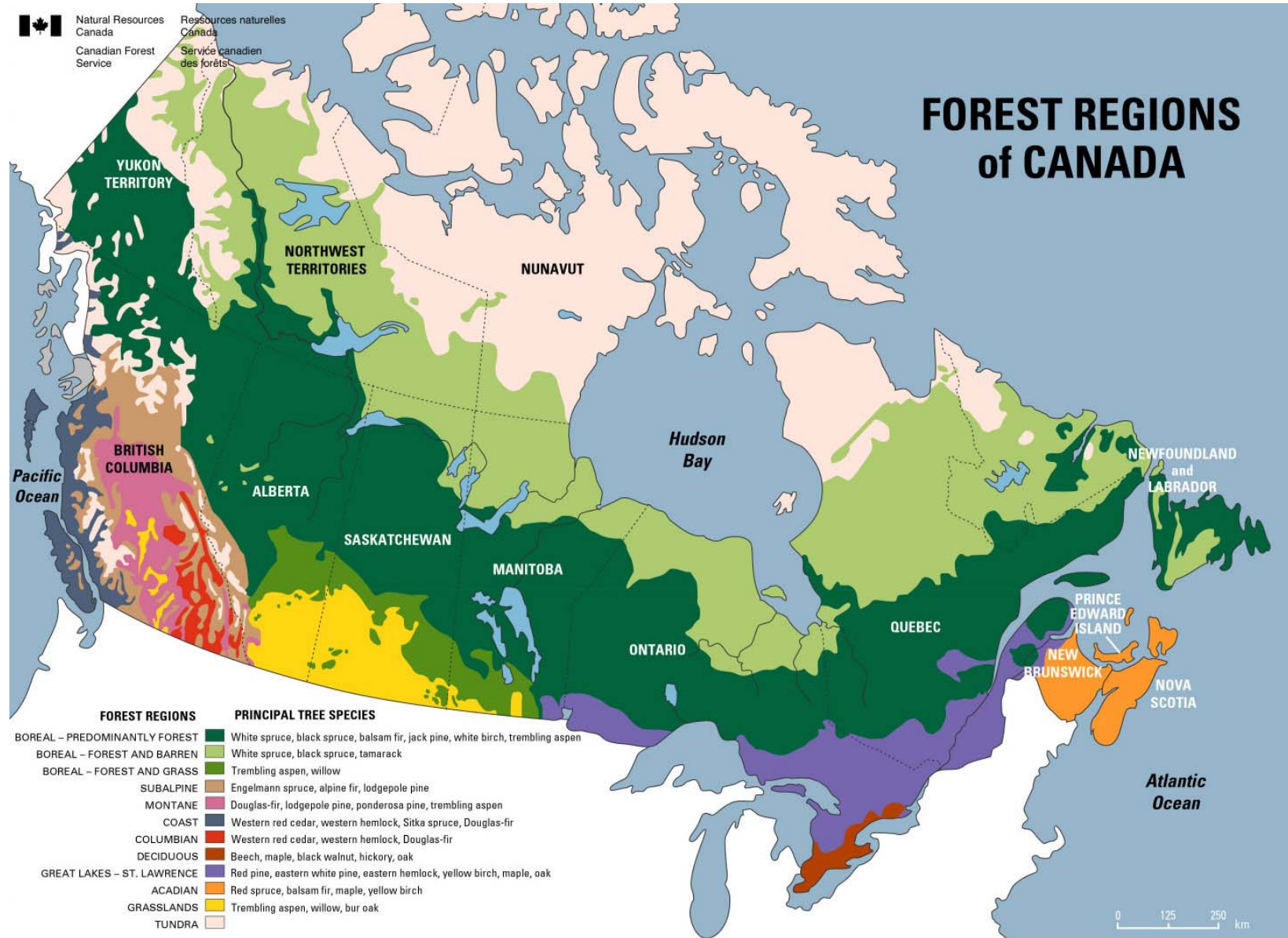
In Canada, despite the vast size of the forest, less than 30% is managed commercially for the production of forest products, as well as other values and over 94% of this area is public land. These 119 million hectares of forest, which is about the size of Finland, France and Germany combined is largely accessed and includes protected areas and sites under a regime of sustainable forest management. It is expected that over 50% of this area will be certified under one of the major systems available in Canada within a few years. As forests are largely publically owned and domestic demographics are increasingly shifting

towards urban centers of growth, there are increasing demands for land withdrawals and set asides from the commercial forest. At the same time, global markets are seeking assurances for the environmental integrity of the products they purchase. Canada continues to respond by pioneering extensive and sustainable forest management across expansive and diverse disturbance driven landscapes and expanding the national network of protected areas and parks.

Compared to forests of many other jurisdictions, although there is huge variation across the country, the natural Canadian forest, on average, is relatively slow growing. Average mean annual increment is in the range of between 1.5 and 2.0 m³/ha/yr.

As one considers industry infrastructure limitations, the increasing challenges of transportation economics, an agricultural economy in transition and the myriad of important environmental benefits that flow from forested areas with respect to water quality, rural landscapes and carbon sequestration, it is timely to re-examine afforestation and what opportunities it might provide.

FIGURE 1 (Map of Canadian Forest Regions)



HISTORY AND CURRENT PRACTICE

Despite the great amounts of natural forest, afforestation programs have a well established history in Canada. Historically, afforestation has typically followed after land clearing for agriculture. In eastern Canada, for example, this generally was undertaken as part of a rehabilitation strategy during the 1920's. In western Canada, afforestation took a different form, as part of agricultural development, through the establishment of shelterbelts. Since the 1930's these efforts have resulted in over 3000 hectares planted per year. Tree planting has also been extensive within urban environments. Over 75 million trees have been planted in Canadian cities over the last 10 years.

The forest industry is also involved in important plantation development. Forest product companies such as Alberta Pacific and Domtar have invested in developing significant fibre supply from plantations. Some targets suggest that fully 15% of future supply to be generated from tree farms for some firms, while others have been and continue to explore fibre sources from fast growing hybrid poplar plantations.

NEW PERSPECTIVES AND ASSESSMENT OF POTENTIAL

Planting trees and establishing thriving plantations is expensive making the economics of fibre production marginal in comparison to managing the natural forest. Natural forests remain the most competitive source of supply. There are, of course, many other benefits that can be derived from planted forest areas. They are well recognized and wide ranging and include wildlife habitat, recreation, soil maintenance, air and water quality improvement and even sewage treatment. It is often difficult to quantify these benefits however, and perhaps even more challenging to assign them or determine how the costs of attaining them should be shared.

In a Chicago based study of urban forests it was estimated that trees in a metropolitan environment have been valued at \$1,500/ha/yr for their removal of pollutants from air, soil and water. In China, treatment forests have been used to manage entire municipalities sewage treatment needs (880 ha of forest can supply treatment for up to 10,000 cubic meters of sewage). All of these benefits are widely dispersed and the public purse is faced with the challenge of addressing this investment in competition with many other important public spending priorities.

In recent years, the terms and conditions of the Kyoto Protocol suggest potential new economic incentives for afforestation that could be considered in the development of domestic plans designed to respond to the challenge of climate change. While carbon management and trading mechanisms will not be any panacea, these considerations do represent a new economic dimension that perhaps brings new investment perspectives to the scene and may offer opportunities that could tip the cost-benefit balance in favor of increased afforestation.

There are between 1.1 and 1.4 million hectares of private land potentially available for afforestation in Canada, however, determining how much might actually be planted with trees depends on many factors. For the most part, as abandoned farmland, it is likely of lower productivity or low economic return, due to transportation issues, or both. While these lands may still offer significant potential for forests, the rate of return to justify the establishment and maintenance investments for fibre value alone is often too low to interest most private owners.

Recent surveys of Canadian farmers reported that 16% of farmers planted trees in the last 5 years on an average area of 10 hectares. Among farmers who owned unforested land, 25% indicated that they would be interested planting trees. The average size of these plantations was projected to be 19 hectares. If trees were offered free and planted at no cost 42% indicated they would have 19 hectares planted. When a rent of \$10 per hectare for 20 years was offered 45% indicated a willingness to plant an average of 29 hectares. Finally the surveyed suggested that if a rent of \$50 per hectare was offered 47% indicated they would plant 61 hectares. In summary, although the willingness to establish and maintain tree cover on private lands increases with the level of incentive, there appears to be a threshold where increased incentives will not offer a commensurate increase in response.

The actual land that will be established in new plantations will be defined by economics and be based on a combined reflection of the value of the fibre, attainable environmental benefits and any new carbon benefits that can be developed.

FEASIBILITY OF AFFORESTATION

As part of the assessment of options for the development of draft national plan to meet Kyoto targets, Natural Resources Canada has been examining the feasibility of various models of partnership to promote afforestation. These pilot projects are designed around the notion of bringing together the range of partners that each has different motivations for planting trees. These could include forest product companies with an interest in fibre, wildlife groups with an interest in habitat, farming community with an interest in environmental farm plans, fisheries groups interested in riparian zone rehabilitation, governments with an interest in water and soil protection, and now a new interest in the value of carbon. This interest is being expressed by institution, that up to now, have shown little interest in tree planting and include utilities, large energy consumers (heavy manufacturing) sector and the investment sector.

The range of incentive being examined includes direct financial, analysis of market based systems (examining various scenarios around the future price of carbon), tax system incentives and regulatory structures. Over the next year, many of these combinations will be evaluated.

LOOKING FORWARD

From a broad national perspective, Kyoto ratification should create a domestic market for carbon offering some opportunity to consider the value of offset credits created by afforestation. Government's role in this should be to establish the policy framework to facilitate the development of the market and offers some predictability for investment. This includes developing the ground rules around ownership, reporting, verification, measurement and monitoring and reporting that should set the foundations for tree planting and management decisions. Such a policy framework will be, by necessity, built on a partnership of public and private sector interests where multiple contributors' investments generate commensurate and equitable benefits.

The next section of this discussion will focus on additional perspectives from a provincial level within the Canadian context.

FOREST MANAGEMENT IN ONTARIO

As we have described, Canada is a very large country. Similarly Ontario is a very large province. Ontario has a total land area of 106.8 million hectares. In an American context this area would stretch from North Dakota to Texas and from Tennessee in the east to Nebraska/Wyoming in the west. Within this large area 61 million hectares are forested. Significantly less than this is however accessible and available for forest management, approximately 39 million hectares. Within the province 87% of the land area is publicly owned and the responsibility for forest management on these lands rests with the provincial government.

Forest management takes place within a comprehensive policy framework to ensure sustainable forestry. This framework is legislative as directed by an Environmental Bill of Rights, the Crown Forest Sustainability Act and rigorous Environmental Assessment regulation. The framework is further supported by a prescriptive set of guidelines and manuals that specify all aspects of forest management from planning to silvicultural treatments. Overriding the forest management direction and supporting this framework is a comprehensive land use strategy, which is the product of unprecedented public participation and review during the late 1990's. This strategy provides for the

establishment and protection of 12% of the forest area in protected spaces and provincial parks. To garner public support and encourage participation and enthusiasm for afforestation programs it is important to seat them within a defined program of sustainable forest management.

In Ontario 5.6 million hectares (8.2%) are privately owned. Government has a lot less control over these areas and in the future it will increasingly confine itself to the tasks of facilitator, policy development, sponsorship and generally championing afforestation programs.

AFFORESTATION HISTORY IN ONTARIO

Afforestation programs provided the genesis for organized forest management in the province. As a result of extensive land clearing for agriculture in the later part of the 19th century, many thousands of hectares were reduced to blow sand and severely eroded landscapes. These practices led to flooding and clearly established the need to reclaim the former forests. Early estimates suggest that as much as 22,000 km² were replanted with over 1 billion trees.

The successful reforestation of these areas demonstrated several elements of afforestation programs that are important for success. Programs should be responsive to environmental needs. They require a broad base of political, administrative and public support. They should be as consistent and continuous as possible with a view to meeting long term objectives. Programs should feature low cost or cost sharing with landowners with a minimum of administration and a focus on efficiency. Successful programs also employ a variety of mechanisms to meet local needs with quality nursery stock in sufficient quantities. Finally, effective follow up treatment after establishment is also important

In recent years in Ontario, afforestation programs have decreased from earlier levels. Since 1980 approximately 10 million trees have been planted and fewer still in more recent years.

CLIMATE CHANGE B PROSPECTS FOR ONTARIO FORESTS

There are a number of models that display various scenarios for the future of Ontario (and Canadian) forests. All indicate dramatic changes. While currently the province is roughly divided in two major bands of distinct forest regions; the south being dominated by the Great Lakes deciduous forest and the north by the Boreal coniferous forest – future scenarios, 70 years in the future, suggest a dramatic reduction and virtual removal of the boreal forest within the province. Regardless of the accuracy of this projection it is clear that the Ontario forest will be subject to significant change and impact.

Afforestation programs will need to actively respond to this situation. It will be important to ensure long term suitability of stock to changing site conditions. Programs will need to account for shifts in precipitation, pest and insect effects, changing fire management regimes and extreme weather events. These conditions suggest a focus on generalist species that tend to flourish under a range of conditions. From a policy perspective strategies that reflect an adaptive approach, which incorporates new estimates from continuously refined climate and biological models will be favored.

CHALLENGES AND OPPORTUNITIES

Climate change strategies and protocols such as the Kyoto accord present opportunities for carbon benefits and carbon trading. As earlier discussed, it is unlikely that these benefits will independently drive afforestation programs but they may well offer the means by which to proceed with marginal or otherwise unattractive programs.

Greater public interest in climate change and ecological systems should present a positive and receptive environment to develop and market new afforestation programs. Similarly heightened public awareness and concern may present opportunities to define programs that capture multiple benefits and respond to ecosystem structure and functional change. Optimistically this interest may foster the means to address some of the issues associated with ecological management within multiple

jurisdictions. Finally sequestration and carbon management benefits may provide the basis for more effective integration between industrial, agricultural and rural residential interests that currently find scarce opportunity for effective integration.

FUTURE STRATEGIES

Afforestation programs in Ontario's future will be the product of multi sector co-operation. Governments role continues to evolve but will focus we believe on marshaling co-ordination and defining common purpose of delivery agencies.

Effective strategies that support the development and maintenance of nursery capacity in the private sector will be required. They must be supported by sound seed management practices that work within a rapidly evolving environmental framework.

Strategies must be sought that reduce costs to landowners and build on a clear interest in planting trees, which was demonstrated in a recent Ontario survey that indicated that 76% of landowners were at least willing to consider planting trees to reduce the effects of climate change. Creative means will be required to support long term planning and define appropriate financing mechanisms.

Future programs will be done through partnerships and therefore must be designed to recognize and respond to the variety of objectives that partners bring to the enterprise.

In terms of scope, the potential for afforestation in Ontario is large. Estimates suggest that there are between 48,000 hectares and 450,000 hectares available for planting, depending on the assessment criteria selected. Hypothetically, if planting levels could be developed to achieve 10 million trees per year, a concerted program in Ontario could be undertaken over a period of from at least 10 to as long as 90 years.

Currently the structure to deliver such a comprehensive program does not exist. The conversation is however underway and we continue to explore how afforestation programs could be enhanced to serve many of our emerging interests and be responsive as possible to future needs.

THE ROLE OF FOREST RESEARCH AND DEVELOPMENT

Mr. Eugene Hendrick, Director, COFORD (Council for Forest Research and Development), Ireland

SUMMARY

Forest cover in the Republic of Ireland extends to some 660,000 ha, almost 9.5% of the land surface. Plantations comprise by far the largest part of the forest area (more than 95%). These have been established over the past century, with the majority being planted in the past half decade. Forestry is therefore a relatively recent land-use in Ireland. Taken together with the fact that the estate is mostly based on exotic tree species these factors present challenges and opportunities for the implementation of sustainable forest management (SFM) in plantation forestry in Ireland. Forest research has played, and continues to play, an important role in implementing SFM in afforestation programmes.

A key feature of the COFORD programme is the identification of priority areas for forest research and development, where expenditure can be targeted in order to meet the issues and problems facing the forestry sector. COFORD is addressing these priorities through co-funded R&D projects. In addition there is a considerable body of knowledge and expertise available from previous COFORD programmes, other nationally funded research and research abroad. These are all brought to bear in addressing issues and problems in the afforestation programme.

Transferring research results into policy and practice is the great challenge for all R&D organisations, whether they be industry or state based. In Ireland we are fortunate that the forestry community is relatively small and is increasingly more open to new ideas and change.

Practice and policy based on good science will pay dividends in the afforestation programme but a caveat must be entered here: policy should not be completely science-led. There are often large uncertainties associated with scientific estimates; frequently new results overturn the conventional (scientific) wisdom. Science alone should not be the determinant of changes in policy or practice. Wise policy makers and practitioners will take other factors, including the uncertainty of scientific 'facts', into account when making and taking decisions.

La recherche appliquée à l'appui d'une gestion durable des forêts plantées d'Irlande

Exposé de M. Eugene Hendrick

Résumé

Les forêts de la République d'Irlande recouvrent quelque 660 000 hectares, soit près de 9,5 % de la superficie du pays. Les forêts plantées forment de loin l'essentiel (plus de 95 %) de ce couvert. Établies au cours du siècle dernier, elles ont été plantées, dans leur majorité, au cours des cinq dernières années. La foresterie est par conséquent, en Irlande, une activité foncière relativement récente. Ces facteurs, associés au fait que les plantations sont principalement composées d'essences exotiques, présentent, pour ce qui est de la mise en œuvre d'une gestion forestière durable des forêts plantées d'Irlande, à la fois des problèmes et des perspectives. La recherche appliquée a joué – et continue de jouer – un rôle important dans l'introduction d'une gestion forestière durable dans les programmes de boisement.

Un volet clef du programme COFORD (Conseil national de la recherche appliquée à la foresterie) consiste à définir, en matière de recherche appliquée, des domaines prioritaires dans lesquels il serait possible de cibler les dépenses pour répondre aux questions et problèmes qui se posent au secteur forestier. Le programme traite ces priorités au moyen de projets de recherche cofinancés. On dispose, en outre, d'un corpus considérable de connaissances et de compétences provenant de programmes COFORD antérieurs, d'autres programmes de recherche nationaux et de programmes de recherche étrangers. Tous ces programmes sont utilisés pour résoudre les questions et problèmes qui se posent au programme de boisement.

Traduire les résultats de la recherche dans les politiques et dans la pratique: tel est le grand défi que doivent relever tous les instituts de recherche appliquée, qu'ils soient industriels ou étatiques. En Irlande, le secteur forestier, relativement limité, s'ouvre de plus en plus aux nouvelles idées et au changement, ce qui est un avantage.

Les pratiques et politiques fondées sur des données scientifiques probantes seront bénéfiques au programme de boisement, mais un avertissement s'impose ici: la politique ne doit pas être uniquement dictée par la science. Les estimations scientifiques sont source d'importantes incertitudes; souvent, de nouveaux résultats réduisent à néant la sagesse (scientifique) traditionnelle. La science ne doit pas être le seul déterminant de l'évolution des politiques et des pratiques. Les décideurs et praticiens avisés tiendront compte, pour prendre leurs décisions, d'autres facteurs, y compris l'incertitude des «faits» scientifiques.

Роль исследований и разработок в области лесоводства в поддержке устойчивого лесопользования и методов ведения лесного хозяйства в Ирландии

Основной документ, подготовленный г-ном Юджином Хендриком

Резюме

Лесной покров в Ирландской Республике простирается на 660 000 га, или почти 9,5% земной поверхности. Лесопосадки составляют, безусловно, большую часть лесных площадей (более чем 95%). Они начались еще в прошлом столетии, но большинство деревьев было посажено в последние 5 лет. Таким образом, лесоводство является относительно новым видом землепользования в Ирландии. Если к этому прибавить тот факт, что в лесных угодьях сосредоточены в основном экзотические породы деревьев, то можно сказать, что в этой сфере существуют как трудности, так и большие перспективы для устойчивого лесопользования (УЛП) в Ирландии. Исследования в области лесоводства играли и продолжают играть важную роль в осуществлении УЛП в программах облесения.

Главным направлением программы Национального совета по лесным исследованиям и разработкам (COFORD) является определение приоритетных задач в области лесных исследований и разработок, на решение которых можно выделять средства. Программа COFORD решает эти приоритетные задачи через совместно финансируемые научно-исследовательские проекты. В результате осуществления предыдущих программ COFORD и других исследований, финансируемых из национальных источников, а также исследований, проводившихся за рубежом, накоплен значительный объем знаний и технический опыт, которые используются для решения вопросов и проблем, возникающих в процессе осуществления проектов облесения.

Сложная проблема для всех научно-исследовательских организаций, независимо от того, являются ли они отраслевыми или государственными, - отразить результаты исследований в политике и практике. В Ирландии нам повезло в том, что лесоводческое сообщество относительно небольшое и становится все в большей степени открытым для новых идей и веяний.

Практика и политика, основанные на передовых достижениях науки, - залог успеха программы облесения, но при одном условии: политика не должна слепо полагаться на науку. Научным оценкам нередко свойственны неопределенности; зачастую новые данные опровергают устоявшиеся (научные) истины. Наука не должна быть единственным определяющим фактором изменений ни в политике, ни в практике. Мудрый политик будет учитывать и другие факторы – включая неопределенность научных «истин» - в процессе разработки и принятия решений.

INTRODUCTION – SETTING THE SCENE

Any discussion on the role of forest research and development in supporting sustainable forest management in afforestation in Ireland has to take into account a number of key features of Irish forestry.

Forest policy in Ireland is to have farmers afforest agricultural land, at a rate of 20,000 ha per annum, to achieve a forest area of 1.2 million ha, or 17% of the land area by 2030 (Department of Agriculture, Food and Forestry 1996). Government grants and annual (tax-free) premiums are the instruments used to encourage this policy. The overall aim is to reduce surplus agricultural production in the EU, while at the same time supporting rural development through providing a source of income to farmers, and a raw material for rurally-based enterprises. This policy has recently been endorsed in the National Development Plan 2000-2006 (Government of Ireland 2000) and its associated operational programmes.

Farmers have responded to this policy by planting mostly poor-quality land. While it is hard to be definitive, up to two-thirds of the land that is being planted at present has some inherent physical or nutritional limit to economic forestry. These must be remedied through soil preparation, fertiliser application or both. If not the plantation will not give an economic return to the grower. In fact the most productive soils for afforestation in Ireland, surface-water gleys, are heavy-textured with a high water content and must be mounded to allow productive forest growth to take place. Furthermore, the range of tree species that will grow reasonably rapidly on such sites, so that the owner or his immediate descendants will have an income from the crop, is relatively limited, and, in the main, exotic species have been preferred.

A feature of farmer forestry in Ireland is that the majority of the sites that have been planted are relatively small - the average is around 9 ha. Properties are scattered, sometimes with poor public road access. Harvesting and transporting wood from these forests in an economic manner presents many R&D challenges. But even before harvesting can begin there is a need to engage with growers, to ensure that plantations are thinned and managed in a sustainable manner. This is a key role for COFORD and is one of the major challenges facing us in our role of supporting sustainable forest management (SFM) over the next decade.

While afforestation grant-aid from the state and EU is predicated on the basis that it is a commercial undertaking and will result in a return to the grower, an important feature of current national forest policy is the adoption of the SFM paradigm by the Forest Service. The framework for SFM has been developed in the context of the Ministerial Conference on the Protection of Forests in Europe (MCPFE). Resolution L2 of the Lisbon conference sets out Pan-European Criteria, Indicators and

Operational Level Guidelines for Sustainable Forest Management (Ministerial Conference on the Protection of Forests in Europe 1998). These have been given expression in the Irish context by the National Forest Standard (Forest Service 2000) and its accompanying codes and guidelines. The multiple-use role of forests, implicit in SFM, has been given further expression in key government policies in areas such as climate change (Department of Environment and Local Government 1999) and biodiversity (Department of Arts, Heritage, Gaeltacht and the Islands 2002). Most if not all of these policies have arisen as a result of the Rio process (Hendrick *et al.* 2002), are directly linked to SFM and call up a range of issues and problems requiring R&D.

Recent years have also seen the advent of new Forest Service schemes such as the Native Woodland Scheme and the Neighbourhood Scheme. Their primary aims are biodiversity conservation and woodland recreation provision. The Native Woodlands Scheme, in particular poses many R&D challenges in issues such as forest design, gene conservation and combining management for biodiversity and wood production.

In summary we can see that the effective implementation of the afforestation programme in the context of SFM brings forth many R&D issues, not just on silvicultural aspects, important and all as these are, but on many other aspects, particularly those concerned with the environmental and social aspects of afforestation. It is COFORD's role to articulate and structure these R&D issues so that they are addressed in a timely and effective manner. Having done this we must set about addressing the issues – getting answers to problems – and conveying the results to those who need them. How we go about these important tasks I will outline in the sections that follow.

DEVELOPING A NATIONAL FOREST RESEARCH AND DEVELOPMENT PROGRAMME IN THE CONTEXT OF SFM

At the outset it is useful to briefly describe the role of COFORD, because this determines when, and how national forest research and development priorities and programmes in support of SFM are arrived at.

COFORD is a state-sponsored body, charged with the development of national forest R&D policy and priorities, the formulation and implementation of programmes that address the priorities and with transferring the information gained into practice. The council is a representative body of the forestry sector, and is appointed by the Minister of State for Forestry.

Research policy and programmes are developed in a bottom up fashion, involving, in as far as practical, all the stakeholders in the forestry sector. This process is, in itself, an important part of SFM, facilitating as it does consultation and involvement. Stakeholders (including the state) determine and 'own' the national R&D programme; it is their programme, we in the executive are charged with implementing it.

The process of developing the R&D programme involves the setting-up of representative panels covering the four sectors (or production phases) of the forest industry, with a fifth panel that deals with environmental and socio-economic issues. The four industry sectors are:

- Reproductive material (mainly the forest nursery sector)
- Growing
- Harvesting and transport
- Processing (mainly primary processing).

Early on in COFORD's existence we recognised that we would have to set up the panels in this way - the forest cycle covers such a range of activities and skills that a single panel would lack the cohesiveness, focus and shared knowledge that are necessary to creating a workable R&D programme. We initially toyed with the idea of an environmental dimension for each sector, but so many environmental issues cut across the sectors that we felt we could best address these for the forestry

sector as whole. As the same concerns apply to social issues we decided to approach those in the same way.

Typically the panels have from ten to fifteen members and include members of the COFORD council. The process involves first the setting down of an agreed profile of the sector, followed by a SWOT (strengths, weaknesses, opportunities and threats) analysis. Panel members identify the issues and problems facing their sector through SWOT analysis (strengths, weaknesses, opportunities and threats) and general discussion, and then focus on those areas where R&D could help in finding solutions. The COFORD executive facilitates the whole process as well as providing state-of-the-art summaries of information or systems already available and on R&D currently underway, either nationally or abroad. This is critically important, as it avoids repeating work that is already done or is underway.

The issues identified during the process can be very general, such the need to investigate the use of natural regeneration, or highly specific problems, such as how to control a particular nursery pest. This is the nature of such processes. It is as much a reflection of the individuals who comprise the panels as it is of what the most important issues are. Obviously, the skill is to have a broad representation on the panels that will reflect both overarching problems and valid concerns regarding specific one-off issues. And while general problems and concerns are useful in setting the scene and structuring R&D programmes it is often necessary to dig deeper to disaggregate what the key information or process gaps are. In some cases, the concerns can be partly satisfied with information that is already available and partly by funding research projects. It is certainly useful to challenge broad problem assertions and see if they can be broken down into key knowledge gasps. This process is a significant help when research calls are being formulated, as it helps us to focus on key knowledge gasps.

Where cross-cutting issues arise, for example, between the harvesting and processing sectors, we organise joint meetings to address them.

When the panels have completed their work, the sectoral profile, issues and problems, existing research and R&D needs are brought together in a draft research programme for the sector. Typically this will go through one or two drafts before final agreement is achieved.

As well as the sector groups, the public at large, and other interest groups, are canvassed in the public media for their views.

Once the consultation process is complete, the draft programme is presented to the COFORD council for discussion and approval. At final approval stage it is presented to the Minister.

How the programme is finally formulated and presented rests with government. Under the present arrangements forest R&D is funded under an overall programme called the Productive Sector Operational Programme (Department of Enterprise, Trade and Employment 2000). This brings together a large number of sector specific and generic R&D programmes at the national level. In the programme the main objectives for the forestry sector are set out as:

- improving the share of home-grown wood products in the home and export markets and developing innovative wood products and conversion technologies in line with market requirements and quality systems;
- improving the cost competitiveness and underpinning the economic and environmental sustainability of the forest industry through the investigation of silvicultural techniques, wood harvesting and transport systems, forest health and vitality, and environmental interactions of forests and forest operations;
- determining the impacts of the afforestation programme on rural development, community stability and the national economy;
- investigating and developing forest products that have a local use and application;

- developing silvicultural systems, harvesting techniques and information & communications technology appropriate to farm forestry, to foster rural development and environmental compliance;
- investigating and developing the genetic resource of indigenous and exotic tree species to ensure that forest plantations are diverse ecosystems;
- developing cost-effective plant production and handling techniques in line with best environmental practice.

These objectives and the issues highlighted elsewhere in the programme are further elaborated in the Costed, Phased and Prioritised Programme for Forest R&D, developed by COFORD in the run-up to the current national forest R&D programme (COFORD 1998), following the practice and procedures outlined previously. Many of the objectives of the programme address economic, environmental and social aspects of SFM as raised during the consultation process.

IMPLEMENTING THE NATIONAL FOREST R&D PROGRAMME - TAKING SFM INTO ACCOUNT

Rolling out a national forest R&D programme takes a great deal of forethought, planning and organisation. Having gone through a consultative and information-gathering process beforehand in developing the programme is, as pointed out, a tremendous asset, in fact it is, in my view, a prerequisite to a well-structured, effective R&D programme. It is particularly useful when it comes to the detailed scoping of calls, and in providing the necessary guidance and background to proposers about what the research issues are.

The research programme is divided into strategic and applied research. While ready distinctions such as these often break down in practice, and it is often said that there are only two types of research: bad and good, in our case the distinction is pretty clear. Strategic research flows from the R&D programme developed by the panels, and is about tackling medium to long-term problems and issues facing the sector, which are generally not specific to any one company or NGO. Such issues include, for example, carbon sequestration in forests, timber grading and the economic impacts of the afforestation programme at a national level. Many are SFM related.

When we were considering how best to structure the current programme it quickly became apparent that some of the issues that had been identified were not specific to the forestry sector alone. This was particularly true in environmental areas, such as water quality and biodiversity, areas which are very closely related to afforestation policies and operations, and indeed to SFM. We therefore approached the Environmental Protection Agency (EPA), which also commissions national research, and with whom we work closely in developing funding and evaluation procedures, with a view to developing a joint programme to address the two issues identified. Cooperation was readily forthcoming and together we developed a jointly-funded R&D programme. This greatly enhanced the ability of both organisations to address forestry-related biodiversity and water quality issues in depth. In fact these were the first two areas we addressed in the current programme. I will return briefly to these topics later on and give some indication of progress that we are making in them.

We have since followed up on the first call with two further calls for proposals that have covered the following broad areas:

- forest genetics and tree breeding
- carbon sequestration
- forest health and vitality
- silviculture
- non-wood forest products
- renewable energy and biomass
- socio-economic aspects of forestry

In each case the call was supported by scoping documents that outlined in detail what was required.

As well as rolling out a strategic research programme as outlined, we decided to leave the door open for companies and organisations to suggest R&D projects of their own in three broad areas under an applied R&D programme:

- mechanisation (silviculture and harvesting)
- communications and information technology
- product and process development

The main difference between the programmes is that in the applied we have not scoped out in detail the areas that the proposals should address. Furthermore proposals can be submitted at any time during the programme. The main target group for the applied programme are companies and sectoral organisations who have specific problems or ideas that they want to address through R&D. Funding rates differ between the two programmes with the higher rates applying to the strategic programme.

We also fund desk-studies, short one-off projects that address specific issues of interest and concern to the council. Typically they last from six months to one year (compared to three to five years for strategic research projects) and involve mainly literature searches and/or surveys. We have found them to be highly effective and good value for money.

SUPPORTING SFM IN AFFORESTATION POLICIES – THE NEED TO BUILD NATIONAL EXPERTISE – POLICY ADVICE

Not only are we concerned with tackling the issues that have been identified during the programme formulation phase (including those with direct implications for SFM) but we have to take cognisance of the fact that other issues may arise, often with implications for SFM, often without warning, and often requiring answers within months rather than years.

Our experience is that policy-makers and industry often don't foresee problems that may arise and, when they do, they cannot always wait under project completion for advice. We try to anticipate these issues as far as possible during the formulation stage of the national R&D programme. In fact we go to a great deal of trouble to anticipate issues during brainstorming sessions and the SWOT analyses referred to previously. But despite the best efforts of all concerned unforeseen issues will arise, and we must be able to respond effectively to such issues and events. Hence it is important to build national R&D competence and overall expertise, in the third level, in national research organisations and, to a certain extent in COFORD itself. It is also important to maintain a flexible approach where answers are needed, while at the same time exercising judgement about the importance of the issue. In my view flexibility to respond is vital to supporting SFM - providing the best available advice when and where it is needed. It is an important feature of the role of COFORD. While COFORD is mainly a research specification body we do have in-house expertise in a number of areas. The staff who run the programme are scientists or professional foresters, hence we can respond to some one-off problems ourselves through literature searches or through consultation with a small number of independent experts we retain for one-off and routine enquiries. We also of course consult with project leaders and scientists working on COFORD-funded projects. Naturally the answers and advice we give in these situations are often preliminary and may require more in-depth analysis and study to arrive at more robust answers.

It is also important to exercise judgement in the provision of scientific advice to policy-makers, without compromise to scientific conclusions. The process of involving scientists in policy-making by providing advice is not new in Ireland but the advent of SFM has made it more extensive. Some of the processes, such as biodiversity conservation, are in themselves science-led, and scientific advice is key to their successful implementation. However policy makers are often uncomfortable with the notion of uncertainty, a key part of science, and they are often puzzled and bemused by scientific debate and argument. The notion that scientists can flatly contradict each other can be hard to take for those seeking simple solutions, where there may be none.

Policy is best formulated taking into account all relevant scientific information, including uncertainty. A policy-making framework, that takes these considerations into account (see Bradshaw and Borchers 2000), will be the best support for SFM. Furthermore, once the principle that all scientific knowledge is uncertain, that it is based on the latest best-guess, of itself frees-up policy making.

TECHNOLOGY TRANSFER- GETTING THE RESULTS INTO PRACTICE

A key factor in ensuring that R&D supports SFM policies and practices at the national level is getting the results from research to the policy maker, grower, forester, contractor or processor in a way that they can readily understand and implement.

As far as policy makers go we have frequent meetings with the Forest Service at which we regularly suggest and are asked to comment on proposed changes in policy, in areas such as environmental guidelines, silvicultural practices and guidelines (taking uncertainty into account!).

We have an active dissemination programme of R&D information to the forestry sector through our COFORD Connects series, and through a monthly email newsletter. We also publish reports and have a wood specifiers guide based on R&D findings. Currently we are developing decision support systems in areas such as species selection and for the sustainable management of private woodlands (PractiSFM) - based mainly on local inventory.

Our two programmes referred to earlier, on biodiversity – BIOFOREST - and on water quality (P-enrich and WATERAC) and are well underway and are already yielding useful information.

CONCLUSION

Forest R&D plays a key role to play in supporting SFM in Ireland. Setting the priorities for R&D must continue to be a bottom-up process, involving all stakeholders. This in itself is SFM at work.

Research programmes and structures should retain flexibility to meet the needs of stakeholders and policy-makers. At the same time policy-makers should be aware that good research takes time, and conclusions that may not be palatable have to be taken into account and reported. When scientific information of this kind becomes available it is the duty of the scientist to report it, and in the long-run it will lead to improved practices and help to underpin SFM.

A good yardstick to judge the effectiveness of R&D is how well it impacts on the achievement of SFM. Transferring results into policy and practice is really what it is all about. Public money that supports SFM through providing the best information available is a good investment, and will show a positive rate of return. Research programmes need continuity of funding; a start-stop approach is a bad investment for the state and the taxpayer.

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COILLTE PRACTICING SFM IN A COMMERCIAL ENVIRONMENT

Mr. Tim Crowley, Coillte - the Irish Forestry Board, Ireland

SUMMARY

Coillte is Irish private limited company that operates in forestry and related activities on a commercial basis. The company was established under the Forestry Act of 1988 and is owned by the Minister for Finance and Minister for Forestry. Coillte owns and manages over 430,000 ha of plantation forests and establishes over 10,000 ha of forests annually.

Today, a greater awareness and appreciation of the environment and increasing prosperity and urbanisation are changing Irish society's expectations from forests. A more multi-purpose approach to forest management is being sought that will deliver both timber and non-timber benefits. Coillte has responded to this need through the adoption of Sustainable Forest Management (SFM) as the principle by which it will manage its forests in the future.

The practice of SFM and its subsequent verification through the Forest Certification process have resulted in major shifts in Coillte's policies and practices. Environmental and social aspects of the company's business have been strengthened, and this, over time, will change the nature of the forest resource. New policies include: designating 15% of the forest estate for nature conservation; commitments to chemical reduction and the use of bio-oils; consultations with stakeholders on management plans; and a move towards more species diversity in both afforestation and restock sites. New practices include: planning at a more local level; more intensive monitoring of the impacts of forest operations; greater emphasis on forest design in sensitive landscapes; the protection of small biodiversity features; and the provision of deadwood habitats.

SFM and Certification has provided a framework by which the company has been able to engage with stakeholders in a structured fashion. The FSC Irish Forestry Standard provides a balanced approach to sustainably managing forests, and compliance with the Standard, verified by independent auditing, has provided a new assurance to the public that the company's forests are being responsibly managed to international standards.

Coillte's achievement of Certification has been widely acknowledged by stakeholders but some campaigning environmental NGOs remain sceptical and regard the Standard as being inadequate.

Despite the considerable effort and cost to Coillte, the benefits of Certification outweigh the negative aspects.

OVERVIEW OF COILLTE

Coillte is a Private Limited Company, which operates in forestry and related activities on a commercial basis. The company is owned by the Minister for Finance and the Minister for Communications, Marine and Natural Resources. Coillte was established under the Forestry Act of 1988 which set out its objectives and duties. Most of the land and staff of the then Forest Service were transferred to Coillte on Vesting Day.

The principal objectives and duties set out in the Forestry Act of 1988 are;

PRINCIPAL OBJECTIVES

To operate on a commercial basis and in accordance with efficient silvicultural practices.

To manage the resources available in a manner consistent with the company objectives.

To establish woodland industries with others in forestry to enhance the profitable operation of the company.

DUTIES INCLUDE

To have due regard to the environmental and amenity consequences of its operations.

The management structure in Coillte is through a Board of Directors appointed by the Minister for Communications, Marine and Natural Resources; a Chief Executive; and three internal Management Boards.

Coillte is primarily a forest company but it also operates in a range of businesses related to the company's forest asset or skill base;

COILLTE FORESTS is the core forestry business, which plans and manages the forest resource – regeneration planning, forest maintenance, forest security, timber sales, timber harvesting.

COILLTE ENTERPRISES COMPRISES THE FOLLOWING BUSINESSES

- Forest Nurseries
- Forestry Services
- Property Sales, Leasing and Development
- Civil Engineering and Environmental Services
- Landscaping
- Christmas Tree Farms
- Wood Products
- Tree Care Services
- Training and Safety Services

COILLTE SUBSIDIARY AND ASSOCIATED COMPANIES

- Smartply Europe Limited
- Coillte Consult Limited
- Irish Forestry Unit Trust

Smartply is 100% owned subsidiary that manufactures oriented strandboard and processes up to 500k m³ annually.

Irish Forestry Unit Trust was established by Coillte, AIB Investment Managers and Irish Life Investment Managers to enable pension funds to invest in forestry.

Coillte Group employs 1,139 in total; 969 in Coillte and 170 in Smartply Europe.

Coillte Estate comprises of 441,000 hectares of forest land, of which 381,000 ha is planted.

TIMBER PRODUCTION

- Coillte's annual harvest c.2.9 million m³ in 2002.
- Total sawlog demand 2.0 million.
- Total pulpwood demand 0.9 million.
- Sawlog sales have increased significantly over the last 3 years. Coillte harvests approximately 50% of total roundwood sales.
- Mostly pulpwood for Smartply and Weyerhaeuser, and lower quality sawlog associated with this pulpwood. The more valuable sawlog is sold standing.

LAND PROCUREMENT

The acquisition of land has reduced from almost 4,000 ha in 1996 to less than 100 ha in 2002 as Coillte cannot compete with competitors who are eligible for grants and premium.

LAND PROCUREMENT (ha)

Coillte is now concentrating on the Farm Partnership where popularity continues to increase. Coillte now has 475 partners who have planted in total 9,220 ha with Coillte.

PLANTING (ha)

10,000 ha per annum.

Restocking has become the biggest component of Coillte annual planting programme.

PREPARATION FOR SFM

In January 1998, the Board of Coillte took a policy decision that Sustainable Forest Management would be the principle by which the company would manage its forests and operations in the future.

Board decision to adopt SFM - 1998

Task Force to co-ordinate activities

Awareness seminars held throughout Coillte and with stakeholders

Consultancy on C&I

Following consultation on the framework document for SFM, we realised that our objectives and targets for timber were well defined but that they needed to be defined for other aspects of our business.

Dedicated work groups called Practice Groups covering 13 issues were established for this purpose. They reviewed current practice, and they determined future requirements in the light of SFM in these areas.

Practice Groups were established on:

Landscape, Chemicals, Biodiversity, CCF, Stakeholder consultation, Soils and Water, Infrastructure, Non-wood Products, Socio-economic issues, Species and Reproductive material, Recreation, Training, Internal Communications.

Similarly, Standard Operating Procedures are they key to the Operations component. SOPs are a set of procedures which set out a standard together with control procedures and documentation to meet the Standard. The SOP incorporated and operationalise all of the Forest Service guidelines, Code of Best Forest Practice, etc within its Standard.

Strategic planning carried out at corporate levels was at too broad a scale to deliver the benefits of SFM.

Development of Standard Operating Procedures (SOPs).

Move to more local planning: planning was based on 6 Regions, each having its own Business Plan which cumulated to the Corporate Plan for Coillte Forests. This was changed to more locally-based plans called Forest Management Unit plans.

CERTIFICATION

In 1999, Coillte decided to seek independent verification that it was managing its forests sustainably. The decision was motivated primarily by the need to re-assure our customers that the products they buy come from sustainably managed forests. Secondly, Coillte wished to show its other stakeholders that it manages its forests well. These stakeholders include contractors who rely on the forests for employment, visitors who use the forest for recreation and communities who want to ensure that other vital environmental values such as water quality, landscapes and wildlife habitats are protected and enhanced.

Coillte applied to the Forest Stewardship Council in 1999 for Certification. In June 2000, International Forest Auditors, SGS Qualifor, audited Coillte's operations for compliance with the Draft FSC Forest Standard for the Republic of Ireland and with Qualifor Standard. In all, Coillte was assessed against 81 measures.

The Auditors observed that while Coillte's operations complied with the requirements of the Standards in most respects, 19 Corrective Actions needed to be implemented.

Coillte developed plans to address these Corrective Actions.

Was re-audited in Spring of 2001, which was reviewed by a peer group and received Certification in May 2001.

CERTIFICATION PROCESS

Application and proposal	Nov '99
Pre-assessment	Dec '99
Main Audit	June '00
Report and Peer review	April to May '01
Certification	May '01
Surveillance	Nov '01
Surveillance	May '02

AUDIT OF COILLTE FORESTS

The Audit process is a very vigorous process

All Regions visited

Review of management planning documentation

Site visits to observe operational practice and compliance with SOPs, guidelines etc

Interviews with management staff, supervisors, forest workers and contractors

CHANGES MADE TO COMPLY WITH THE STANDARD

Consultation

Restructuring

Impact Assessment

Biodiversity:

- 15% of Estate for Nature Conservation
- Protection of valuable habitats
- Deadwood habitats
- Semi-natural woodlands

Deer Management

CHANGES MADE TO COMPLY WITH THE STANDARD

Chemical reduction strategies and use of Bio-oil

Planning:

- Strategic plans for FMUs
- Monitoring systems

Species proportions

Continuous cover forestry

MEETING THE STANDARD

Forest Planning

Forest Design

Chemical Reduction

Species

FOREST PLANNING

The essence of Sustainable Forest Management planning is that it seeks to balance the achievement of economic, social and environmental objectives today and into the future. Coillte carried out its strategic and operational planning at National and Regional level. In 2000, a new level of planning called Forest Management Unit planning or FMU planning was introduced.

The purpose of FMU planning is to develop plans on a scale which stakeholders, ie – local authorities, communities and others, can relate to and offer their input.

Coillte Forests were divided into 36 FMU plans based on geographical areas which would have a similar Forest Management objective. They ranged in size from 3,000 ha to 33,000 ha.

For each of the FMU, Coillte prepared a 5-Year Plan. These plans describe the forest resource in the FMU, sets out a long-term vision of how these forests will be managed and set 5-year management objectives designed to achieve progress towards the long-term vision.

The plan addresses a wide range of economic, social and environmental issues and include details of how the forest will be restructured, how the mix of tree species will change over time, how nature will be conserved and what recreational facilities will be provided among other issues.

The draft plans are widely consulted on to facilitate local input before they are finalised.

FOREST DESIGN

Previous forestry policies favoured large scale planting of conifers on marginal agricultural land. In some instances, these plantations occupied highly visible positions. This sometimes resulted in a highly visible, large even-aged plantation that blended poorly with the surrounding landscape.

Coillte engaged the expertise of a leading international Forest Design Consultant to help in devise a Standard Objective Procedure for delineating these units and classifying them according to their environmental sensitivity.

MEETING THE STANDARD – FOREST DESIGN

All forest blocks allocated to landscape units and landscape sensitivity assessed.

Design plans developed appropriate to the landscape sensitivity class.

Plantations and felling coupes to follow landforms.

As uniform forest blocks >60 ha mature they are being restructured to create more diversity in age class and species composition.

SPECIES

Detailed species diversification plans were developed for each of the 36 Forest Management Units. These plans demonstrate how the current species' composition of the forest will be changed over time to a more diverse range of species in line with the Standard. Like restructuring, changing species composition will take time and will be achieved as forests are harvested, restructured and replanted in the future.

MEETING THE STANDARD – SPECIES

Species proportions addressed at FMU level.

Moving towards the species requirements of the Standard – gradual process.

Limited opportunities for broadleaves on existing estate due to land quality .

Better opportunities on Farm Partnership sites – minimum of 15% being planted. Higher % depends on the farmer’s wishes.

MEETING THE STANDARD – SPECIES

Current species in FMU (%)	Required to meet the Standard (%)	Min. Changes needed for FMU (%)
Primary species (Sitka spruce) 73%	Less than 65%	Decrease by at least 8%
Diverse species 26%	More than 20%	Decrease by at most 6%
Broadleaves 1%	More than 10%	Increase by at least 9%
Open space/Biodiversity 0%	More than 5%	Increase by at least 5%

THE IMPACT OF SFM ON COILLTE – NEGATIVE

Generates lots of paper!

Initially expensive to implement

Extra costs on grower not recouped from customers

Can interrupt timber supplies

Frequent audits disrupt the organisation

Many single issue complaints

Issues brought to SGS and/or FSC rather than Coillte

IMPACT OF SFM ON COILLTE – POSITIVE

Imposes discipline of compliance

Clarifies policies and practices

Framework to engage stakeholders

Provides the means for CI

Focus on training – re-training of staff and contractors

Widens the scope of forestry

Encourages integrated planning

Allows customers access to markets

More responsible image

In conclusion, we have found that the positive benefits far outweigh the negative impacts, and will continue to over time.

There are some issues yet to be resolved such as: the FSC Standard still in draft stage; the National Standard is not an auditing scheme; no shared vision for Forestry in Ireland – between Industry, NGOs, Heritage Council, Forest Service, Academia etc.

SOLUTION

Bring the FSC Draft Standard and the National Standard together into one '**Standard**', agreed by all.

AFFORESTATION IN EUROPE: THE NEED FOR BETTER COMMUNICATION AND NEW PARTNERS

**Mr. Josef Herkendell, Ministry of the Environment and Conservation, Agriculture and
Consumer Protection of the State of North Rhine-Westphalia, Germany**

SUMMARY

Successful afforestation is not only based on well prepared and technically improved methods and experiences in the field but also needs to be accompanied by a broad and sustainable consensus in society on the basis of an open communication process which includes all major interest involved. This open communication processes need to be based on convincing PR activities as well as supported by integrated concepts of education in society.

It is obvious that afforestation measures are based on long-term consideration. Important factors, which should be more intensively investigated in this context to increase acceptance in our changing societies, are:

- urbanization, increasing alienation from nature and forests,
- the ignored “ Slaughterhouse paradox” and
- the silent erosion of expert knowledge in the field of Forestry Science.

A draft text for further discussion on best practice principle for communication of afforestation is proposed.

The loss of economic importance of the forestry sector in most of our national economies has led to a new discussion on how to find new statigic partners for afforestation in society. First idea on new partner is propsoed for further discussion.

Le boisement en Europe: la nécessité d’une meilleure communication et de nouveaux partenaires

Exposé de M. Josef Herkendell

Résumé

L’importance, pour le développement des sociétés et, en particulier, des zones rurales, du rôle multifonctionnel des forêts et de leur gestion durable tenant compte de leurs fonctions et propriétés sociales, économiques et écologiques est admise par la quasi-totalité des pays et institutions d’Europe. Or le boisement joue un rôle très important dans la gestion durable des forêts d’Europe.

Pour réussir, ce boisement doit non seulement mettre en œuvre, sur le terrain, des méthodes et des expériences bien conçues et techniquement à jour, mais aussi s’accompagner d’un processus de communication vaste et approfondi associant les principales parties prenantes. De surcroît, ces nouveaux processus de communication doivent s’appuyer sur des activités de relations publiques convaincantes et sur des concepts intégrés d’éducation de la société. Enfin, ils doivent s’ouvrir à toutes les composantes de ce qu’on appelle la société civile.

Le boisement se fonde, évidemment, sur des considérations à long terme; il doit par conséquent être largement et durablement accepté par la société. L’un des facteurs qui contribuent à son succès a trait

aux changements qui se produisent actuellement au sein de la société, en particulier à l'urbanisation et au fait qu'un nombre croissant d'Européens sont privés de nature et de forêts.

L'ensemble du secteur forestier européen est influencé par les changements structurels en cours.

La décroissance constante du rôle joué par la foresterie dans nos économies suscite actuellement un débat sur les buts, l'utilité et les avantages du boisement. Cette situation est, de toute évidence, liée à l'évolution de la société et de l'économie et ne peut pas, par conséquent, être influencée par le secteur de la foresterie lui-même. Il faut, avec l'aide de nouveaux partenaires, lancer et intégrer dans l'ensemble de ce processus de nouvelles idées créatives, que ce soit dans nos sociétés, dans l'industrie, dans l'administration ou parmi les organisations non gouvernementales.

**Облесение в Европе: необходимость улучшения системы передачи информации
и расширения партнерства**

Основной докладчик: г-н Жозеф Херкенделл

Краткое изложение

Важность многофункциональной роли лесов и устойчивого лесопользования с учетом их социальных, экономических и экологических функций и свойств для развития стран, и особенно сельских районов, в целом признается всеми европейскими государствами и институтами. В этом контексте меры по облесению играют особенно большую роль для устойчивого лесопользования в Европе.

Меры по успешному облесению должны основываться не только на хорошо подготовленных и технически совершенных методах и накопленном в этой области опыте, но и должны сопровождаться широким и тщательно продуманным процессом обмена информацией по главным проблемам. Кроме того, процесс обмена информацией должен подкрепляться развернутой пропагандистской кампанией и предусматривать проведение комплексной разъяснительной работы среди населения. И наконец, этот процесс обмена информацией должен быть доступен для всех сторон так называемого гражданского общества.

Само собой разумеется, что меры по облесению рассчитаны на длительный период и поэтому им требуется глубокое и долгосрочное признание в обществе. Одной из причин, способствующих успешному облесению, является влияние происходящих в обществе изменений, особенно урбанизация и отчуждение все возрастающего числа людей в Европе от природы и лесов.

Весь лесной сектор Европы находится под влиянием происходящих структурных изменений.

Постоянное снижение экономической важности лесного сектора в экономике наших стран вызвало оживленные дискуссии в обществе относительно целей облесения и лежащих в его основе ценностей и преимуществ. Очевидно, что сложившаяся ситуация возникла под влиянием изменений в обществе и в экономике, а не в результате действий лесного сектора. Нам нужны новые творческие идеи, которые мы могли бы воплотить в жизнь в рамках единого процесса вместе с новыми партнерами в наших обществах, промышленности, административных органах и НПО.

I. INTRODUCTION

The forestry sector worldwide is confronted with challenges in fast changing societies and in a more and more globalized world. The quality of products, services demanded by economies and societies are increasing. Forests are expected to contribute to environmental protection and to preserving biodiversity as well as to leisure activities and tourism. At the same time the demand for certain timber and other forest products is rising. The public wants to have a say in where and how forests are managed.

Afforestation measures in the frame of sustainable forest management (SFM) are widely recognized in Europe on a political level. According to Resolution H1 of the Ministerial Conference on Protection of Forests in Europe SFM entails the stewardship and the use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local national and global levels, and does not cause damage to other ecosystems.

In the introduction of the second announcement for this meeting it was stressed: “SFM is an international initiative and is adapted to different areas of the globe according to the regional context. Despite this diversity in implementation, core criteria remain common throughout, and these relate to the forest resource, forest health and vitality, productive capacity, biodiversity, soil and water, and socio-economic issues. Although applicable to all stages of the forest cycle, these criteria are perhaps of greatest importance at the time of afforestation stage involving the development of new forests on open land. Proper practices at this stage lay a solid foundation for the full implementation of SFM throughout the forest’s lifetime and beyond.”

This seems to be a good basis for further discussion.

Afforestation is first of all matter of national policies. The consequences of the competition in landuse (forest against agriculture, settlements and / or infrastructure) on one hand and the uncertain development of supply on the wood and timber market in Europe on the other hand have an important impact on national decisions in this context. In addition the enlargement of the European Union in Eastern Europe will speed up the principle discussion about the benefits, yields and targets of afforestation in Western Europe. These developments are not covered by this contribution. Therefore this paper focus on improvements of communication of afforestation measures in Europe.

Public ownership that is in charge of implementing afforestation measures has to face a wide range of new tasks and challenges. The planning and implementation of afforestation measures will be carefully observed on national level by private ownership, NGOs, European Commission as well as by other countries which are also planning the afforestation measures and finally on international level by a huge number of developing countries. We should be aware that developing countries are looking very carefully - apart from the various technical and financial aspects of afforestation – how we communicate the whole process in our societies. The new information technology will spread the different phases of planning and implementation worldwide and bring the public into national and sub national afforestation processes within minutes. Public ownership will get a new role and a new responsibility for successful afforestation measures and it’s broad impact on national and international level. The growing public interest on the destiny of forests worldwide is mainly due to the environmental properties and functions and will raise new attention to afforestation measures. In the past afforestation measures have been matter of national policies even when the scale was extraordinary like in China for example. The “big green wall” in China is the largest afforestation measure worldwide. Roughly 6000 km long, some hundreds of km wide and in parts already visible by satellite images. The main objective is to protect agricultural land from desertification. Only the experts are aware of this ongoing process. Occasionally the media in Europe report about this item but the general interest of the public is very limited.

Successful afforestation measures in Europe will attract more attention even when the dimension is smaller. Europe might get a kind a “beacon function” for successful afforestation. The beacon should

send out positive signals to spread this idea. In economic terms: the forestry sector should create a product that is widely accepted and attractive for future markets.

At present we are not able to precisely predict what role afforestation measures might play in the context of the implementation of the Kyoto Protocol. Regardless which additional benefits might resolve out of this international development afforestation measures should be carried in first instance by a broad and sustainable consensus in our societies.

Therefore the forestry sector needs acceptance in our societies, which are now changing faster than ever before. It is not enough to stress we are following the principles of SFM and doing something good for the next generations, the environment, the industry and for the whole of our societies. Although our products and services are good, the mass of the members in our society is not aware what SFM means especially in the context of afforestation. We have to bring SFM and afforestation with its consequences back to the people, which are far away from our way of thinking and from our experiences. This growing lack of understanding broadens the distance between the forestry sector, as the implementing sector for afforestation, and the rest of society. This seems to be an unspoken but obvious fact.

As a forester looking from the outside but following the development in around the forestry sector including afforestation in Europe for years I would like to

- point out several observations on aspects which contribute to broader acceptance in society,
- propose to look more intensively at the best practise principle for communication of afforestation by public ownership (Proposal for further discussuion)
- propose first hints for new partners (Proposal for further discussion)

to increase acceptance in society by more transparent ways of communicating the whole process.

II. ASPECTS WHICH COULD CONTRIBUTE TO BROADER ACCEPTANCE OF AFFORESTATION IN SOCIETY

1st Observation: The ignored “Slaughterhouse Paradox”¹

Prof. Suda , Chair for forest policy at Munich Technical University, recently published an article on our spontaneous feelings and reactions on keywords like forests, forestry and wood / timber. The results of his investigations give hints for a better u8nderstanding of the underlying problems of acceptance in society for forestry activities. The conclusions and interpretations of the results should be seen under the normal range of uncertainties and specially under German cultural background conditions. Nevertheless the results show the need to have a more in-depth look at the underlying reasons to better understand the problem we are confronted with. These results might be of interest for other countries, too.

The” slaughterhouse paradox” stands for a phenomenon which can be briefly described as follows: The spontaneous reaction on the presentation of the following two images was asked by interviews and gave a clear positive reaction:

- A cow is standing on the meadow, and
- A good steak is lying on a plate.

One necessary step is missing in the meat production chain: the slaughterhouse.

This slaughterhouse has a clear negative image and will be excluded by the mass of the people when they are thinking about cows and steaks. This phenomenon is applicable for the forestry sector, too.

¹ Based on major results of a publication by Suda, M. et. al., 2000: “Unser Verhältnis zum Wald im ausgehenden 20. Jahrhundert“, Prof. Suda is chair of forest policy and forest history at Munich Technical Universityh.

One third of the people asked do not know what forestry means or have somehow a negative feeling about forestry. The interpretation of the underlying reasons for this kind of spontaneous reaction seems to be very complex. But interestingly the term forest and its products wood and timber, which have been presented parallel to the requested groups showed a clear positive association. The image of “forest” seems to be heavily influenced by individual subjective feelings on forests and trees and personal feelings. They seem to have a deep rooted cultural background. Interestingly Swiss and Dutch young people have been asked parallel the same questions. They came to same spontaneous reaction of feelings on forests.

One further result I would like to stress in this context: The terms forestry and sustainable development became more publicly known in the last decade due to the results and follow up activities of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro 1992. The follow up development has influenced the general anticipation of forestry and sustainable development in a positive way. The awareness and consciousness on sustainable development generally increased. Taken this positive move of understanding into account the question was raised: Does the forestry sector follow the rules of sustainable development? The result is not positive for the forestry sector: There is a high percentage of people which are not convinced that forests are managed in a sustainable way.

Without overrating the results several conclusions can be taken out of these interesting investigations:

- a) Forestry seems to have a underlying problem of acceptance in some of our societies which should be analysed with a broader and deeper social science approach. This should to be done on the basis of given differences in cultural backgrounds in Europe to find the appropriate ways out of the underlying crisis of acceptance of forestry measures.
- b) The Forestry sector should therefore make more use of the positive image and role of their products, esp. wood and timber in the public. The personal subjective feelings on forests and trees seems to be part of our different cultural developments. The products wood and timber and subjective feelings should be brought together and integrated in one communication concept. The target should be to communicate a sound and clear performance of the wood production chain from planting to harvesting on the basis of SFM.
- c) The forestry sector should stress more or advertise more for his unique quality of SFM.

All these measures need open and intensive communication and will at the end lead to more acceptance in society.

2nd Observation: Increasing Alienation from Nature and Forests

Europe is a continent where urbanized areas are slowly but constantly growing and extending. 2/3 of the population in Europe is living in and around urbanized areas. A lot of information is available on the development of urbanized areas in terms of environmental quality, urban patterns like demographic structure, land use, mobility, life stile etc.. Very little is known on the relationship between the expectations of the population in urbanized areas and afforestation measures and SFM in remote areas. The mass of people which are living in urbanized areas are not aware what afforestation and SFM means. Older people - even those that have grown up in cities – have somehow a personal contact to nature and the forest. These generations have a kind of feeling or imagination of forests. But this kind of basic knowledge and experience is declining. In the last decades and driven by the fast changes of life stile in urbanized areas a growing lack of direct experience with nature and forests can be observed. The children are working and playing with computers and watching TV. The world of the younger generation is heavily dominated by virtual site conditions and backgrounds. This development has to be observed carefully to avoid that forests and nature are becoming a virtual culisse for children. We should organize practical experience in forests and nature for the younger generations as part of education. This is a challenge and needs broad support. Maybe it could be an alternative to found a foundation that is in charge of tackling this new education challenge in society. We should be aware that real experience is needed to understand and finally support SFM and afforestation measures.

Looking at figures, esp. distribution of forests, infrastructure, distribution of the population in Europe there is a need to look more intensively into the relationship between the expectation and needs of urbanized population on one hand and changes in land use on the country side on the other hand. Less and less space is needed to supply urban areas with resources. This is valid for agricultural products. So afforestation will stay on the political agenda in Europe.

We should use this development more intensively for communication with the urbanized world. We have to bring back forests to the mass of the people and tell them about the mutual benefits that resolve out of SFM and afforestation.

We have to be aware that decisions on our plannings and activities will be made in urban areas. Most likely with urban views and expectations. It should be in our own interest to inform more intensively and continuously about SFM and afforestation to find new urban partners.

Recommendations:

There seems to be a demand for

- checking the needs and expectations of the urbanized population on afforestation and SFM
- an improved mutual communication between urbanized and remote areas
- providing more information to the younger generation in urbanized areas to bring back practical experience with nature and forests.

3rd Observation: Keeping the Forestry Science Infrastructure vital

Looking into the scientific forestry infrastructure in Europe the following observation can be made: Due to the ongoing loss of economic importance of the forestry sector as a whole in our national economies the financial support of the forestry academic infrastructure and in neighbouring disciplines is slowly but continuously eroding. Although no precise data are available on this development in Europe the remaining capacities and structures will be forced to work together more intensively. Networking, exchange of experience especially on the item of afforestation and SFM will be one solution to keep the knowledge and the capacities in the field of forestry accessible and active. Afforestation measures need to be accompanied by a good and sound forestry science background and by a team of neighbouring disciplines involved.

New scientific directions like Global Change Science provide us with additional information on limits and risks of SFM and afforestation:

The core of Global Change Science in the anthroposphere is:

- population growth and migration
- ongoing urbanization
- threats to health
- threats to food security
- widening disparities in development world wide
- spreading of non-sustainable lifestyles
- growing alienation from nature and forests

and in the biosphere are:

- climate change
- loss of bio-diversity
- soil degradation
- scarcity and pollution of freshwater resources

- pollution of world's oceans
- human-induced natural disasters (inter alia flooding and storms)
- loss of forests

From the forestry science point of view new bridges are needed to prepare successful afforestation measures. Afforestation measures should be carefully checked under the known development and risks of global change and esp. on the impact of climate change. The increased risk of heavy storms can influence species and species composition in the field. The same is true for areas with a high risk of flooding. On the other hand afforestation can positively influence the concentration of carbon dioxide in the atmosphere and actively contribute or stop the loss of bio-diversity and soil degradation.

Recommendation:

- All the risks of the impact of climate change should be checked in an interdisciplinary approach and co-operation to found a solid basis for a best state of the art afforestation measure
- A vital forest science infrastructure is needed to provide the requested information and to keep the experience and knowledge accessible and useable for the future
- A more intensive networking and information exchange is essential.

4th Observation: Further Improvement of Communication is Indicated

There seems to be a general problem of communication between the forestry sector and rest of society. Afforestation measures in the frame of SFM are the most visible change in land use and will lead to an intensive communication in society and in addition they are complex matters which are not understood by the mass of the people. Although a lot of efforts have been made at national level to improve communication we are aware that items like SFM and afforestation do not attract attention in the public. A general interest in society and consciousness for the problem seems not to be existing. Causes for this lack of interest have to be seen in the dominance of economic and other social problems in our fast changing societies. We are confronted with the fact that SFM management is only understood by a minority in our society. So we should use the historical challenge of afforestation to start with a sound and cultural adopted concept to communicate both, the basic principles of SFM and also what afforestation means in this context. We need a better communication and therefore we need also to optimise our Public Relations as well as our measures in the field of education on all levels especially for younger people in urbanized areas. We need a concept that follows the initiative from the very beginning to the very end and also covers all phases of monitoring. In one word, we have to bring forests and afforestation and other forest measures in an easy and understandable way back to the people. Due to the dimension of afforestation new optimised strategies for communication for the public and for stakeholders involved is indicated. This kind of mid and long term strategies of Public Relations and education activities and measures is needed to prepare, create and keep acceptance in society.

Recommendation:

An integrated concept to actively and openly communicate SFM and afforestation could help to support a process to create a broader acceptance and understanding. In this context NGOs and other partners of the civil society should be involved.

An initiative to optimise existing or new programmes to continuously inform on afforestation and other forest related activities at all levels of education is needed. The aim could or should be to have a very well transported initiative which is attractive and has a good image in society. Depending on the specific conditions an alternative could be to found a foundation which is commissioned to continuously improve the communication between the forestry sector and the rest of society.

III. PROPOSAL FOR BEST PRACTICE PRINCIPLES FOR COMMUNICATION OF AFFORESTATION –(PROPOSAL FOR FURTHER DISCUSSION)

1) Basic Principles

Openness, participation, effectiveness and coherence are inter alia the key principles for good and successful management and communication. Several aspects seem to be trivial from the theoretical point of view but daily experience shows it should or could be reasonable to check whether we are following the best practice rules in the field of communication: Following the rules of this principles will lead to more acceptance of the whole process of afforestation.

Each principle is also important for establishing a more democratic governance. They underline democracy on all levels.

- **Openness**

The institutions involved should work in a more open manner. Therefore they should actively communicate SFMsustainable and afforestation and what decisions need to be taken in this context. They should use a language that is accessible and understandable for the general public. This is of particular importance in order to improve the communication and the confidence in institutions and competences involved in the process.

- **Participation**

The quality, relevance and effectiveness of policies in and around afforestation depend on ensuring wide participation throughout the political decision chain – from the conception to the implementation - with of course wide range of cultural and regional differences in Europe. Improved participation is likely to create more confidence in the final result and in the institutions, which deliver policies. Participation crucially depends on willingness of institutions to communicate openly.

- **Effectiveness**

Afforestation measures and policies must be effective and deliver timely, what is needed on the basis of clear objectives and evaluation of future impact and where available on past experiences. Effectiveness also depends on implementing policies in a balanced manner and on taking decisions at the most appropriate level.

- **Coherence**

Policies and their implementation must be coherent and easily understood. The need for coherence in our societies is increasing. The range of tasks has grown: Challenges such as globalization, climate and demographic change cross the boundaries of the sectional policies all over Europe and the rest of the world. Regional and local authorities have recently demanded adequate solutions. Coherence requires political leadership and strong responsibility on the part of the institutions to ensure a consistent approach within a complex matter like afforestation and sustainable forest management.

2) Proposals for further Improvement

Keeping in mind the overall aim to create a broad acceptance in society all institutions involved should take the following proposals for improvement into account.

- **Better involvement**

Democracy depends on people being able to take part in public debate. To do this, they must have access to reliable information and they need to be able to scrutinize the policy process in its various stages. All interested citizens should have the access to all relevant documents.

The institutions involved need to communicate more actively with the general public on SFM and afforestation measures. An open communication policy will promote efforts to deliver information at national and local level and where possible making use of networks, grassroots organisations and national, regional and local authorities. Information should be presented in a way adapted to local needs and concerns.

Information and communication technologies have an important role. The forestry sector needs an inter-active platform for information, feedback and debate, which shows what, why and how we want to do it. Afforestation measures can be made visible with alternatives and be brought to all levels and interest involved.

Providing relevant information and more effective communication are the preconditions for generating a sense of identifying with the whole process and its results. Our aim should be to create “space” where citizens can discuss what they perceive as being important for the whole process. This should help decision makers to stay in close touch with the public opinion and could guide them in identifying projects which mobilise public support.

- **Reaching out to Citizens through Regional and Local Democracy**

SFM and afforestation measures should be close to regions, cities and municipalities which are affected directly or indirectly. The strong involvement of regional and local authorities also reflects both their growing responsibility and a strong engagement of people and grassroots organizations in local democracy. In this context we should get younger people more and more and continuously involved because they are the future of our initiatives.

3) New and better partnerships

We need in four areas to build better partnerships across various levels:

- **Involvement in Policy Shaping**

At national and regional level the competent authority should ensure that regional and local knowledge and conditions are taken in account when developing afforestation measures. For this purpose it should be organized in a systematic and open dialogue with regional and local governments and the corresponding non-governmental organizations.

- **Greater Flexibility**

It could also be an alternative to delegate the implementation of afforestation measures by target based contracts. Such contracts could be between the competent authority, regions, sub regions and localities and other appropriate partners designated for that purpose. The central government would play a key role in setting up such contracts and would remain responsible for their implementation. The contract would provide that the designated sub-national authority undertakes to implement the afforestation measures on the basis of the good state of the art. It seems to be quite obvious that this more decentralized approach leads in most of the cases to more identification with the measure and its outcome and to more responsibility.

- **Overall Policy Coherence**

In the same way, decisions taken at regional and local level should be coherent with a broader set of principles that would underline more sustainable and balanced territorial development within a country, regions and its surrounding neighbours. The competent authority intends to use the enhanced dialogue with regions, cities and municipalities to develop indicators to identify where coherence is needed. It will build upon existing work such as experience and other sources. The work of promoting better coherence between territorial development actions at different levels should also feed the review process.

- **Involving Civil Society**

Civil society plays an important role in giving voice to the concerns of citizens and delivering services that meet people's needs. Churches and religious communities have also a particular contribution to make. Non-governmental organizations should play an active role to support the whole measure. They often act as an early warning system for the direction of the political and technical debate.

Civil society increasingly can offer a good platform to change policy orientation. This offers a real potential to broaden the debate on the future of forests and their management. It's a chance to get

citizens more actively involved in achieving afforestation objectives and to offer them a strategic general feedback, criticism and if really needed protest.

The civil society must itself follow the principles of good governance, which includes inter alia accountability and openness. These are the preconditions to come to an equal position of sharing and following the same targets.

More effective and transparent consultation of all stakeholders involved is needed. The competent authorities should consult interested parties through different instruments such as communications, advisory committees and other forms of consultations. Furthermore the competent authorities should develop an online consultation through the interactive policy making initiative including new media such as the Internet. The Internet offers a unique chance to visualize alternatives and different development of afforestation over time.

Such a quality of consultation helps the competent authority to arbitrate between competing claims and priorities and assists in developing a long-term policy perspective. Participation is not about institutionalizing protest. It is about more effective policy shaping based on early consultation and past experience.

The competent authority must reinforce a culture of consultation and dialogue in fields of SFM and afforestation. This offers a unique chance to inform also on what SFM means in this context and on the whole underlying concept. Better consultation complements, and does not replace, decision-making by institutions. This must be stressed.

Consultation is essential to receive sustainable support afforestation. What we need is a reinforced culture of consultation and dialogue on what SFM and afforestation mean.

Creating a culture of consultation cannot be achieved by legal rules which would create excessive rigidity and risk slowing the adoption of afforestation. It should rather be underlined by the code of conduct that sets up minimum standards, focusing on what to consult on, when, who and how to consult. Those standards will reduce the risk of decision makers just listening to one side of the argument of particular groups getting privileged access on the basis of sectional interests which is a clear weakness of the current method of ad hoc consultations. All these standards should improve the representatively of civil society organisations and structure their debate within the institutions involved.

4) Connecting with Networks

It seems to be essential for successful afforestation measures to connect networks. New information technologies supported the development of a large variety of European and international networks focused on specific objectives. This is also true for parts of forestry sector but not that far developed for the item afforestation in the field of SFM. These networks should bring together business, research centres and link institutions and stakeholders involved. They provide new foundations for integration of knowledge and for building bridges for new groups and to existing experiences. It is very important to stress that afforestation measures in Europe will attract attention worldwide. These networks also act as multipliers in spreading awareness of the advantages of SFM and in the context of afforestation and showing policies in action.

Yet, many of these networks whose roots reach down deep into society, sometimes feel disconnected from the forestry policy processes. By making them more open and constructing better their relation with institution. Networks could make a more effective contribution to new challenges in our societies. More specifically regional and city networks could support our planning process. In this context we have to look for new strategic partners.

5) More Confidence in Expert Advice

Furthermore we need more confidence in expert advice. Scientific and other experts play an increasingly significant role in preparing site conditions for afforestation and formonitoring. Each sector and the competent authority rely on special expertise to anticipate and identify the nature of the

problem and uncertainties. This basic information is needed to take decisions and to ensure that risks can be explained clearly and simply to the public.

Daily experience shows the importance of informing people and policy makers about what is known and where uncertainty persists. It is often unclear who is actually deciding – experts or those with political authority. At the same time a better informed public increasingly questions the content and the independence of the expert advice that is given.

The forest sector needs a vital scientific capability, transparency and better networking in the area of SFM and afforestation.

We also need a stronger culture of evaluation and feedback in order to learn from the success and the mistakes of the past. This will help to ensure that proposals do not over-regulate and that decisions are taken and implemented at the appropriate level.

Networking at all levels shows clear benefits. Expertise and experience, however, is usually organised at a national level. It is essential that resources will be put together and work better in the common interest of all parties involved.

IV. PROPOSALS FOR A NEW PARTNER (FOR FURTHER DISCUSSION)

Larger afforestation measures, which are well communicated and accepted in society, will develop attractiveness on national but also international markets. Our products have a good image in society and are more than environmentally friendly. They are sustainable in the original sense of definition.

The natural partner for afforestation will stay the forest industry but in addition we should be open to look a little bit beyond our “Forestry plate”.

- **Possible Partners in Frame of the Implementation of the Kyoto Protocol**

When the Kyoto protocol comes into force on international level afforestation measures will get an up to now unknown additional value on the international market. There is likely to be interest in utilities and oil companies to pay for a real carbon sink in the biosphere. But nobody is able to predict how supply and demand will influence the market conditions and finally the price of the forestry product. Afforestation that is carried by broad acceptance in society and based on best state of the art will be more attractive than afforestation that has a negative image in society.

- **Changing Conditions in Field of Re-insurers**

The ongoing impact of global climate change is currently changing the market conditions for banks. The bank group of re-insurers is intensively thinking about setting new market conditions due to the non predictable cost resulting out of storms and flooding. The cost of the damages caused by flooding are estimated for about more than 12 Billion € in Eastern Germany this year alone. Precautionary measures will become one solution to reduce the cost for damage. Depending on what the re-insurers will demand the forestry sector can actively contribute to reduce risks and costs.

- **Green/Eco and Ethik Investment**

Green/eco and ethik investment is a new but constantly growing segment of financial markets. Due to the loss of credibility in and around stock exchange some very conservative pension funds are interested to invest in future leading measures and initiative, too. The shareholders ask for more responsibility for the next generations and are accepting for this positive image and feeling less return of capital. This is a new and interesting market segment that should attract our attention.

The forestry sector should observe the ongoing changes and new developments on the financial markets to identify attractive partners for their attractive products!

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THE ROLE OF CO-OPERATIVES IN SUSTAINABLE AFFORESTATION AND PROMOTING RURAL DEVELOPMENT

Mr. Ray Gallagher, Western Forestry Co-Operative Society Ltd., Ireland

SUMMARY

In farming terms, the west of Ireland has been designated as a 'Severely Handicapped Area' by the EU. It is an area of fragmented small farms, where poor drumlin/gley soils and interdrumlin peats predominate.

For over a century, the agricultural co-operatives in the area have a tradition of introducing new services and farming techniques for their members. When research in the 70s showed that unproductive gley soils could produce a valuable timber crop, these co-operatives were quick to see the opportunities this offered. The challenge was to introduce forestry onto western farms without undermining the cultural, environmental or social fabric of the regions. It must complement farming – not replace it.

To meet this challenge, with EU and Forest Service help, seven of the main agricultural co-operatives in the region set up the Western Forestry Society. The objectives of this Society were:

- to increase farm incomes through the introduction of a new crop to make marginal areas of farms productive;
 - to create employment in remote rural areas, in order to accommodate under-employed farmers and to retain farm youth in the community; and
 - to give a planned approach to farm forestry development aimed at optimising its economic, social and environmental impact on the farmer and his community.
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FARMER FORESTRY AND RURAL DEVELOPMENT

Background

In Ireland, a diagonal line on the map from the South-West to the North-East roughly divides the areas of rich farming to the East and the area of subsistence farming to the West. While there is some good farm land in the West, heavy wet mineral/gley soils and interdrumlin peat predominate. The ice movement, which resulted in the drumlin formation in the Western region of Ireland, also resulted in great variation in soil type.

One thousand years of conquest (with traditional land clearance programmes) resulted in a disproportionately high percentage of the population living on small farms in the disadvantaged Western areas. Fifty years ago the average size of Western farms was about five or six hectares. At present the average farm size is approximately twenty-seven hectares, but as the increase was achieved by acquiring a number of small-holdings, such farms are frequently in three or four divisions. Another feature of the region is that more than 20% of the work force is employed directly in farming with average family farm income much lower than the minimum industrial wage.

In the 70's, research showed that the unproductive heavy wet mineral soils of the West and border counties of Ireland, could grow certain species of trees better than anywhere else in Europe. Only 6% of the land area in this region was then afforested, almost all of which was state owned. A simple survey carried out on behalf of the main farmer (dairy) co-operatives indicated that a high percentage of farms had some land which was marginal for agricultural production but highly suitable for forestry. Farmers in the region had no knowledge, tradition or interest in forestry. To many it was symbolic of the old landlord system. The purchase of the larger tracts of farmland (required by

farmers to consolidate their fragmented holdings) by financial institutions, who saw the opportunity that the above research had uncovered, led to the open hostility of farmers and their organisations to forestry.

Co-operative Approach to Farmer Forestry

For one hundred years, farmer owned producer co-operatives (especially dairy co-operatives) have had a great tradition of introducing the innovations which emerged during that period, to Irish farming. The challenge of introducing forestry into the enterprise mix of farming, without undermining the cultural, environmental or social fabric of the region, was consistent with this co-operative tradition and philosophy.

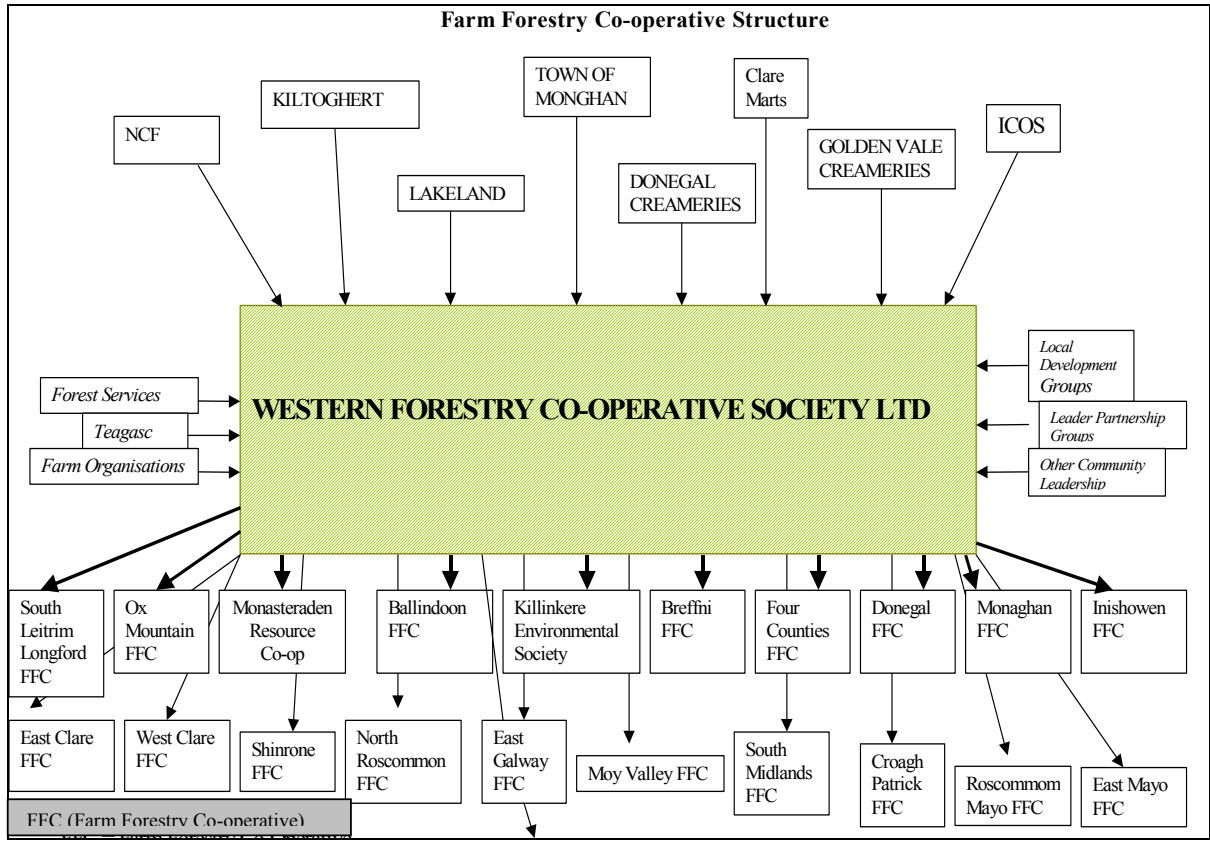
In 1980 Western Dairy Co-operatives with ICOS, successfully lobbied to have a farm afforestation programme included in the “The Western Package” scheme (Reg. 1820/80), and widely promoted farm forestry among their members. These Co-operatives realised that forestry provided a unique opportunity to enhance their social responsibility to their farmer members and rural dwellers through planned organisation, co-ordination and the provision of the structures required for a progressive forestry programme in a small farming area. In 1985 the seven main dairy co-operatives serving the Western and border regions, with support from EC ‘Farm Modernisation Scheme’ (Dir759/75) set up the Western Forestry Co-operative Society (a federal co-operative with seven corporate members). This new Society had three objectives:

- To increase farm income through the introduction of a new crop, (forestry), to profitably utilise the parts of farms that were heretofore unproductive. In this way forestry would compliment agriculture rather than replace it.
- To create employment in remote rural areas (to sustain farm youth in their own communities, and to utilise under-employment on small farms).
- To give a planned-approach to forestry development by optimising it’s economic, social and environmental impact for the farmer, his community and society generally.

This new co-operative spent a few years breaking down the strongly held negative perception of farmers towards afforestation. There was also the practical difficulty of persuading a farmer to release the small area of his farm which was suitable for forestry, and then encourage neighbouring farmers to release adjoining areas in order to produce a plantation of sufficient area to afford economies of scale, layout (in the landscape context) accessibility, and later to facilitate marketing.

For five years the establishment of such group plantations were strategically distributed throughout the Western Region and were used as “extension demonstration units” to encourage more farmers to embrace the afforestation concept.

Research (Bowen UCC), in the early 90’s, showed that objective information and an efficient local support organisation (offering a range of services), was essential, if Western farmers were to become engaged in afforestation. Moreover, research papers from other countries (IUFRO reports) showed that farmers tend to neglect forestry (in favour of traditional farm crops) if sufficient motivation and backup services are not readily available. Accordingly, directed by such research findings and particularly influenced by the successful Danish model, twenty farmer-owned forestry co-operatives were established. These new co-operatives (affiliated to Western Forestry) were usually established around existing community leadership, and in areas where the longstanding dairy co-operative network was strong. In addition to encouraging best silvicultural practice and sustainability of farmer forestry, these forestry co-operatives aimed to ensure that forestry be developed as a critical element of integrated rural community planning. By observing the achievements and the mistakes of forestry development elsewhere, in addition to studying the needs of farmers, local communities, environmentalists and official planners, the ‘green field’ starting point provided a unique opportunity to get the formula right.



The Operation of Farmer Forestry Co-operatives

When the twenty farmer-owned forestry co-operatives were being established, care was taken to involve local leadership, where the longstanding dairy co-operative network was strong. Care was also taken to include representatives of relevant statutory and voluntary farmer organisations. Many of these new co-operatives form an additional wing to existing community development bodies. This approach is useful in achieving community legitimisation and support for the forestry programme and also to ensure that the programme compliments and enhances the main rural development programmes for the area. In this way its commercial, environmental, visual and social impact can be optimised. An important advantage for these new forestry co-operatives was being able to link in with the existing network of the dairy co-operative, board members, advisory board members (at each local branch), branch store staff as well as with milk assembly and farm development personnel. The dairy co-operatives have continued to provide this important support to forestry co-operatives free of charge.

Each co-operative is assigned a forester/development officer (initially on a part-time basis). In addition to working with the local community, he/she is available at all times by phone and at set times for consultations, to deal with member's problems and to make representations on their behalf, especially with regard to the small woodland owners.

In line with co-operative objectives and with The National Development Plan, the forester's main activity is the promotion of afforestation, its ongoing maintenance and the grouping of areas available on adjoining farms into larger well laid out units. This is a daunting task, in view of the fact that almost eighty percent of farmers in western regions are not active in farm organisations, do not attend lectures/meetings or field days, and are most unlikely to be influenced by press or television to adopt an unfamiliar enterprise such as forestry. The provision of a choice of quality management services, for the farmer who has not his own resources, is naturally essential. Having a local support organisation with objective advice/information readily available together with a variety of promotional

approaches is proving to be successful, while the local co-operative network (mentioned above) has been critical in breaking down initial barriers.

Once woodland has been established on a farm, the annual inspection tour of the plantation by the co-operative forester, accompanied by the owner is succeeding in motivating the owner to take good care of his woodland enterprise. In this way it is hoped that the limitations in woodland size on farms can be compensated for by increasing its value through quality timber production.

Educational Programme

Farming organisations, Teagasc (the agricultural extension service) the Forest Service and other developmental and environmental organisations have useful educational programmes aimed at woodland owners. Feedback from the co-operative forester who visits member's plantations annually, and encounters the actual problems occurring on the ground, can help to refine the objectives of such programmes and make them more meaningful to the farmer. Through the ongoing involvement of such organisations with the local farmer forestry co-operative, each is aware of the other's programme, which helps such organisations to complement one another's activities and avoid duplication of effort.

In this regard the Western Forestry Co-operative has recently developed a close working relationship with the Irish Timber Growers Association (ITGA). Among the advantages of this arrangement, Co-operative members receive the ITGA quarterly newsletter, including a special co-operative supplement and they have free access to field-days and other events organised by ITGA. Apart from formal educational aspects of the latter, interaction with experienced woodland owners from ITGA is also proving to be very useful.

CROSS BORDER CO-OPERATIVES

Likewise the traditional networking between the border forestry co-operatives in the Irish Republic and the forestry Co-operative in Northern Ireland has recently been active in developing a programme (mainly involving broadleaf species) highlighting the importance of conservation and the environmental aspects of forestry. Its basic philosophy is that Irish farm woodlands should benefit the local community as well as the farmer owner. This occurs when farmers are encouraged to view their woodland as part of the local landscape and environment. In order to create this holistic approach, the farm forestry co-operatives have been developing a methodology that evaluates existing farm woodland in terms of ecology, landscape inputs and historical importance, in addition to strategic timber resources. Towards this purpose, forestry co-operatives are co-ordinating diverse planning interests to achieve a forestry development plan for lakeshores and areas of natural beauty in border areas that it is hoped will have widespread application. Included in the programme at each co-operative level are foresters, official planners, ecologists, local historians as well as farmer and local community representatives and Dúchas (the state conservation body). In relation to this programme, which is still in its infancy, a number of cross-border field day, tours, workshops and seminars have been successfully organised.

Achievements in Co-Operative Farm Forestry

Progress inspection of the Co-operative Forestry Project in relation to 'Value for Money' for funds contributed by the Forest Service and E.U. have always been favourable. The rate of progress among forestry co-operative has varied with, for examples, one having 390 members with another having only 50 members. The total cumulative membership is now almost 2500 members who between them have planted approximately 15000 Ha of woodland. For the 15 years since the 1st plantation was set up concentration has been in encouraging best silvicultural practice in terms of woodland establishment. For those who have successfully progressed beyond this stage the co-operative must develop a programme aimed at ensuring quality timber production, while also taking steps to ensure that this is reflected in the price per cubic metre paid to farmers for their timber. This programme must also be developed in a sustainable manner to fully meet the national environmental requirement and

demonstrate that it is socially beneficial. This in reality is a Sustainable Forest Management (SFM) programme.

SUSTAINABLE FOREST MANAGEMENT

For farmers whose woodland is approaching the 1st thinning stage, a long-term sustainable management approach, leading ultimately to quality timber production can best be achieved through a formal SFM programme. Such a programme with its sensible balance between the environmental, social and economic aspects of woodland reflects perfectly the objectives of the farm forestry co-operatives. These co-operatives since their establishment have promoted farm forestry as a central element of integrated rural community planning to optimise its impact for the farmer and his community. The introduction of a new SFM programme gives continuity, greater discipline and a formal structure, to this approach. Certification is a by-product of SFM and is a measure of how well the aims and objectives of such a programme are being achieved.

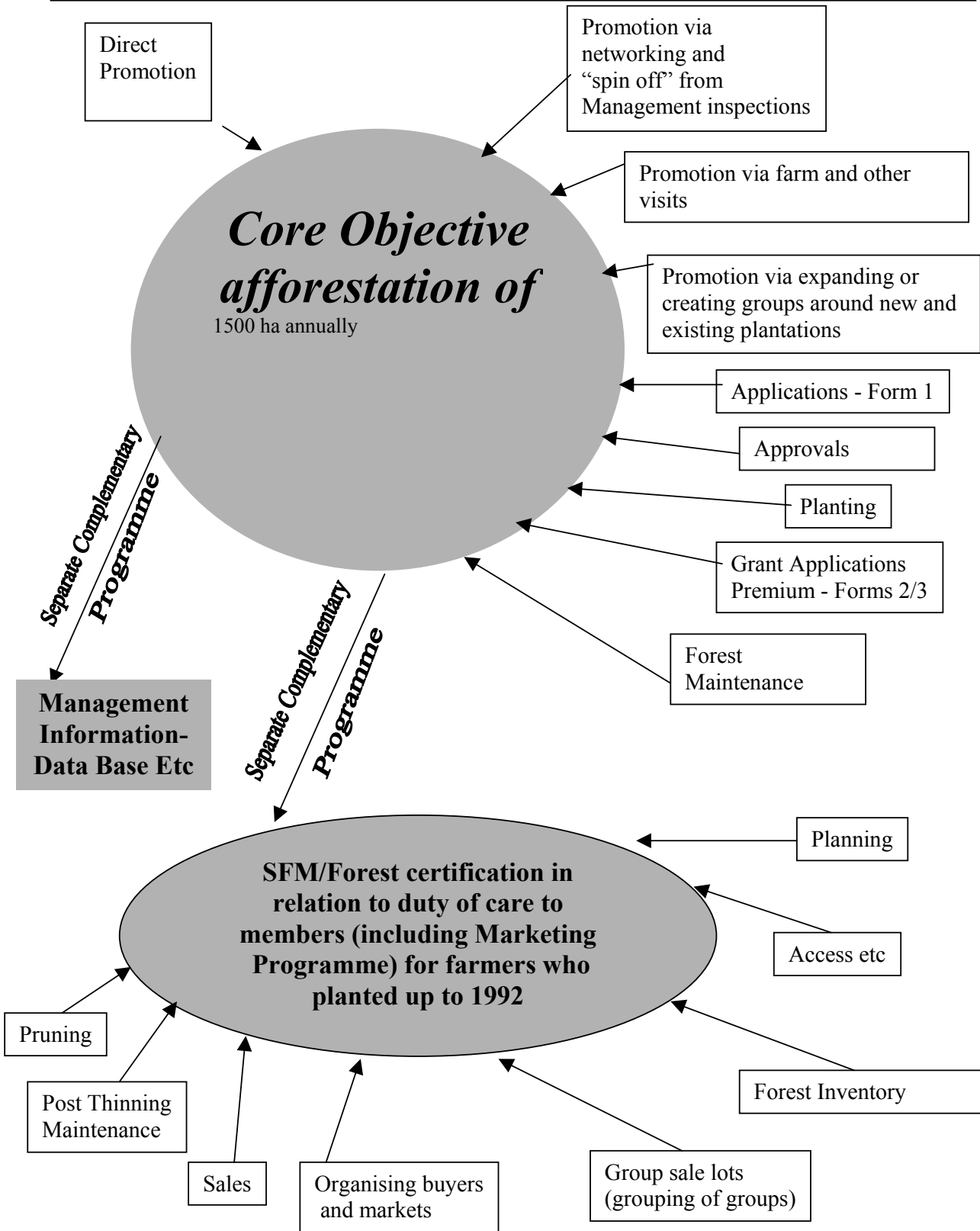
Accordingly, it will result in the improvement of the quality and marketability of the timber produced as well as monitoring the performance of woodland management.

Group Certification

In adopting a formal SFM programme the Western Forestry Co-operative is opting for that of the Forest Stewardship Council (FSC) as this is the certification status of almost all timber offered for sale in Ireland.

As the high costs involved in individual participation, would prove to be prohibitive for the small woodland owner, each of the 20 co-operatives mentioned above will apply for Group Certification. With this approach the Group will take on responsibility for the programme, with each farmer member participant signing a commitment to the principles of Sustainable Forest Management, and the principles of the Forest Stewardship Council. The Co-operative strongly believe this certification programme, while daunting, is essential if the aim of producing quality timber in a sustainable manner, is to be achieved. Among the requirements are a forest management plan at individual farmer level and an overall plan at each group level. Almost all of the initial participants are within a few years of 1st thinning. This allows time for planning to overcome the pre-sale difficulties associated with the small timber producers. Inspection passages must be opened, inventories of timber available completed, access roads, loading bays etc constructed, plans for grouping timber available on adjacent farms into practical sized woodlots as well as the compiling of harvesting plans. There will also be liaison with sawmills, energy users, commercial companies, hauliers etc re sales proposals This planning phase is an essential prelude to the actual sale of the timber which must be successfully completed to allow the third phase of post thinning management to proceed. This involves essential maintenance, such as post thinning drainage, road and fence repairs. Pruning (in 2 stages) can then proceed.

Structure of Programme to meet expectations, responsibilities and the eventual procurement of quality timber



THE SIGNIFICANCE OF THE SFM

Involvement in the SFM programme, while challenging will be a useful programming aid from the Western Forestry Co-operative and its 20 farm forestry co-operative affiliates. It gives formal expression, structure and discipline to the work it has been successfully carrying out in developing farm forestry as an integral element of the enterprise mix on farms and of rural community planning. The latter places emphasis on social elements such as suitable off farm employment. It also emphasises the environmental element in terms of landscape and ecological protection in addition to other aspects such as the provision of amenities for local communities and tourists.

CONCLUSION

Farming in the west of Ireland has always had problems in surviving. Farming trends over the next decade, with forecasted reductions in commodity support structures, together with the region's disadvantaged location in relation to the main EU markets, suggest that only large well equipped farmers will survive in this region. Timber is one of the few commodities produced, which is not in surplus in the EU. Its development, coupled with judicious rural community development planning will play an important role in reducing the decline in the West of Ireland farming population.

FOREST REGENERATION IN ROMANIA

**Mr. Filip Georgescu, General Manager, Romanian National Administration, and
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SUMMARY

Romanian forests cover 6.3 million ha, representing 26.7% of the country's total area. The National Forestry Administration (NFA) is a legal state-owned entity that operates as a financially autonomous organisation under the authority of the Ministry of Agriculture, Food and Forests, with responsibilities for administrating the state forests. The NFA is mandated to implement the National Forest Strategy for the forests under its stewardship, and to ensure the protection, conservation and long-term development of state forest assets. Priority objectives of the National Forest Strategy include: safeguarding the continuity and enlargement of the forest area through the regeneration of all harvested areas; the afforestation of bare-lands; and the ecological reconstruction of degraded lands.

The NFA will regenerate 17,200 ha of state forest land under its administration in 2002. Apart from the establishment of new forest, maintenance of recently established plantations will be undertaken on an area of 5,725 ha. The NFA 2002-03 forest regeneration programme will increase by 7,700 ha to take into account a recent Governmental Decision on the transfer of degraded agricultural land from the State Domain Agency to the national forest fund, for ecological reconstruction.

In relation to forest regeneration and vegetation establishment activities, Romanian foresters are promoting natural regeneration and the use of native species adapted to local site conditions.

I. BACKGROUND

The Romanian forests cover 6.3 million hectares or 26.7% of the country land surface and are located in very diverse pedological and climate conditions, starting from the Danube Floodplain and up to the peaks of the Carpathian Mountains. Accounting for a total volume of standing wood of 1,350 million cubic meters, the Romanian forests have a mean volume of 217 cubic meters per hectare and a mean yearly increment of 5.6 cubic meters per hectare. The commercial wood mass volume is of 15 million cubic meters each year.

Most of the forests in Romania are located in the mountain area (65% of the total surface), 28% of the stands can be found in the hill area. The poorest areas in forest occur in the lowlands (only 7%).

The main forest species in the Romanian forests are the beech (31.7%), spruce (23.5%) and oak species (17.8%). Figure 1 shows the complete structure of the Romanian forests by species.

The state forests are managed by the National Forest Company, which is a company with a state capital, under the authority of the Ministry of Agriculture, Food and Forests. Of the total Romanian forest area, 5.4 million hectares (85.7%) are owned by the state and managed by the National Forest Company. The main activity of the company is the implementation of the national strategy for forestry. It takes actions to safeguard, preserve and sustainably develop the state public forest area, which it manages. It also operates in the management and marketing of game, mountain water fish and of other forest-related products, according to the legal regulations and according to the economic efficiency principles.

The continuation of the forest area, regeneration of the felling areas, afforestation of abandoned lands and the ecological rehabilitation of degraded lands are the objectives included in the national strategy for forestry development.

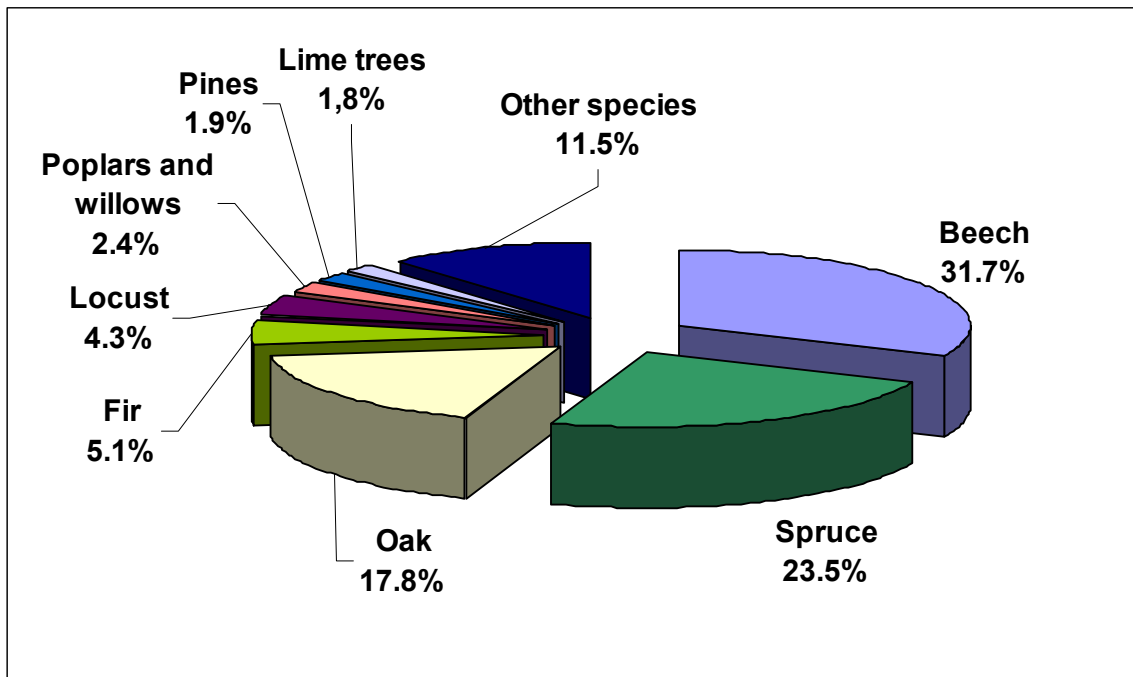


Figure 1 – Forest area structure in Romania by species

II. PRINCIPLES AND INTERVENTION METHODS USED IN FOREST REGENERATION IN ROMANIA

Without any doubts, forest regeneration starts from one question: natural or artificial regeneration? The famous Romanian forester Marin Drăcea gave an ever-lasting answer to this question: “to work by imitating the nature, to gratefully receive its gifts, when they do not come too late and when they respond to our goals and, especially to give a helping hand, without delay and with energy and skill, to speed up, support and guide the blind forces of nature to fulfill our goals...”, this is the principle of the modern forestry.

The diversifying of the forest functions, the increase in ecological uses, without diminishing the interest of the society in the economic functions call for the management of the stands with optimal structures by applying intensive methods in forestry. Therefore, for the present and future phase, the natural regeneration and the intensive methods are priorities in those situations in which they are possible to implement.

In promoting natural regeneration, the Romanian foresters have a long experience. The forestry methods with regeneration under a shelter-wood have been used the first time in the second half of the 19th century. The working techniques have been improved in time and under the influence of the French, German and Austrian forestry specific methods and techniques have been established to implement forestry systems with long regeneration periods.

The regeneration of the cultivated forests under a shelter-wood, the creation of stands with a diverse composition, with uneven-aged and relatively uneven-aged structures are the precise goals in the implementation of the forestry methods in Romania. The detailed management program for the regeneration under a shelter-wood does not stop only to the step by step thinning, through felling in the adult stand. To be able to create highly valuable stand there is a need for preparation selection works used to remove the specimens which are not wanted according to their species or value, thus avoiding their participation in the future regenerations. It is obvious that regeneration under a shelter-wood cannot be performed in a satisfactory manner only according to some general recipes. It is necessary to establish the type, rhythm and intensity of the interventions for the plots where the regeneration will be applied, by taking into consideration that the protection requirements for the seedlings are lower and lower as they grow older.

The policy regarding the species is highly important both for the natural and the artificial regenerations. This policy has to be adjusted mostly according to the requirements of sustainable forest management. That means to promote first of all the local species, which have adapted themselves to these environment conditions for thousands of years.

According to the complex way to intervene in the forest structure, the Romanian forestry defines three fundamental regeneration forms:

- Regeneration under a shelter-wood in high forests, with uniform and slow thinning, in a certain moment of the periodic block in rows, aiming at installing and developing the new generation in a uniform and slow way, too.
- Regeneration under a shelter-wood in high forests, with un-uniform and progressive thinning in the adult stand, aiming at installing and developing the new stand in an un-uniform way, in the time corresponding to the regeneration period. The main concern is the opening, in each fructification year, of small areas in the places most favorable for the seedlings. These open areas are elementary plots in the regeneration process and they will have different sizes and shapes, according to the requirements of the species to form the future stand. As the seedlings grow and develop, these open areas are thinned progressively until they connect with each other when the seedlings have reached the biological independence.
- Regeneration under a shelter-wood in high forests, with continuous removals, characteristic to the uneven-aged stands. The mechanism for this regeneration system is characterized by the fact that it keeps the forest in the same dimensional structure, but involves it into a continuous exploitation-regeneration process. These interventions result in the most favorable conditions for the seedling to install in and in the continuous integration of the existing growths with the stand.

The main treatments and their combinations are being detailed corresponding to these fundamental regeneration forms.

The restoration of the stands damaged by human and natural factors to their structures before the impact or to similar structures is also one of the priorities of the National Forest Company. The following stand categories are considered:

- Oak stand regenerated from coppice, degraded by grazing, destructured composition.
- Cottonwood stands created with unsuitable clones and installed in unsuitable site conditions.
- Riverside coppices and mixed broadleaf stands on river floodplains, strongly affected by hydrotechnical works.
- Locust stands from coppice and the ones installed on unsuitable sites, including on sites favorable to oaks.
- Most of the spruce monocultures located on sites favorable to mixed beech and conifer stands.
- Degraded mountain pine stands.
- Forests strongly affected by pollution, drought, pests, etc.

At present, there is being performed an inventory of the lands which require works for ecological rehabilitation, at the level of the entire national forest area. There are also being established the criteria for stand classification according to their structure against the optimal structure and according to the emergency of the interventions. These criteria will be in agreement with the levels of biodiversity, complexity, stability and ecoprotection and productive functions, characterizing those stands.

Ecological rehabilitation, a difficult and long term process, understood as a component of the sustainable forest management, calls for “close to nature” specific technologies and methods. Here are some of the methods successfully applied in the Romanian forest area:

- Methods based on natural regeneration of beech stands, mixed beech and conifer stands and oak forests.

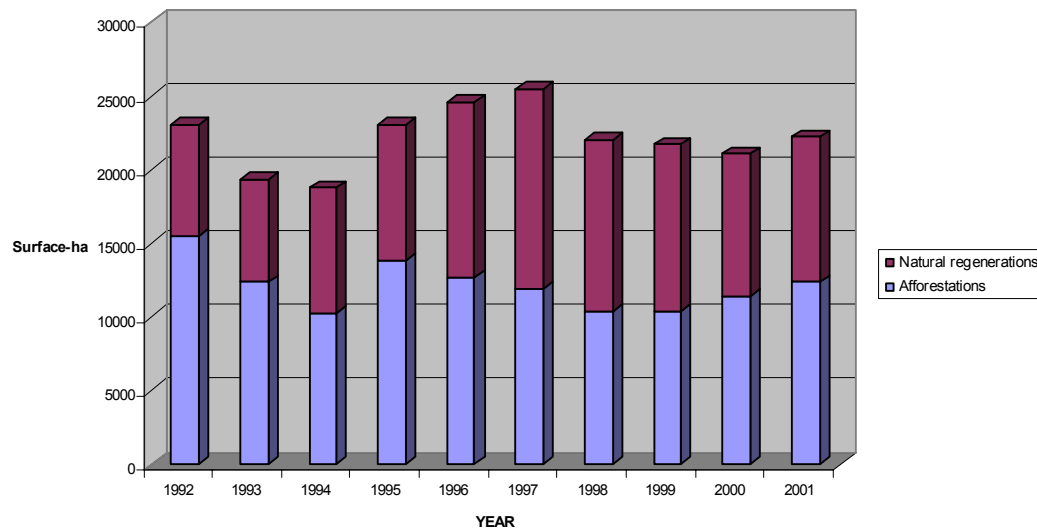
- Methods based on using the shelter of damaged stands and possibly existing shrubs, by using the mixed regeneration which leads to a better preservation of the population biodiversity.
- Methods based on artificial improvement of the site conditions with the help of irrigations, drainage, fertilization, etc. Their application is recommended on small areas.

It is really difficult to rehabilitate the lands affected by pollution, where the success is mainly related to the reduction of the pollution.

III. PRESENT ASPECTS CONCERNING FOREST REGENERATION IN ROMANIA

In the last decade, the increase in the percentage of natural regeneration has been a permanent item for the Romanian foresters. As it may be noticed in the following chart, in the last ten years their share has increased from 32.6% in 1991, to percentages higher than 50% in the latest years. It is being estimated that the structure of the Romanian forests allows, by implementing a correct management to reach 60% for the natural regeneration

Figure-2-Regeneration percentages over the period 1992-2001



The planning of the afforestation works is a complex process, which starts one year before initiating the works. There are being considered all the areas where wood has been harvested as main products, afforestation of the not used lands without forest vegetation, ecological reconstruction of lands affected by degradation. The regeneration solution is established during the elaboration of the “Site sheet”. This sheet describes: the geographic and ecological zoning of the area, the ecological group (established according to the site type and the natural fundamental type forest), altitude, inclination, exposure, local climate, the bedrock and cover deposits, genetic soil type, humus type, skeleton content, edaphic volume, erosion, hydrological system, humidity, acidity, content of carbonates and soluble salts, limitative factors, indicating flora and the social-economic goal. The regeneration composition is established after the analysis of all these elements. The next step is the feasibility study and the technical project. They include the elements needed for a proper development of planting works. The number of forest plants needed by species and sizes, the planting schemes, planting technologies, maintenance works applied until reaching the dense stand phase.

The control of the areas under regeneration is performed each year, at the end of the vegetation season, by carrying out an inventory of 4% of all regenerations. The Conclusions of this inventory are included in a document “Annual regeneration control”, which gives data on their status, and the measures to be applied in the next vegetation season (completions, maintenance, planting material needed, etc.). More than 92,000 hectares of regeneration will be subjected this year to an annual regeneration control.

17,200 hectares will be regenerated this year in the state forest area managed by the National Forest Company. Of these 8,200 hectares (47.7%) will be naturally regenerated according to the silvicultural methods used, and 9,000 hectares will be artificially regenerated through afforestation works. Beside these, completion works will be performed in the plantations created in the previous years on 5,700 hectares. In the planting campaign from this spring, more than 11,700 hectares have been regenerated, of which 6,500 hectares by afforestation and more than 5,200 by natural regenerations. Completions works have been performed on more than 4,700 hectares. For the afforestation campaign in autumn this year all the technical details have been prepared to implement the proposed program.

A special attention is paid to the technical regeneration solutions that take into account the specific conditions of the sites for each area to be regenerated (genetic soil type, climate conditions, etc.) by promoting especially the valuable local species.

The planting material necessary in the regeneration works is produced in our nurseries. More than 100 million forest seedlings, suitable for planting and showing superior genetic traits are produced each year.

A special attention is paid to the genetic provenance of the forest seedlings. The harvesting of the reproductive material is performed in seed orchards and reserves included in the “National Catalog of Genetic Forest Resources”, catalog elaborated according to international standards. The National Forest Company manages 58097 hectares of seed reserves and 700 of forest orchards. Specific operations are performed in these areas like marking the seed trees, stimulating the fructification by regulating the consistence, shaping the tree crown, etc. The crops are analyzed each year; the exceeding material is preserved in special deposits.

The forest regeneration operations are financed in the plots from the state forest areas from “The Forest Conservation and Regeneration Fund”, set up according to the stipulations of the Romanian Forestry Act (20% of the traded wood value goes into that fund). The works for the degraded lands taken over in order to improve them are financed from the state budget and from other sources.

Like other European countries, Romania has recurrent problems within the managed forest area due to wind felling, especially in pure conifer stands. In March this year 3,000 ha have been affected by wind felling. The experience from other similar situations shows that the technology to rehabilitate these areas includes the following phases:

- Removal of the wood as soon as possible.
- Carrying out a close analysis and the implementation of specific treatments against biotic pests (*Hylobius abietis*).
- Site mapping of all the surfaces and planting, using afforestation compositions which to lead to the creation of stable stands. A special part is played by the beech, the larch, service tree, etc.

The increase in the forest area, the afforestation of agricultural lands damaged by different degradation processes represent priorities in the forestry policy in Romania. Creating new forests, without a profit in wood, becomes more and more important. The protection, biodiversity and even the recreational functions become priorities in these cases.

The Romanian legislation supports the carrying out of improvement works on degraded lands, and forest rehabilitation. By a recent Governmental decision the National Forest Company took over 7,700 hectares of degraded agricultural lands from the State Assets Agency, in order to afforest them and to apply ecological rehabilitation works.

The signing by Romania of the United Nations Framework Convention on Climate Changes and the ratification of the Kyoto Protocol (1997) set the starting points for the specific instruments in fighting against the climate changes and against their impact.

Taking into account the need to perform important afforestation works in order to improve degraded lands, and the opportunities given by the Kyoto Protocol, the National Forest Company, together with the World Bank Carbon Prototype Fund, has initiated in 2001 a project for the afforestation of about 7,000 hectares of degraded lands over the period 2002-2005 and the transaction of the reduced emissions (carbon sequestrated) according to the Kyoto Protocol. According to the calculations, the project will lead to the sequestration of one million tones of carbon dioxide.

After the specific steps for the preparation of the project and the validation of the basic study by an independent body in the summer of this year, the signing of the transaction agreement for the sequestrated carbon for the period 2002-2017 is expected to be signed by the end of 2002.

The validation of the afforested lands, of the growths and of the sequestrated carbon amount will be performed each year, by Romanian foresters; after five years an independent body will verify and validate the data collected. A special importance was granted to the social aspects and the ones related to biodiversity, proving that this project has a positive impact on these fields.

The expansion of the Romanian forests, up to 35% of the total surface of the country, is a long-term objective. For the period 2001-2004, Romania proposed a significant increase in the afforestation works and in the forest area. The afforestation works will be carried out wisely, by analyzing for each plot, the regeneration solutions according to the site conditions, the social impact of the works and to the need to preserve the existing biodiversity.

ROMANIA





NURSERY



OAK SEEDLINGS IN NURSERY



BEECH ORCHARD



NATURAL REGENERATION IN BEECH FOREST



MIX REGENERATION IN COMMON OAK FOREST



REGENERATION UNDER SHELTER-WOOD



MIX REGENERATION AT CONOPY CLOSURE



NATURAL REGENERATION (OAK+BEECH)



REGENERATION UNDER A SHELTER WOOD



AFFORESTATION WITH OAK AND ASH



AFFORESTATION WITH PINE IN DEGRADED LANDS

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THE FORESTRY REGULATORY FRAMEWORK - AN ENVIRONMENTAL NGO PERSPECTIVE

Ms. Shirley Clerkin, Natural Environment Officer, An Taisce, Ireland

SUMMARY

An Taisce – the National Trust for Ireland – was established over 50 years ago and is the broadest environmental non-governmental organisation in Ireland. An Taisce has been a statutory consultee under the Irish Planning Acts since 1963. Since then, other consultative responsibilities have been added to our remit, including commenting on Integrated Pollution Control Licences, Waste Licences, aquaculture licences and, most recently, forestry consent applications.

This paper examines the new forestry regulatory regime, as introduced in December 2001 by the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 2001.

This legislation removed initial afforestation from the planning acts, and initial afforestation is now 'exempt' from planning permission requirements. A new forestry consent procedure, governed by the Minister for Communications, Marine and Natural Resources, allows for public participation in the consent process through a system of public notification *via* local newspapers, with a period for comment. Provision has also been made for consultation with specific bodies including Dúchas The Heritage Service and An Taisce - the National Trust for Ireland. The new regulations lower the thresholds for mandatory Environmental Impact Assessment from 70 to 50 hectares. Provision for requiring an EIA below the threshold has also been included where there may be significant environmental impacts.

An Taisce, as a statutory consultee under the new Regulations, will present an overview of this new forestry consent system. The paper will investigate the legislation's effectiveness in implementing elements of the National Forest Standard and Code of Best Forest Practice, both of which have been developed in order to implement Sustainable Forest Management principles in Ireland.

Le cadre de réglementation des activités forestières en Irlande: le point de vue d'une ONG spécialiste de l'environnement

Exposé de M. Shirley Clerkin

Résumé

An Taisce – association irlandaise pour la préservation des bâtiments historiques, des monuments et des sites naturels – a été créée il y a plus de 50 ans; elle est la plus importante organisation non gouvernementale d'Irlande spécialisée dans l'environnement. An Taisce est dotée, depuis 1963, d'un statut consultatif officiel en vertu de la loi irlandaise sur l'aménagement du territoire. Depuis, d'autres fonctions consultatives se sont ajoutées à sa mission: entre autres, l'association est aujourd'hui appelée à donner des avis sur des demandes d'autorisations relatives à la lutte intégrée contre la pollution, à la gestion des déchets et à l'aquaculture, ainsi que, plus récemment, sur des demandes de consentement à des activités forestières.

Le document passera en revue la nouvelle réglementation forestière, adoptée en décembre 2001 comme suite à la directive de 2001 des Communautés européennes portant modification des dispositions relatives à l'Évaluation de l'impact sur l'environnement.

En vertu de cette législation, les activités forestières ne sont plus soumises aux textes relatifs à l'aménagement du territoire, ni partant, à autorisation. Une nouvelle procédure de consentement à des activités de foresterie, qui relève du Ministre des communications, de la mer et des ressources

naturelles, permet au public de participer au processus d'examen grâce à un système de notification utilisant les journaux locaux, un délai étant imparti pour donner un avis. Il a également été prévu la consultation de certaines organisations, dont Dúchas (service du patrimoine) et An Taisce. La nouvelle réglementation ramène de 70 à 50 hectares le seuil d'évaluation obligatoire de l'impact sur l'environnement. Il est également prévu d'exiger, en dessous de ce seuil, une évaluation en cas d'importantes incidences potentielles sur l'environnement.

An Taisce, consultant officiel en vertu de la nouvelle réglementation, présentera un aperçu de ce nouveau système de consentement à des activités forestières. L'auteur du document examinera l'efficacité de la législation pour ce qui est de l'application des Normes nationales d'exploitation forestière et du Code des meilleures pratiques forestières, deux documents qui ont été élaborés afin de faire appliquer en Irlande les principes d'une gestion durable des forêts.

Нормативно-правовая база лесного хозяйства Ирландии: участие НПО в решении экологических вопросов

Основной документ, подготовленный г-ном Ширли Клеркин

Резюме

An Taisce - Национальный траст-фонд Ирландии - был учрежден более 50 лет тому назад и является самой представительной экологической неправительственной организацией Ирландии. An Taisce также является официально уполномоченной консультативной организацией в соответствии с Актом местного управления (планирование и развитие) Ирландии 1963 года. В последние годы в круг ведения An Taisce были добавлены новые консультативные обязанности, включая проведение оценки работы интегрированной системы лицензирования контроля загрязнения, выдачу лицензий на удаление отходов, на разведение аквакультур, а также утверждение заявок на право пользования лесом в лесохозяйственных целях.

В представленном документе рассматривается новый нормативно-правовой режим деятельности лесного хозяйства, введенный в декабре 2001 года Правилами Европейского союза (Оценка воздействия на окружающую среду) (Поправка) 2001 года.

Согласно этому законодательству из актов о местном управлении была исключена закладка лесопосадок первого поколения, это же положение "изъято" из требований, касающихся получения разрешения на планирование лесопосадок. Новая процедура подачи и утверждения заявок на ведение лесного хозяйства, контролируемая Министерством по связи, морским и природным ресурсам, предполагает участие общественности в рассмотрении заявок. Сообщения о поступивших заявках публикуются в местных газетах, и в течение установленного периода времени заявки обсуждаются общественностью. Также предусмотрена возможность консультироваться со специальными органами, включая Dúchas The Heritage Service и An Taisce. Согласно новым правилам с 70 га до 50 га снижены пороговые значения, предусмотренные обязательной оценкой экологического воздействия (ОЭК). Положение о снижении пороговых значений было также введено в тех случаях, где могут существовать значительные риски для окружающей среды.

An Taisce, как официально уполномоченная в соответствии с новыми Правилами консультативная организация, представит обзор этой новой системы утверждения заявок. В документе будет также показана эффективность нового законодательства при осуществлении элементов Национального стандарта развития лесного хозяйства и Кодекса наилучшей практики, которые были разработаны в целях утверждения в Ирландии принципов устойчивого лесопользования.

INTRODUCTION

To start, I want to inform you about An Taisce and our role as a non-governmental organisation.

An Taisce was established by a group of concerned citizens in 1949, among them Robert Lloyd Praeger the eminent botanist, naturalist and author, most well known for his book "The Way that I Went".

Among An Taisce's early objectives was the establishment of national parks, protection of landscape and environmental education.

In 1963, when planning laws were introduced in Ireland for the first time An Taisce was prescribed as a statutory consultee, due to an acceptance by the government of the time that An Taisce held within its ranks expertise in the areas of planning, landscape and buildings as well as a network of local associations.

Since then, we have been prescribed as statutory consultees for a number of areas, the only non-governmental environmental organisation in Ireland to be allowed this specific privilege.

An Taisce has roles under planning legislation, including commenting on development plans and applications; under waste licensing and Integrated Pollution Control Licensing; commenting on aquaculture licence applications and most recently under the new Forestry Consent System.

Trees have been on An Taisce's agenda for many years now. In 1984 An Taisce published "*Trees for Tomorrow, how to help the national tree campaign in your neighbourhood*". In 1994 we published "*Ireland's forested future - a plan for forestry and the environment*".

This plan formed the basis of many of the overall forestry objectives we wanted to see materialise in Ireland at the time including

- increased broadleaf planting;
- Continuous Forest cover;
- the location of forestry plantations away from peatlands and acid sensitive catchments;
- better design contiguous with landscape character;
- the development of a national forestry strategy;
- the amendment of Environmental impact Assessment thresholds, planning and felling legislation; and
- the modification of the grant structure to steer forestry towards suitable areas and away from unsuitable areas.

In 2000, An Taisce was the Irish partner in the production of a book entitled "Trees, Hedges and Water", which deals with the impact of non-forest trees on water resources where they are intimately associated with farming. The report involved partners from Austria, France, Spain and Ireland.

An Taisce has been involved in many tree and forestry initiatives including The Irish Coalition for Sustainable Forestry, a network of national and local environmental NGOs which grew out of an increasing recognition that Irish National Forestry policy was unacceptable to many concerned with the conservation of Ireland's natural heritage.

An Taisce is a member of the International Forest Stewardship Council.

We are also represented on the steering group of the Irish Forestry Certification Initiative. An Taisce is also represented on the Woodlands of Ireland steering group, a partnership for all those interested in native woodland conservation whose objectives are to develop strategies aimed at securing the sustainable management of Ireland's semi-natural woodlands and to encourage the restoration of

degraded semi-natural woods. The Native Woodland Scheme launched in October 2001 operated by the Forest Service has built on the proposals originally drawn up by the Woodlands of Ireland in 1999.

I am the Natural Environment Officer with An Taisce and one of my roles is the monitoring and assessment of the operation of the new forestry consent system in place since the end of 2001, to which I now turn.

PURPOSES OF NEW FORESTRY REGULATORY FRAMEWORK

The new Forestry Consent System came into effect on the 10th December 2001 via the Local Government (Planning and Development) (Amendment) Regulations, 2001² and the European Communities (Environmental Impact Assessment) Regulations, 2001.³

One of the purposes of the new regulations is to facilitate compliance with the European Court of Justice ruling of 21st September 1999. This found that the EIA thresholds adopted by Ireland for initial afforestation exceeded the discretion available to Ireland under the Directive as it did not take into account the "nature, location or cumulative effects of projects below this threshold".

“The absolute nature of the thresholds means that it is not possible to ensure that every project likely to have significant effects on the environment is subject to an impact assessment, because the mere fact that a project does not reach the threshold is not sufficient for it not to be subject to such an assessment regardless of its other characteristics. Under Article 4(2) of the Directive, however, account must be taken of all the characteristics of a project, not the single factor of size or capacity. Furthermore, Article 2(1) refers to a project’s nature and location as criteria for assessing whether it is likely to have significant environmental effects.”

The original transposition of the EIA Directive in Ireland laid down a threshold of 200 hectares below which an EIA was not a mandatory requirement. Following pressure from the ECJ and European Commission this was subsequently lowered to 70 hectares, and finally to 50 hectares under the 2001 regulations.

Before the introduction of the new regulations, initial afforestation was covered by planning legislation, meaning that permission had to be sought from local planning authorities for afforestation of 200 hectares. Permission also had to be sought for the replacement of high woodland with conifers. All other forestry was exempted development.

The new regulations remove 'afforestation' as development from the remit of the planning authorities and place the consent system with the Department of Communications, Marine and Natural Resources instead. Heretofore, planning permission and EIA was required for planting projects of 200 hectares or more. This threshold excluded the vast majority of projects from environmental and planning controls. Now permission must be sought from the Department's forest service for all plans for 'initial afforestation' and EIA submitted for all above 50 hectares.

An Taisce advised in their 1995 *Ireland's forested future* that planning control was not the ideal mechanism for the majority of planting projects because many local authorities have limited expertise in forestry matters in addition to over-stretched planning departments.

In fact, the system virtually collapsed during the period 1996 – 1999. The applications referred to local authorities for comment rose from an average of 372 in 1996 to 790 in 1999.⁴ Recommendations for refusals, however, fell from 90 to 14, reflecting not a better quality of application but insufficient resources to properly assess the growing workload.

² S.I. no 539 of 2001

³ S.I. no 538 of 2001

⁴ Irish CAP Rural Development Plan. Draft 1999.

While the reduction in the EIA threshold is welcomed by An Taisce, it may be interesting though to see if the cloth is being cut to fit the coat, as no EIS has yet been submitted to An Taisce for comment. The Forest Service stated to us that once an applicant realises that an EIS is required that they normally withdraw their application. It is unclear whether this is due to the additional cost involved or an impression by the applicant that a negative decision on their application would result if all the environmental consequences of their application were laid before the Forest Service. Five weeks are allowed for comment on an EIS.

A provision also exists for an EIS to be requested for a sub-threshold application where the Minister considers that the proposed afforestation would be likely to have significant effects on the environment.

An Taisce believes that this provision, which is a direct result of the 1999 Judgement of the Court referred to earlier, should be used more than at present. We are not aware of it being invoked to date, although many of the applications we have seen seek additional coniferous plantations in already heavily forested catchments and some applications are for 49 or 48 hectares.

WORKING OF THE NEW CONSENT SYSTEM

The Forestry Consent System places an obligation on a person intending to undertake afforestation to make an application to the Minister for Communications, Marine and Natural Resources.⁵ The application must be submitted on the application form specified by the Department and contain particulars such as the location of proposed planting and ownership as well as land classification and status and whether an access road to the plantation exists.

The application form lists as silvicultural considerations, whether or not the land is suitable for 10% broadleaf forestry.

Environmental Considerations examine issues such as water quality and sensitive fisheries, in addition to designated habitats, archaeology and landscape. It is this section which determines the public consultation phase and targeted consultation with prescribed bodies such as An Taisce. I will return to this topic later.

Page 4 of the application form outlines the species proposed for planting and their area, as well as plant age, size, diameter and estimated yield. Site information such as soil type, elevation, aspect and exposure are also provided and current vegetation type listed.

Operational proposals for the management of the plantation must also be provided, including details on stocking, spacing, fertiliser applications, fencing and access.

Applicants must also have regard to the National Forest Standard, Code of Best Forest Practice and the environmental guidelines on biodiversity, water quality, landscape, archaeology and harvesting published by the Forest Service, as the Minister must have regard to these when determining the applications.⁶

Provision for consultation with the general public and also with prescribed bodies is provided by the legislation.⁷ The consultation mechanism does not kick in automatically by virtue of the receipt of an application for afforestation by the Forest Service. Rather it depends on a number of criteria being fulfilled. According to the legislation:

- The Environmental Protection Agency and the Fisheries Board are consulted where the proposed afforestation might cause significant acidification of waters.
- Duchas, the Heritage Service is consulted where it appears that the proposed planting might have significant effects in relation to nature conservation.

⁵ Article 8, Part V, S.I. no 538 of 2001

⁶ Article 12, Part V, S.I. no 538 of 2001

⁷ Article 10, Part V, S.I. no 538 of 2001

- Duchas and An Taisce are to be consulted where it appears that the proposals might have significant effect on an archaeological site or feature.
- The local authority, Bord Failte - The Tourism Board and An Taisce are to be consulted where the afforestation might be situated in an area of special amenity.

Notwithstanding these specifics, the Minister may undertake any consultation in relation to any application which he or she considers appropriate. Prescribed bodies are allowed four weeks to comment on applications.

An Taisce is of the opinion that these consultation roles should have mirrored the roles as outlined in the planning acts for the various authorities, which for An Taisce cover amenity, archaeology, architectural heritage and nature conservation, instead of limiting the applications received by us by archaeology and amenity.

An Taisce does not limit, however, comments submitted to the Forest Service on any application to these two areas and will comment on the totality of the application where appropriate⁸. Our comments have included comments on acid sensitive areas, water quality, designated nature conservation areas, cumulative impacts of forestry plantations, as well as the compliance of the application with the Forestry guidelines themselves.

An Taisce does not consider this to be a duplication of effort which may be provided by other authorities but the continuance of our approach to examine all applications received by us under any of the consent systems from the perspective of sustainable development.

The way in which the consultation mechanism has been operated has caused us some concern.

The Forest Service has limited public consultation to applications within a designated nature conservation area; sites containing an archaeological feature with intensive public usage and sites within a prime scenic area or within a site listed in the Inventory of Outstanding Landscapes.

Areas that have been omitted by this approach are water quality considerations including those for fisheries, impacts on Special Areas of Conservation not directly proposed for planting, non-designated important landscapes and listed or adjoining archaeological features not intensively used by the public.

In addition to these restrictions, the public consultation period is short, only three weeks from the date of notification in a local newspaper. This is considerably shorter than the consultation period for planning applications which is five weeks under the Planning and Development Acts.

An Taisce supports the Aarhus Convention, an important element for furthering the Agenda 21 principles enshrined in Rio. This Convention advocates public participation which is timely, effective, adequate and formal and which contains information, notification, dialogue, consideration and response. Given the huge spatial and environmental changes that can result from afforestation, real efforts must be made to ensure effective public participation.

Public participation can also involve a targeted approach to outreach groups such as An Taisce, but here too there have been flaws in the manner of implementation. One of the key elements of consultation is formality so that the party making the submission knows that their submission is being considered. The receipt of a response is equally important so that the consultee knows their comments are received and are on file⁹. Finally, there is information as to the outcome and the transmission of this the consultee party.¹⁰ These elements are enshrined in the Regulations.

The Minister is under an obligation to acknowledge in writing the receipt of any submission or observation received.

The Minister when making the decision on the application shall have regard to any written submission or observation concerning the proposed afforestation. Notification of the decision on an application

⁸ See Appendix I

⁹ s.10(4), Part v, S.I. no 538 of 2001

¹⁰ s.13, Part V, S.I. no 538 of 2001

shall be given to any person who made a submission on that application, including the nature of the decision, its date, any conditions attached to an approval and the main reasons on which the decision is based and reasons for any attached conditions.¹¹

With regard to submissions made by An Taisce, these requirements have not been met. During negotiations with the Department, we found that despite the fact that we were notified of these applications by virtue of our role under the legislation, the Forest Service had not processed our submissions as formal submissions under the legislation and had not informed us of the decisions made in the relevant case in accordance with the Regulations.

CONCLUSION AND RECOMMENDATIONS

In conclusion, An Taisce welcomes the new forestry consent system and the improvements to spatial planning decisions which it should bring if implemented properly. Despite our reservations, in our opinion these improvements are:

1. Permission is now required for all initial afforestation proposals.
2. The reduction in EIA thresholds for forestry to 50 hectares.
3. The possibility of sub-threshold EIA.
4. The introduction of a public consultation mechanism for forestry proposals below 200 hectares.
5. The Minister must have regard to the forestry environmental guidelines when making decisions.
6. The reasons for the decisions must be provided.

However, there do remain improvements that An Taisce would like to see. These include:

1. Strict adherence by the Forest Service to the new legislation to facilitate confidence and transparency in the new system.
2. Closer regard to the notification, response and notification of decision requirements.
3. EIS should be sought from applicants where significant environmental impacts may result from proposals. This must include cumulative impacts, vulnerable catchments and impacts on Special Areas of Conservation as per Article 6 of the Habitats Directive. It may be useful if guidance was provided in this regard.
4. The completion by all Local Authorities of indicative forestry strategies to provide guidance to applicants and the Forest Service with regard to overall planning frameworks.
5. The absence of an appeals procedure should be re-examined and in the light of all other consent procedures in the country on spatial planning decisions.

Finally, it must be noted that no funding is being made available to An Taisce to fulfil its role under the new legislation. Neither the Forest Service itself, with its new responsibilities for public and targeted consultation nor An Taisce, The National Trust can be expected to take on these arduous and demanding responsibilities without the financial support that in the end will ensure proper implementation of the new regulatory framework for sustainable Irish forestry.

¹¹ s.13, Part V, S.I. no 538 of 2001

Appendix

Submissions made by An Taisce on forestry applications to end June 2002

	COUNTY	AREA (has)	CONTRACT NUMBER	SUBMISSION BY AN TAISCE	DECISION	COMMENTS FROM FS	NHA / SAC	AN TAISCE COMMENTS / OBJECTIONS
1	TIPPERARY	18.2	30376	30/01/02	P			No application form provided. Only maps.
2	DONEGAL	13.2	31227	30/01/02	A	No watercourses on site to allow acid sensitive testing		No ABE Acid sensitive area
3	MONAGHAN	2.74	31346	30/01/02	A			No ABE, open space of retained habitat
4	OFFALY	40.5	31369	30/01/02	A	Approval was conditional on extended buffer zone		Ringfort located on map. No mention on application form. CDP - area of special control and special view Proximity to Offaly Way 2.5% for ABE not marked on map
5	KERRY	16.5	30448	30/01/02	A			Inconsistencies re figures provided No cultivation plan No silt traps marked No ABE or 15% Acid sensitive area
6	LIMERICK	16.6	31379	30/01/02	R			No ABE or 15% No habitat retention or open space Located between two tribs of Bilboa River - no buffer zone No silt traps marked
7	LAOIS	6.7	31507	30/01/02	A			
8	CORK	13.1	31518	30/01/02	A			Drainage falling towards river, aquatic zone marked as collector drain. No open space No retained habitats Archaeological standing stone - non-compliance with guidelines re same.
9	WICKLOW	5	28436	30/01/02	A	Planting not allowed on pNHA. Application rec prior to acid sensitive protocol. AT advice re Glencree R. noted	SAC	Within Wicklow Mts SAC (2122). No assessment in a/c article 6. Acid sensitive area Glencree River No ABE Not noted as within SAC on application form

	COUNTY	AREA (has)	CONTRACT NUMBER	SUBMISSION BY AN TAISCE	DECISION	COMMENTS FROM FS	NHA / SAC	AN TAISCE COMMENTS / OBJECTIONS
10	DONEGAL	20	31018	06/02/02	R			Implications for water quality (R.Inn, R.Alt and Lough Inn) No ABE No cultivation plan / map Fisheries sensitive area
11	LAOIS	17	30374	06/02/02	A	Cleared with Fisheries Board and County Council		No ABE, open space or retained habitat Trib of Tonet R, cuts through site - no buffer zone around aquatic zone Page 3 - silvicultural considerations not completed
12	LAOIS	11	30767	06/02/02	A			No ABE No open space Silt traps not marked Located beside heavily forested area
13	CLARE	13	30774	06/02/02	R			CDP- visually sensitive area (Cliffs of Moher) No ABE No habitat retention or open space No cultivation plan / map Page 3 - silvicultural considerations not completed
14	CORK	9.92	30854	06/02/02	R			Tribes of Awbeg River (which is SAC) runs through site No ABE, 15%, open space or retained habitat No cultivation map / plan
15	CORK	8	30970	06/02/02	A	Species changed to broadleaves. Duchas advice was to allow planting,	SAC	Located in SAC 2131 Awbeg River No assess in a/c with article 6 No ABE or 15% No cultivation plan /map
16	GALWAY	0.6	30987	06/02/02	A			No ABE, habitat retention or open space No cultivation map / plan Heavily forested area
17	CLARE	2.4	31225	06/02/02	A			No ABE No 15% or open space or retained habitats No cultivation map/plan Adjacent to existing forestry

	COUNTY	AREA (has)	CONTRACT NUMBER	SUBMISSION BY AN TAISCE	DECISION	COMMENTS FROM FS	NHA / SAC	AN TAISCE COMMENTS / OBJECTIONS
18	WEXFORD	6.1	31323	06/02/02	A			No ABE, 15% or open space No cultivation map / plan Houses located on access road
19	WEXFORD	33.6	31446	06/02/02	A	Species changed. Approval conditional on Ringfort buffer zone.		No ABE, no 15% Ringfort on site Silt traps located beside ringfort
20	WICKLOW	10.9	31485	06/02/02	P			No ABE or 15% Two tribs of Little Slarr River cross site No cultivation plan No silt traps
21	KERRY	12.69	29687	26/02/02	P			
22	LAOIS	42.55	30077	26/02/02	A			
23	TIPPERARY	147	32528	15/05/02	P	Joint inspection with Duchas. Refusal likely. EIA and planning would be required in any event.		No EIA / EIS. Non-compliance with NFC / FSG No open space provision Existing habitat not mapped No adherence to road planning guidelines. No buffer zones adjacent to watercourses.
24	DONEGAL	34	32537	16/05/02	P			Adjacent to application 32303, area 26.4. Cumulative impacts. EIS should have been requested.
25	TIPPERARY	48	32568	16/05/02	P			Lodged by same applicant as 32528. Same heavily forested area/ Plot referred to as plot no 3. (plots 1&2 are app. 32528) Cumulative impact = 200 hectares/ Non-compliance with Forest Biod. Guidelines Non-compliance with WQ guidelines - no buffer zones.
26	DONEGAL	10.4	31027	29/02/02	A			
27	TIPPERARY	17.1	30867	29/02/02	A			
28	CLARE	8.44	30966	29/02/02	P			

Key to table:

FS = Forest Service, Department of Communications, Marine and Natural Resources

ABE = Areas for Biodiversity Enhancement

Decisions: A = Approval, P= Pending, R = refusal

NFC= National Forest Code

FSG= Forest Service Guidelines

WQ= Water Quality

SAC= Special Area of Conservation

Local and site planning

Under this topic the following papers were presented:

Mrs. Katerina Trejbalova (Czech Republic) on The Czech Republic: Current Situation and Experiences in the Field of Afforestation

Mr. Damian Allen and Mr. Séamus Dunne (Ireland) on Indicative Forest Strategies: The Irish Experience

Mr. Tim O'Brien (Ireland) on Private Afforestation in Ireland

Mr. Richard H. Ramsauer (Austria) on A Comparison of Central European and Irish Forestry

Mr. Donald Whelan (Ireland) on Irish Timber Growers Association - Representing and Supporting Woodland Owners Through Practical Initiatives

Mr. Stanislaw Dabrowski (Poland) on The National Programme for the Augmentation of Forest Cover and its Implementation in the Region of Warmia and Mazury

Mr. Tony Mannion (Ireland) on The Society of Irish Foresters - The Voice of the Irish Forest Industry Profession

Mr. Donald Fitzpatrick (Ireland) on The Contractors' views on Afforestation in the context of Certification and Sustainable Forest Management (SFM)

THE CZECH REPUBLIC: CURRENT SITUATION AND EXPERIENCES IN THE FIELD OF AFFORESTATION

Mrs. Katerina Trejbalova, Forestry Division , Ministry of Agriculture, the Czech Republic

SUMMARY

The afforestation of agricultural land and the protection of young stands in the Czech Republic have been the subject of state subsidies and aids for a number of years. These supports are direct and non-returnable. Approximately 3,750 hectares were afforested during the period 1994-2000. Over 170 million CZK were paid for the afforestation of agricultural land and the protection of young plantations. Support rules (2002) for the afforestation of agricultural land were laid down in Government Regulation No. 505/2000 Coll. on aids and assistance amended by Government Regulation No. 500/2001. Current support covers direct costs and some overhead costs.

Aids and assistance for the afforestation of agricultural land in the Czech Republic during the period 1994 to 2000 were as follows.

Ownership	1994		1995		1996		1997		1998		1999		2000	
	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK
Private	287	12 907	507	21 448	519	20 946	306	11 843	283	13 402	324	15 669	616	28 810
Communal	12	461	57	3 018	107	5 304	88	4 086	116	6 315	161	9 006	283	16 345
Other	0	0	3	169	24	1 042	39	1 203	4	266	8	530	9	808
Total	299	13 368	567	24 635	650	27 292	433	17 132	403	19 983	493	25 205	908	45 963

According to Government Regulation No. 505/2000 Coll. (as amended by later acts), state subsidies are currently granted for:

- first afforestation;
- repair planting (up to a maximum of 30% of plants used during initial afforestation);
- the installation of exclusion fences; and
- the protection of plantations against vegetation competition and animals.

Two new afforestation measures are currently being prepared which will apply after the planned accession of the Czech Republic to the European Union. The first focuses on the afforestation of agricultural land and is based on Article 31 of Council Regulation No. 1257/1999. This objective is included in the Czech Rural Development Plan. The second focuses on the afforestation of non-farm land and is a part of the Czech rural development components of Structural Funds programmes.

La République tchèque: situation actuelle et expérience en matière de boisement

Exposé de M^{me} Andrea Pondelickova et M^{me} Katerina Trejbalova

Résumé

En République tchèque, le boisement de terres agricoles et la protection des jeunes formations arborées bénéficient, depuis plusieurs années, de subventions et d'aides de l'État. Ces aides sont directes et octroyées à fonds perdus. Pendant la période 1994-2000, quelque 3 750 hectares ont été boisés. Plus de 170 millions de couronnes tchèques ont été versées pour le boisement de terres agricoles et la protection de jeunes plantations. Les règles (2002) qui régissent les aides au boisement des terres agricoles ont été édictées par le Gouvernement dans son Règlement n° 505/2000 relatif aux aides à l'assistance, modifié par le Règlement n° 500/2001. Le soutien actuel couvre les coûts directs et certains frais généraux.

Pendant la période comprise entre 1994 et 2000, les aides et l'assistance au boisement des terres agricoles en République tchèque ont été les suivantes:

Propriété	1994		1995		1996		1997		1998		1999		2000	
	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK	ha	1 000 CZK
Privée	28 7	12 907	507	21 448	519	20 946	306	11 843	283	13 402	324	15 669	616	28 810
Communale	12	461	57	3 018	107	5 304	88	4 086	116	6 315	161	9 006	283	16 345
Autre	0	0	3	169	24	1 042	39	1 203	4	266	8	530	9	808
Total	29 9	13 368	567	24 635	650	27 292	433	17 132	403	19 983	493	25 205	908	45 963

En vertu du Règlement n° 505/2000 (tel que modifié par les instruments ultérieurs), des subventions sont actuellement accordées par l'État pour:

- Le premier boisement;
- Les plantations de réparation (jusqu'à un maximum de 30 % de plantes utilisées lors du premier boisement);
- La pose de clôtures;
- La protection des plantations contre les végétaux concurrents et les animaux.

Deux nouvelles mesures relatives au boisement sont en cours d'élaboration; elles s'appliqueront après l'adhésion prévue de la République tchèque à l'Union européenne. La première porte sur le boisement des terres agricoles et se fonde sur l'article 31 du règlement n° 1257/1999 du Conseil. Cet objectif figure dans les Plan national de développement rural. La seconde porte sur le boisement des terres non agricoles et s'inscrit dans le cadre du volet des programmes de fonds structurels consacré au développement rural de la République tchèque.

Чешская Республика: Нынешняя ситуация и опыт в области облесения

Основной документ, подготовленный г-жой Андреа Понделиковой
и г-жой Катериной Трейбаловой

Резюме

На облесение сельскохозяйственных земель и защиту молодых лесопосадок в Чешской Республике вот уже многие годы выделяются государственные субсидии и помощь. Эта помощь является прямой и невозвратной. В период 1994–2000 годов приблизительно 3 750 гектаров земель были засажены лесами. На облесение сельскохозяйственных земель и защиту молодых лесонасаждений было израсходовано свыше 170 млн. чешских крон.

Процедуры поддержки мероприятий по облесению сельскохозяйственных земель (2000) были изложены в постановлении № 505/2000 Coll. правительства об оказании помощи и поддержке мероприятий по облесению с внесенными в него изменениями постановлением правительства № 500/2001. Нынешняя поддержка предусматривает покрытие прямых затрат и части накладных затрат.

На оказание помощи и проведение мероприятий по облесению сельскохозяйственных земель в Чешской Республике в период 1994–2000 годов было выделено:

Владение	1994		1995		1996		1997		1998		1999		2000	
	га	1000 ЧК	га	1000 ЧК	га	1000 ЧК	га	1000 ЧК	га	1000 ЧК	га	1000 ЧК	га	1000 ЧК
Частные	287	12 907	50 7	21 448	51 9	20 946	30 6	11 843	283	13 402	324	15 669	616	28 810
Общественные	12	461	57	3 018	10 7	5 304	88	4 086	116	6 315	161	9 006	283	16 345
Прочие	0	0	3	169	24	1 042	39	1 203	4	266	8	530	9	808
Всего	299	13 368	56 7	24 635	65 0	27 292	43 3	17 132	403	19 983	493	25 205	908	45 963

В соответствии с постановлением № 505/2000 Coll. правительства (с внесенными в него более поздними актами поправками), государственные субсидии в настоящее время выделяются на:

- первоначальное облесение;
- посадку деревьев с целью восстановления леса (максимум до 30% деревьев, использованных в процессе первоначального облесения);
- установку заграждений; и
- защиту лесонасаждений от других растений и от животных.

В настоящее время готовится две новые меры по облесению, которые будут применяться после запланированного вступления Чешской Республики в Европейский союз. Первая из них направлена на облесение сельскохозяйственных земель и основана на положении Совета ЕС № 1257/1999. Эта мера включена в Чешский план развития сельскохозяйственных районов. Вторая мера направлена на облесение не сельскохозяйственных земель и является частью Чешского плана развития районов, включенных в программы Структурных фондов.

SHARE OF FOREST LAND

The total forest area covering the territory of what is known as the Czech Republic now was for the first time surveyed in 1790 under the Joseph's cadastre and amounted to 1,974,000 ha (which was approximately 25 % of the total area). Figures from 1839 reported already 2,267,000 ha. Between 1920 and 1960 the forest area increased by about 10 % and it covers 2,634,000 ha at the present time.

FOREST OWNERSHIP CHANGES

There were only 9,000 ha or 0.5 % of state forests in 1918 when the Czechoslovak Republic was established. On the contrary 99.6 % of forests were in state hands at the end of the nineteen eighties. The Act No. 229/1991 Coll. was the main tool of the process of restitution after the "velvet revolution" in 1989 (collapse of communism). The table depicts the development of ownership changes. Only the smaller part of disputable claims has not yet been resolved because of unclear conditions - some of them must be adjudicated by the courts.

Changes in forest ownership in % of forest land		
Forests	Year	
	1990	2001 (+/- change)
State	95.8	61.5 (- 34.3)
Communities and regions	-	14.6 (+ 14.6)
Church	-	-
Forest co-operatives	-	0.9 (+ 0.9)
Other private	0,1	23.0 (+ 22.9)
Co-operative farms	4,1	- (- 4.1)

A political decision must be taken on the restitution of church forests (about 170,000 ha or 6.5 % of the total forest area). There is a need to settle ownership issues arising in the restoration of proprietary rights of communities and to promote grouping of forest holdings by purchase, sale, barter, gift and estate arrangements.

SPECIES COMPOSITION OF FORESTS AND PROPORTION OF BROADLEAVES

The present tree species composition of forests is the result of efforts of past generations of foresters to satisfy the then major social requirement – demand for balanced, maximum possible production of high-quality timber. Relatively high growing stock of timber, its good quality as well as the area of forests are proof that these purposeful attempts were successful. After the first experience with the problems caused by unilateral reduction of tree species composition in favour of the most productive species, as far back as the 19th century there were attempts to find out how to achieve a greater stability of forest stands by both technical methods (spatial arrangements of the forest, stand tending) and reintroduction of stabilizing broadleaved tree species. Over the past fifty years, the proportion of broadleaved tree species in Czech forests has almost doubled and has risen from 12.5% to 22.3%.

Forests have to be managed in such a way that all their functions (including production function - i.e. resource of renewable raw material) are fulfilled. Species composition has to be adapted to local growth conditions and social requirements, among those is the enlargement of biological diversity of forest ecosystems. Greater biological diversity substantially enhances both the static and ecological stability of forests and gives a good chance for its safeguarding even in the case of considerable changes in growth conditions as a result of anthropogenic or natural impacts. The proposals of tree species composition for reforestation contained in the regional forest development plans are therefore an optimal compromise between the requirements for increased ecological stability of the forest and continuous fulfilment of all its functions.

In view of the duration of the rotation period, the changes in tree species composition will be a long-term process. Fundamental changes in tree species composition of forests may be achieved without unreasonable economic losses and costs not sooner than after one to two rotation periods (100-200 years) of systematic, purposeful effort.

GROWING STOCK VOLUME

The growing stock volume of Czech forests was about 630 mill. m³ in 2000 (564 mil m³ in 1990). The continuous growth in growing stock volume is largely caused by the fact that above-normal age groups have been reaching their most productive age and at the same time the average age of tree species has been increasing. Part of the increment can probably be explained by the general trend of increasing increments reported all over Europe.

Growing Stock Volume					
1950	1960	1970	1980	1990	2000
322	348	445	536	564	631

FOREST REGENERATION AND REFORESTATION

The gradual transition from the management of even-aged stands to a shelterwood system has caused a drop in the area of regenerated stands since 1990. On the other hand, the success rate of reforestation has significantly increased. Since 1990, the proportion of coniferous tree species in regeneration has been falling. The area planted with Norway spruce has decreased to almost a half, and with European larch to a third. On the contrary, the area reforested with fir has increased. Similarly, the area planted with oak and beech has risen too while the areas of other broadleaved species have been decreasing. The extent of natural regeneration has been gradually rising since 1990.

Forest regeneration and reforestation (ha)				
Method of regeneration	1990	1995	2000	2001
Artificial	33,615	30,128	21,867	18,914
of which: Repeated	9,635	12,760	4,371	3,934
Natural	908	1,163	3,422	2,944
Total	34,523	31,291	25,289	21,858

SALVAGE FELLINGS BY AGENTS IN MILL. M3

In 2000 overall salvage fellings caused by abiotic factors (wind, snow, rime, air pollution, drought and other influences) accounted for 1,986 thousand m³, which represents 13.8 per cent of total fellings in the year. As usual, the greatest share of salvage fellings can be ascribed to wind (more than 1, 450 thousands m³).

In the last decade the volume of salvage fellings was constantly decreasing. At the beginning of the 1990s the portion of salvage fellings reached more than 55 % of total fellings. In the middle of the decade it was still nearly 30 per cent. During the period of 1993 – 1995 a considerable volume of wood had to be cut as a result of the increased occurrence of bark beetle. The reason for a relatively satisfactory development in the second half of the last decade was mainly the favourable course of weather conditions in those years.

RECORDED VOLUME OF WOOD INFESTED BY BARK BEETLES IN NORWAY SPRUCE STANDS IN 1,000 M3

Among all harmful biotic factors the most important one from the long-term point of view is undoubtedly bark beetle, which infests Norway spruce stands. There was a great outbreak of the bark beetle population in the middle of the 1990s with a peak in 1995, when over 1.9 mill. m³ of wood were infested. In the last years the situation is much more favourable with about 297,000 m³ of infested wood in 2000, and 197,000 m³ of infested wood in 2001, which represents a 34-percent decrease in comparison with 2000. The most serious damage caused by bark beetle continues to occur in the Šumava and Jeseníky Mts.

DAMAGE TO FOREST STANDS CAUSED BY AIR POLLUTION

The condition of forest stands and forest soils mainly in border mountain areas of the Czech Republic heavily deteriorated during the period of massive air pollution lasting for several decades from the beginning of the second half of the 20th century. A considerable part of the damaged forests had to be prematurely felled and regenerated. With the aim of improving chemical properties of forest soil, extensive liming - over an area of nearly 80,000 ha (including repeated treatment) - was carried out in the period of 1978 - 1991. During the nineties the extent of liming was gradually decreased. But in the period of 1999-2001 the state of forest stands in some parts of The Krušné hory and Orlické hory Mts. rapidly deteriorated and a considerable shortage of magnesium and calcium was found in needles and forest land. The Resolution of the Government of the Czech Republic No. 532 of May 31, 2000 obliged the Ministry of Agriculture to provide 79 million crowns for liming and fertilizing of forests in The Krušné hory and Orlické hory Mts. In 2001 liming was carried out over an area of more than 8,000 ha.

ROLE OF FORESTRY IN NATIONAL ECONOMY (STATE IN 2000)

Unfortunately forestry does not play an important role in the national economy. The share of Gross Domestic Product is stabilized but varies by only about 0.6 to 0.7 %. There is a need to improve knowledge on how to adequately evaluate all forest functions. The total number of employees in forestry has been decreasing since 1990: Nevertheless, we believe that forestry in the broader sense could offer some more possibilities of employment in the future.

ECONOMIC SITUATION OF FOREST OWNERS

2000

The positive economic development, which started in previous years, steadily continued in the year 2000. A high demand for timber went on while prices for the major assortments stagnated. Forest

owners of all categories achieved profits on average. The indebtedness of forest owners was continuously low and the demand for credits was weak. The provision of financial aid for forest management continued to have a positive effect. It also contributed to the balanced management of the forest land of below-average quality and of some forest holdings affected by air pollution. For reasons of economy, forest owners and contractors in the forestry sector carried out further reductions in the number of employees. The year-on-year total number of employees in forestry thus fell by 3.2 % (from 33,314 to 32,264). This constant slight drop in the number of employees has not yet caused any social friction.

2001

The economic situation in the forestry sector was stable and comparable with 2000. The assumed surplus of timber coming from the calamity caused by the hurricane Lothar in western Europe had a negligible impact on prices for roundwood. Prices for the major timber assortments slightly decreased. Forest owners of all categories achieved profits on average. The year-on-year total number of employees in forestry fell by another 7.6 % (by 2,460 persons). Most of the employees were dismissed from private companies.

The average profits of all forest owners varied between 11 and 14 EUR/ha during the past three years. Whereas in 2000 (and previous years) state forests were the most successful category, in 2001 the situation has dramatically changed in favour of private owners who had achieved much higher profit (by almost 50 %) than state forests. On the other hand, it is known that profits of private owners are subjected to the highest fluctuation, which depends on owners' concrete decisions made in a certain year.

FINANCIAL SUPPORT FOR THE FORESTRY SECTOR IN MILL. EURO

Every year the government launches programmes to support management of forests, which are comparable in terms of structure to the aid provided for forest owners in the EU states. Subsidies are provided based on the article 46 paragraph 5 of the Forest Act and the prerequisites and rules for their administration are given by the *Obligatory Rules for Financial Contributions for Forest Management and Audit Method for the Utilisation thereof*, which are approved every year as the appendix to the State Budget Act.

THE AFFORESTATION OF AGRICULTURAL LAND

The afforestation of agricultural land in the Czech Republic, including the protection of stabilized young plantations, has been a constant subject of state subsidies and aids, which are direct and non-returnable, for a lot of years. In the years 1994 - 2000; 3 753 hectares were afforested, and 173 578 thousands CZK were paid away for the afforestation of agricultural land and the protection of stabilized young plantations. The rules of support for afforestation of agricultural land for the year 2001 were laid down in Government Regulation No 505/2000 Coll., on aids and assistance. Current support covers direct costs and also partially overhead costs.

Aids and assistances for afforestation of agricultural lands (1994 - 2000)

Ownership	1994		1995		1996		1997		1998		1999		2000	
	ha	1 000 EUR	ha	1 000 EUR	ha	1 000 EUR	ha	1 000 EUR	ha	1 000 EUR	ha	1 000 EUR	ha	1 000 EUR
Private	287	430,2	507	714,9	519	698,2	306	394,8	283	446,7	324	522,3	616	960,3
Comunal	12	15,4	57	100,6	107	176,8	88	136,2	116	210,5	161	300,2	283	544,8
Other	0	0	3	5,6	24	34,7	39	40,1	4	8,9	8	17,7	9	27,0
Total	299	445,6	567	821,1	650	909,7	433	571,1	403	666,1	493	840,2	908	1532,1

According to the Government Regulation No 505/2000 Coll. following state subsidies are currently granted:

- on first afforestation
- on replanting (max. 30% from plants used during first afforestation)
- fencing to plant protection
- protection of stabilized young plantations against the weed and game

For the year 2002 supports on afforestation of agricultural land were modified. Support is granted in two taxes according to site quality.

Payment for technical unit (for year 2002)

	Subject of support	Indikat.		Unit	EUR per unit type 1. ³⁾	EUR per unit type 2. ⁴⁾
1	First afforestation					
	a) soil improving and stabilizing species ¹	A	a	pc	0.26	0.19
	b) other species ²	A	b	pc	0.23	0.16
2	Replanting					
	a) soil improving and stabilizing species ¹	B	a	pc	0.23	0.16
	b) other species ²⁾	B	b	pc	0.16	0.13
3	Young plantation control					
	- weed control	C	a	ha	129	96.8
	- browsing control	C	b	ha	64.5	48
4	Fencing	D	a	km	1936	1290

¹⁾ Decree of Ministry of Agriculture no 83/1996 Coll., on preparation of plans of forest development and delimitation of management sets of stands

²⁾ Planting of willows, shrubs and plantations of Christmas trees on continual areas is not supported

³⁾⁴⁾ Payments for unit of type 1 and 2 are differenced according to site quality

INDICATIVE FOREST STRATEGIES: THE IRISH EXPERIENCE

Mr. Damian Allen, Mr. Séamus Dunne, Mr. Mark Twomey, Mr. Karl Coggins and Ms. Mary O’Leary, Forest Service, Department of Communications Marine and Natural Resources, Ireland

SUMMARY

In October 2001, the Forest Service of the Department of Communications, Marine and Natural Resources started a project to develop IFSs in Ireland. Indicative Forest Strategies are well suited to Ireland as it has one of the highest afforestation rates in the world. While the area of land under forest amounts to circa 9%, the planting targets aim to increase this figure to 17% by the year 2030.

While the time was ripe to introduce such a tool, the Forest Service had been actively encouraging SFM (Sustainable Forest Practices) practices in the industry through its enforcement of a suite of SFM documents including a Code of Best Forest Practice and a National Forest Standard published by the Forest Service in 2000. New environmental and public consultation procedures in relation to individual forestry applications also coincided with the initiation of the IFS development process.

The primary objective of the project is to produce IFSs, based largely on the Scottish model, for each administrative County. These Strategies, *inter alia*, would highlight the preferred areas of the County for new planting. The key element of the project is the process of consultation and negotiation with all the stakeholders within each county. The County Councils were identified as key partners in this process and the Forest Service has initiated the process with over half of the Councils.

Stratégies forestières possibles: l’expérience de l’Irlande

Exposé de M. Damian Allen et M. Séamus Dunne

Résumé

En octobre 2001, le Service des forêts du Ministère des communications, de la marine et des ressources naturelles a entrepris un projet visant à mettre sur pied des stratégies forestières possibles (IFS ou «indicative forest strategies») en Irlande. Les IFS sont bien adaptées à ce pays dont le taux de boisement est l’un des plus élevés du monde. Le couvert forestier représente actuellement 9 % de la superficie de l’Irlande, mais les objectifs de plantation devraient porter ce chiffre à 17 % d’ici 2030.

Il est clair que le moment était venu d’introduire ce genre d’instrument, mais le Service des forêts avait déjà encouragé activement l’adoption de pratiques de gestion durable des forêts (GDF) dans le secteur forestier en assurant la mise en application d’une série de documents sur la GDF, notamment un code de bonnes pratiques forestières et une norme forestière nationale publiés en 2000. La mise en place de nouvelles procédures de consultation environnementale et publique concernant l’application de différentes techniques de foresterie a également coïncidé avec le lancement du processus de développement des IFS.

L’objectif principal du projet est de produire, pour chaque comté administratif, des IFS, en s’inspirant essentiellement du modèle écossais. Ces stratégies permettraient entre autres d’appeler l’attention sur les zones d’un comté qui se prêtent le mieux aux nouvelles plantations. L’élément clef du projet est le processus de consultation et de négociation avec toutes les parties intéressées dans chaque comté. Les conseils de comté sont considérés comme les partenaires clefs dans ce contexte et le Service des forêts a engagé le processus en question avec plus de la moitié d’entre eux.

Стратегии развития лесного хозяйства: опыт Ирландии

Основной документ, подготовленный Дамианом Алленом и Симусем Даунном

Резюме

В октябре 2001 года Лесная служба Ирландии (министерство связи, морских и природных ресурсов) приступила к осуществлению проекта по разработке стратегий развития лесного хозяйства (СРЛХ) в Ирландии. Стратегии прекрасно подходят Ирландии, поскольку по темпам облесения она занимает одно из первых мест в мире. Хотя площадь лесного покрова страны составляет примерно 9%, в соответствии с целями облесения до 2030 года этот показатель должен возрасти до 17%.

Поскольку наступило время для введения такого инструмента, Лесная служба активно содействовала применению принципов УЛП в отрасли посредством контроля за соблюдением ряда документов по УЛП, включая Кодекс наилучшей практики Ирландии и Национальный стандарт развития лесного хозяйства, опубликованных в 2000 году. Введение новых экологических процедур и процедур публичных консультаций также совпало с началом процесса разработки СРЛХ.

Основная цель проекта заключается в разработке стратегий для каждого административного округа с использованием, главным образом, шотландской модели. Эти стратегии, в частности, должны показать, в каких районах округа предпочтительнее осуществлять новые лесопосадки. Ключевым элементом проекта является проведение консультаций и переговоров со всеми заинтересованными сторонами в каждом округе. Советы округов были определены в качестве основных партнеров в этом процессе, и Лесная служба уже начала работать с более чем половиной советов.

IRISH FORESTRY TODAY

Ireland has a favourable climate for tree growth with growth rates up to three times those in mainland Europe for conifer species. Total forest cover extends to 665,000 hectares or 9.7% of land area, the lowest proportion in the European Union, with private forests accounting for an estimated 268,000 hectares or 40% of total forests. Afforestation is now dominated by the private sector, principally farmers with an average forest holding of less than 10 hectares

The national forest estate is relatively young and disease free with more than 50% of the estate less than 20 years of age.

The annual timber production of 3 million m³ is set to increase to 5 million m³ by 2015.

There are currently approximately 16,000 people employed in Forestry related activities in Ireland. We have a modern sawmilling sector, which competes with sawnwood imports from Scandinavia, the Baltics and Canada. We are a nett exporter of wood panels, with four major panel mills producing chipboard, medium density fibreboard (MDF), orientated strand board (OSB) and moulded door facings. Over 60% of Irish forests are independently certified. More than 80% of sawn and wood panel output has chain of custody certification.

International Context

Forestry in Ireland is not a stand alone sector and has strong linkages with agriculture, environment, rural development and industry. It cannot operate in isolation and must compete in a global timber

market if it is to survive and develop in line with the increasing supply of raw material. Nor can the sector afford to ignore changes in the European and world scene which places increasing emphasis on non-timber forest products (NTFP), environmental values and public expectation of the many functions of forests e.g. recreation, protection, landscape etc.

Changes in the European and World Scene

EUROPE	Ministerial Conference for Protection of Forests in Europe:
	Strasbourg 1990 (Collaboration, genetic resources, monitoring etc)
	Helsinki 1993 (SFM, biodiversity, climate change)
	Lisbon 1998 (C+I for SFM)
	Forestry Strategy for the European Union
	European Landscape Convention (2000)
	EU Directives – Habitats, Birds, EIA Water
	Pan European Forest Certification (PEFC)
WORLD	Kyoto Protocol (1997)
	Rio Earth Summit (1992)
	Intergovernmental Panel on Forestry (IPP)
	Intergovernmental Forum on Forestry (IFF)
	UN Convention on Climate Change (UNCCC)
	Certification – Forest Stewardship Council (FSC)
	ECE/FAO Review and forecasts for timber and timber products

Legal and Regulatory Framework

The State regulatory (policy and legislation), supervisory and support (education, extension services, public awareness) functions are vested in the Forest Service, Department of Communications, Marine and Natural Resources.

From being what many would consider an under-regulated sector in the 1980s, due in the main to State self-inspection by the then Forest and Wildlife Service, the forest sector is now highly regulated and controlled. Forestry and the practice of forestry is governed by the Forestry Acts of 1946, 1956 and 1988 and ancillary legislation. The Forestry Acts of 1946, 1956 and 1988 and ancillary legislation govern forestry and the practice of forestry.

The Forest Service is a Division of the Department of Communications, Marine and Natural Resources and is responsible for the efficient and sustainable development of forestry in Ireland. Its strategic objectives are:

- To increase quality planting,
- To promote the planting of diverse species,
- To improve the level of farmer participation in forestry,
- To promote research and training in the sector, and
- To encourage increased employment in the sector.

RECENT DEVELOPMENTS IN IRISH FORESTRY

The adoption by Government of “*Growing for the Future – A Strategic Plan for the Development of the Forestry Sector in Ireland*” in 1996 saw a change in emphasis away from State to farmer planting, targets for broadleaf planting and a greater awareness of the environmental values of forestry.

The overall framework for forest policy in Ireland is set out in “*Growing for the Future A Strategic Plan for the Development of the Forestry Sector in Ireland*”. The areas covered in this plan are wide ranging and include planting policy, amenity and recreation, environment, forest protection and health, harvesting and transport, sawmilling, quality and standards, research and development, education and training and many other related areas. Strategic actions are listed for each sector included in the Plan, the implementation of which will allow forestry to achieve its critical mass. The Plan identified that in order to reach “critical mass” the national forest estate would need to increase from its current level of 9.7% to 17% of the land area. (Critical mass relates specifically to a scale of timber production large enough to make true competition and the operation of market forces possible and to support a range of processing industries.) The Strategic Plan defines how this can be achieved on a sustainable basis and in a manner which is compatible with the protection of the environment.

Perhaps the most marked change in forestry worldwide over the past decade has been the growth in support for SFM and forest certification. Forests are no longer viewed as providers of timber but rather as providers of multiple benefits including environmental, economic and social. Irish forestry has embraced the principles of SFM.

In September 2000, following an extensive consultation process, the Forest Service published a number of important policy documents which collectively seek to uphold the highest standards in the management of forestry in Ireland i.e. SFM. These were:

- The Irish National Standard
- The Code of Best Forest Practice
- Forestry and Water Quality Guidelines
- Forestry and Biodiversity Guidelines
- Forestry and Archaeology Guidelines
- Forestry and Landscape Guidelines
- Forest Harvesting and the Environment Guidelines and
- Forestry and Aerial Fertilisation Guidelines

With effect from the 1st October 2001, new procedures for the administration of afforestation applications have been introduced. As part of these new procedures, individual applications will be subject to an enhanced consultation procedure and a public consultation procedure in specified cases. A statutory appeals process will back this up. The new regime also calls for the development of an Indicative Forest Strategy for each County.

WHAT IS AN INDICATIVE FOREST STRATEGY?

An IFS is concerned with planting the right trees in the right places and will help guide the location and character of future afforestation by identifying the potential that future afforestation can make towards the establishment of high quality forests serving a variety of purposes including timber production, forest industry development, rural development and off farm incomes, tourism and the enhancement of the environment.

Along with local opinions and considerations the IFS for each County will present these issues on a single platform thereby providing easy access to all relevant information relating to forestry development in the County.

The IFS will set out the likely areas where further forests will be planted, those areas where particular care and close consultation with interested parties will be required, and the special areas where it is unlikely that planting will ever take place.

The IFS may also provide guidance and make recommendations on other forestry activities such as harvesting and haulage. The overall aim will be to guide and promote sustainable forestry within each County. The Strategy will specifically aim to support the local economy, conserve and enhance the environment, and enhance the quality of life of the people of each county.

THE THEMES

Everyone in each county now has the opportunity to help guide the future of the forestry industry through the preparation of an IFS. The final product should identify where there are opportunities for further forestry planting including some where various sensitivities mean that very careful thought may be needed about the scale, nature and extent of any new forests. It will create a strategic vision for forestry in each county and encourage investment, which will benefit the area. The issues below are circulated to all stakeholders in the County as part of a discussion document and serve to stimulate discussion by providing background information on forestry in the County and highlighting a number of key issues which have to be addressed during the preparation of the strategy. It is hoped that by working in partnership the final IFS will represent a widespread consensus amongst interested parties.

No	Themes
1	What are the future opportunities for increased forestry related employment in the county?
2	How can the IFS assist the forestry and wood processing industries in the county?
3	What potential is there for planting more new forests ?
4	What further opportunities are there in relation to farm forestry in the county?
5	How can the strategy help to promote forestry as a way of diversifying farm enterprises?
6	What opportunities are there for forestry to increase its role in the economic and social well being of rural communities in the county ?
7	What opportunities are there in the county to increase broadleaf cover and diversify the conifer mix?
8	How should an IFS protect conserve or enhance areas of outstanding beauty? What other areas of outstanding beauty, other than those already officially identified, should be recorded in the IFS?
9	In what ways might forestry enhance landscape? What Landscapes would be enhanced by new planting?
10	What role should an IFS have in protecting and improving water quality?
11	Which watercourses would benefit from the introduction of appropriate afforestation?
12	Where are the Native and Semi natural woodlands in the county and what condition are they in? How are they best protected and conserved? How can an IFS do this?
13	What is the nature and location of archaeological sites, which are not already officially recorded in the Dúchas Sites and Monuments Record? How best should they be protected? How can an IFS help?
14	What are the archaeological sites or monuments in the County that are of intense public interest?
15	How can an IFS help conserve and protect Special Areas of Conservation?
16	How can an IFS help conserve and protect Natural Heritage Areas?

17	How can an IFS help conserve and protect Special Protection Areas?
18	What local habitats, not protected under regulation, should be protected and conserved when planting new forests? How can these be identified on the ground to facilitate their conservation?
19	What areas would benefit from planting new forest or restructuring existing forests to enhance biodiversity?
20	What potential is there in the county for NeighbourWoods? What are the likely locations?
21	What level of involvement in forestry would communities like and what form might this take?
22	Are further support facilities (e.g. picnic areas, way-marked trails) required in the counties forests and if so where.
23	What opportunities are there for improving the tourism and recreation potential of the counties forests ?
24	How can forest recreation improve the health of the community?
25	What are your views on this approach?

THE PROCESS

The process below for initiating and completing an IFS is carried out in consultation with stakeholders and members of the public and agreed by the local planning authority. It is generic and is amended to suit different County Councils needs.

Discussion Document Phase

- Kick off meeting with Local Authority
- Compile forest resource statistics
- Analysis of forest cover
- Calculate employment statistics
- Calculate grant and premium payments
- Complete first draft of a Discussion Document which gives a background to current national forest policy and highlights the issues that it is hoped will be addressed in the IFS.
- Complete second draft, agreed with local Forest Service Inspector
- Issue Discussion Document to Local Authority for agreement
- Agree and sign off on Discussion Document with Local Authorities

Consultation Phase

- Compilation of Stakeholder List
- Agree Consultation process with Local Authorities
- Advertise call for written submissions in local media
- Issue Discussion Document to stakeholders
- Issue Discussion Document to Public

Completion Phase of County IFS

- Incorporate submissions received and complete first IFS draft
- Agree first Draft IFS with Local Authorities
- Issue first draft of IFS to those who made submissions

- Public Hall meeting with members of the public
- Second and final draft prepared
- IFS adopted following agreement with Local Authority

The consultation process is represented by the Figure below;



PRODUCTION OF IFS MAPS

The Forest Service and the County Council’s approach to developing the IFS will involve dividing the County into various categories according to the suitability of these areas for new forests. A productivity map of each county based on parent material, soils and other data will be used to determine at a strategic level the productive potential distribution within a county. The potential sensitivities and consequent level of consultation required for individual forestry applications will be determined on the basis of various environmental constraints. The following table lists the categories being proposed and the type of consultation process that may be required. The table also shows the maps that represent the various environmental constraints that trigger the consultation process described.

Category	Consultation Process	Environmental Constraints (Maps)
Existing Forestry	N/A	Forest Service Inventory data
Areas Preferred for Forestry	Consultation with Dúchas required where there is an archaeological site or monument either recorded or unrecorded.	These are areas with no environmental constraints and therefore no maps, (with the exception of Archaeological sites or monuments which are represented at site level).
Potential areas for Forestry	Before being approved consultation must take place with one or more prescribed bodies, which may include Fisheries Boards, Dúchas, EPA and is Local Authorities.	Acid sensitive areas as designated by the Forest Service, Areas sensitive for fisheries, Catchment areas of local Authority water schemes Rural Environmental Protection Scheme Areas, Archaeological sites or monuments Landscapes of high amenity
Areas Sensitive to Forestry	Public consultation will be required in these areas along with consultation with one or more prescribed bodies as described above. An Taisce and An Bord Fáilte may also be consulted.	Proposed Natural Heritage Areas, candidate Special Areas of Conservation, Special Protection Areas and National Parks, Archaeological sites or monuments with intense public interest, Prime Scenic areas identified in the County Development Plan or areas listed in the Inventory of Outstanding Landscapes

CONCLUSION

Ireland is at an early stage in the development of IFSs. It has been encouraged by experience abroad most notably in Scotland. We are committed to the process and believe that it provides a useful platform to engage with stakeholder groups as to the future direction of forestry in local areas. The availability of up to date maps in digital format is a prerequisite to the development of any IFS. It is also seen as paramount importance that the local planning authority and the forest authority each agree to the implementation of the agreed strategy.

PRIVATE AFFORESTATION IN IRELAND - PAST ACHIEVEMENTS AND FUTURE DIRECTIONS

Mr. Tim O'Brien, Green Belt Ltd., Ireland

SUMMARY

Past Achievements

Up to the early 1980s in Ireland, both the level of interest and the level of development in private afforestation were minimal. With the introduction of EU-supported incentives in 1981, the level of planting got off to a slow start, expanded rapidly from 1985 onwards, peaked in 1995 and '96, and has since dropped back 30%. However, a total of 166,000 ha of new forests were planted by the private sector over the past 20 years, which was no mean achievement.

During the 1980s the main reasons for expansion were:

- the introduction of the Western Package Scheme, grant aiding up to 85% of costs;
- 4-year Fixed Price Package to establish a forest provided by Green Belt;
- the lead given by financial institutions by investing pension funds in forestry.

During the 1990s the reasons are farmer-related:

- introduction of the Forest Premium Scheme, i.e. annual payment to farmers for 20 years;
- the Strategic Plan for the Development of the Forestry Sector in Ireland, produced by the Government to afforest an additional 10% of Ireland's land area;
- the increasing acceptance by farmers of the growing of trees as a legitimate farming activity.

While there has been substantial progress, current planting is 30-40% below targets because:

- annual premiums payable to farmers are not competitive with other schemes; and
- the Afforestation Grant Scheme and the Rural Environmental Protection Scheme (REPS) are not integrated.

Future direction

It is critical that the afforestation target of 20,000 ha per year is achieved to ensure the sustainability of the timber processing sector by:

- making annual forestry premiums competitive; and
- integrating forestry and REPS schemes.

The forests of the future should be designed to facilitate continuous cover with a greater diversity of species especially broadleaves, with the objective of achieving 50% broadleaf cover in the second rotation.

1. INTRODUCTION

In 1600 about 12.5% of Ireland was under forest, and this was reduced to 2% by 1800. By 1907, this figure was less than 1.6% and the reduction continued during the 1914 to 1918 war. Since then, many of our older private forests were allowed to fall into a state of neglect, so the history of private forestry in this country is one of exploitation rather than establishment.

It was not until the initiation of the State Afforestation Programme in the early 1920's that any substantial increase in the national forest area occurred. The expansion of State forestry up to the 1980's was not matched by the private sector and there were a number of reasons for this. Firstly, forestry was not a traditional land use and was looked upon by farmers as a last resort for poor land. Secondly, grant aid was not sufficiently attractive. And finally, with the emphasis on agricultural development in the 1970's, land owners influenced by advice and the financial supports available, retained what today would be considered 'forestry land' and so marginal for agriculture.

Up to the early 1980's both the level of interest and the level of development in private forestry was minimal. With the introduction of incentives in 1981 the level of planting got off to a slow start, expanded rapidly from 1985 onwards, peaked in 1995 and 1996 and dropped back 30% since then. However, a total of 166,000 Ha of new forests were planted by the private sector over the past twenty years, which was a huge achievement.

In the Irish General Election last May the outgoing government were re-elected using the slogan "A Lot Done – More to do". This slogan very aptly describes the current state of the Private Afforestation Sector – a lot has been done over the past twenty years but there is a lot more to do over the next twenty. In this paper I want to look at:

- The achievements of the past twenty years,
- Identify the main reasons for the expansion in private planting,
- Examine why national afforestation targets are not being achieved, and
- Future direction for private afforestation.

2. THE ACHIEVEMENTS OF THE PAST 20 YEARS

- Over 15,000 Ha were planted by the Private Sector in 2001. Twenty years ago, in 1982 only 187 Ha were planted. A total of 166,000 Ha were planted over these 20 years.
- During the 1980's planting by the Private Sector was virtually 100% Conifer. Broadleaf planting over recent years averaged 14% plus an additional 5% for amenity and landscaping.
- Sitka Spruce and Lodgepole Pine were the dominant species in the 80's. Today the percentage of Sitka Spruce planted is less than 50%.
- Most of the trees planted during the 1980's were imported from Britain and mainland Europe. Over 90% of trees planted in recent years were grown in Ireland.
- Less than ten foresters were employed by the Private Management Contracting Companies up to the late 1980's. Today, over one hundred foresters are either working for Private Companies or as Consultants to the Private Sector.
- Agricultural contractors who worked for farmers draining and reclaiming land up to the mid 1980's are now doing ground preparation for the Private Forestry Sector.
- Fencing and Planting Contractors have grown in experience and skills and are providing an excellent service.
- The Private Afforestation Sector went through a phase of very rapid expansion up to the mid 1990's. Since then it has consolidated its position and is now well positioned to provide an

excellent service to farmers to afforest 20,000 Ha. per year plus maintenance and on-going management.

3. THE MAIN REASONS FOR THE EXPANSION OF PRIVATE PLANTING

If one were to label the private forestry of the 1980's it could be described as "Investment Forestry" and the decade of the 1990's as "Farmer Forestry" and the reasons for expansion in both decades are different.

3.1. The main reasons for expansion of private planting in the 1980's

The main reasons for the expansion of private planting in the 1980's were; (1) introduction of the Western Package; (2) Four Year Fixed Price Package and (3) The favourable direction shown by the Financial Institutions.

3.1.1. Introduction of Western Package

The long term nature of the investment for forestry requires the support of grants and tax incentives to compete with other investment opportunities. For the first time in the history of the State a realistic and very attractive grant scheme was introduced in 1981, partly funded by the E.U. and known as the Western Package Scheme. A grant level of 85% of the costs of planting were applied to farmers and 70% to others, of which 75% was payable in Year 1 and 25% payable in Year 4. This amount was substantially higher, and the four year retention shorter, than the State grant. The only negative aspect was that it was limited to the twelve Western counties. As a result, 85% of the private planting in the 1980's was carried out in the western half of the country.

Receiving 85% grant was attractive to farmers and for the institutional and private sector, funding only 30% of the development cost plus the cost of the land would give a tax free return on investment of 5% to 7% plus inflation. For the first time, forestry was being considered as an alternative investment opportunity by a growing number of pension fund managers and private individuals. Despite the initial slow uptake, the Western Package grants were responsible for farmers and investors taking a new look at forestry investment. Thus, making a major contribution to the expansion of private forestry.

3.1.2. Four Year Fixed Price Package

Initially Allied Irish Bank and Irish Life Insurance Company were not prepared to invest in a green field situation. This was because they were investing pension fund money on behalf of others, and could not quantify in advance the cost of replacing failures and vegetation control. They were only interested in buying three to four year old forests, which were established, and past the risk stage. However there were very few established forest properties for sale in the mid 1980s. AIB and Irish Life had money to invest in forestry, Green Belt had the expertise to buy land and establish forests but no money, so it required some original thinking to come up with a solution.

Green Belt was set up in 1982 by Mossie Ryan and Tim O'Brien. The situation in Britain was examined the situation in Britain where Pension Funds invested only in established forests. These forests had been planted by private investors with the help of relatively small grants and very generous incentives for high tax payers. The small investors were not inclined to invest in forestry due to the higher than estimated costs for replacing failures. However, this problem did not arise for the large investors because on certain sites costs were averaged out over the full planting season and over a number of sites and years.

Green Belt re-assessed the situation in Ireland and concluded that if investors were prepared to invest in a large number of sites that forestry would be a safer alternative investment. Thus, by having a large portfolio of diverse sites, good quality trees and thorough management the risk factor for investors could be substantially reduced.

Green Belt presented this proposal to AIB and Irish Life Insurance Company. They convinced both institutions that they were prepared to take all the risk and the concept of a four year fixed price

contract was agreed. Green Belt now had a complete package for investors involving land acquisition, development, planting, maintenance, management and insurance. Green Belt funded both phases of the grant over a four year period. In addition to the legal contract the investor had the comfort of knowing that Green Belt had to wait four years for the second phase of the grant and the initial investment costs were agreed up front.

The four year package became our strongest selling point and I am glad to say that the “Green Belt Package” is now adopted by most responsible contractors, and the private forestry sector is now in a much healthier position because of it. The Green Belt Package also made a major contribution to the development and expansion of the company. From small beginnings and a slow start in 1982, Green Belt is now the largest private forestry company in the country, with one third market share, employing 25 foresters and operating countrywide.

3.1.3. Financial Institutions Gave a Lead

The rapid expansion of private forestry from 1985 onwards must be attributed to the lead given by AIB and Irish Life. When others were not as open minded to new investment opportunities, these institutions recognised the potential and the suitability of pension fund money to finance a long term investment like forestry. Both organisations appointed professional consultants to analyse and appraise the specific proposals put forward by the private forestry companies, and only invested if the real minimal rate of return was likely to exceed 5%. They insisted on the highest standards of development and planting and successfully marketed the investment to the trustees and managers of the various pension funds.

By their actions, they opened people’s eyes to the tremendous investment opportunities in forestry and instilled confidence in private individuals to invest. This was achieved because AIB and Irish Life were widely respected and have been an integral part of the Irish economy for years. The announcement by Smurfit Natural Resources in 1989 to invest £10m removed any doubts that were lingering at that stage and provided an outlet for private investors to sell three to four year old forests. Financial institutions accounted for about 50% of the private planting carried out in the late 1980s, with the balance made up by farmers and private individuals.

3.2 The main reasons for expansion of private planting in the 1990’s

The main reasons for the expansion of private planting in the 1990’s are: (1) Introduction of the Forest Premium Scheme; (2) Strategic Plan for the Development of the Forestry Sector in Ireland and (3) The increasing acceptance of forestry by farmers as a Legitimate farming activity.

3.2.1 Introduction of the Forest Premium Scheme

The Forest Premium Scheme was introduced in the 1990’s to compensate farmers for loss of agricultural income for twenty years. This had a major impact on farmers and continues to do so.

The circumstances which led Johnny Butterfield, a client of Green Belt’s, to establish his first forestry plantation in 1994 are similar to a lot of Irish farmers.

Johnny spent most of his life reclaiming land, growing up with the motto of Macra. The Young Farmers Organisation: “To make two blades of grass grow where one grew before”. Several factors influenced his decision; time, circumstances, the bad year of 1993, a parcel of land which was not convenient or of a quality that was economic to farm, the failure of the main farming organisation to cry halt to the ever increasing bureaucracy and the imposition of unreasonable controls and penalties on the dwindling farming sector. The old farming philosophy “To leave the world a better place because you’ve been” means a lot to Johnny and I quote him “When we realise all the dangers to humanity and the environment from pollution, and poisoning by toxic emissions of all kinds, it seems important to know that by planting a few hectares of trees we can make a contribution towards making this planet a healthier and safer place to live”. But there was one over-riding reason that influenced his decision to plant and again I quote him “A crop that could give a guaranteed tax free income through the forest premium for probably the rest of my life, as well as leaving a valuable asset for the next generation seemed ok”.

3.2.2 The Production of a Strategic Plan for the Development of the Forest Sector in Ireland

In 1996 the Department of Agriculture Food and Forestry launched a Strategic Plan for the Development of the Forestry Sector in Ireland. This report sought to increase the productive planted area of the country from less than 0.5 million Ha (7% of the land area) to almost 1.23 million Ha (17% of the land area) by 2030. This is an increase of 10% of the afforested land area of the country. The report set annual planting targets of 25,000 Ha. up to the year 2000 and 20,000 Ha per annum thereafter. While the targets were initially seen as ambitious there is a growing acceptance among farmers that they are realistic and achievable. The vast majority of farmers readily accept that 10% of most farms in the country are more suited to the growing of trees rather than any other crop. They also accept that when you consider the increasing number of full-time farmers who are taking up off-farm employment that planting an additional 10% of the land area of the country is a very realistic target.

While Private Forestry was making steady progress up to 1996 there was still doubt among a substantial number of farmers about Government commitment to the sector and in particular to farm forestry. The Strategic Plan changed all that. It was now Government Policy to transfer 10% of the land area of the country from agricultural production to forestry. Farmer involvement in forestry was specifically encouraged with the undertaking that the relativity of forestry supports to other farm supports would be maintained. Apart from clearly spelling out Government Policy the fact that it was produced by the very Department that farmers relied on over the decades for support to increase agriculture production had a big impact on farmers. The very thought of reducing agricultural output from the farm and planting trees instead, came as a shock to a lot of farmers, and the impact of the plan is still only in its infancy.

3.2.3 Increasing Acceptance of Forestry by Farmers

The increasing acceptance by farmers of the growing of trees as a legitimate farming activity was brought about mainly by: (1) Formation of a Forestry Committee within the Irish Farmers Association (IFA) and (2) Publicity for forestry in the Farmers Journal and Farming Independent

The IFA is the main organisation representing farmers in Ireland. The structure at national level is based on committees for each sector of farming, e.g. Dairy Committee, Sheep Committee etc. When the setting up of a Forestry Committee within the IFA was first proposed there was considerable opposition. The then IFA president Alan Gillis and general secretary Michael Berkery are to be congratulated on pushing the idea. Both Padraig Divilly (past chairman of the Forestry Committee) and Pat Lehane (current chairman) worked extremely hard to promote forestry at national level. The county representatives on the committee have gradually gained increasing acceptance for forestry at local level.

The Farmers Journal is a weekly paper read by the majority of farmers and the Farming Independent is a supplement published every Tuesday with the Irish Independent. Through regular contributions both Hugh Scanlan and Joe Barry have made a huge contribution to informing and educating farmers on all aspects of forestry.

In addition support from the IFA and publicity for forestry in the farming papers have led to an increasing acceptance of forestry by farmers in general.

4. WHY NATIONAL PLANTING TARGETS ARE NOT BEING ACHIEVED

While there has been substantial progress current planting is approximately 30% to 40% below targets because: (1) Annual Forestry Premiums are not competitive, (2) Competition from other Schemes, e.g. REPS and (3) the Forest Service is not a Developmental Organisation

4.1 Annual Forestry Premiums are not Competitive

Annual Premiums are payable to landowners to compensate for loss of agricultural income. The level of this payment is the major factor influencing farmers to plant all or part of their lands.

During the five years 1990 to 1994, an average of 10,000 Ha. per annum. were planted by the Private Sector. With the introduction of a new programme in May 1994 bringing the level of forestry premiums closer to supports for agriculture than they ever had been, planting in 1995 and 1996 jumped to 17,000 Ha. per annum. Presently, planting levels are 30% - 40% below the national target of 20,000 Ha. per annum because income from forestry premiums is not competitive with other land use enterprises.

At a conference on Rural Development earlier this year a leading Irish agricultural economist Brendan Kearney quantified the level of support for forestry as being less than half that for agriculture.

SUPPORT TO AGRICULTURE IS €660 PER HA

SUPPORT TO FORESTRY IS ONLY €267 PER HA

He went on to state and I quote: “Support for forestry is an important and intrinsic element in the reform of the CAP and merits equivalent status with other land using activities such as the sheep, milk, cattle and cereal enterprises”.

4.2 Competition from Other Schemes e.g. REPS

The biggest single Forest Policy mistake of the last twenty years was to make the forestry scheme and the Rural Environment Protection Scheme (REPS) exclusive. REPS is a scheme which compensates farmers for practising farming in an environmentally friendly manner. If a farmer is managing his entire farm under a REPS plan and wishes to plant part of his land, he is obliged to exclude the area being planted and draw up a new plan for the remainder of the farm. Farmers are reluctant to incur the cost involved in this exercise putting forestry at a disadvantage.

REPS was introduced in 1994, the problem for forestry was identified in 1995 and addressed in the Strategic Plan for the Development of Forestry in 1996 and I quote: “Forestry can play a very valuable role in the diversification of farm enterprises and in rural development but its attraction to farmers will depend in most circumstances on its relativity to other available land use options, other schemes and farm supports including REPS which is a strong competitor to forestry”.

A Strategic Action Plan was proposed and again I quote: “Those conditions of REPS which have the effect of creating mutual exclusivity between it and forestry will be adjusted to allow farmers, whose circumstances permit, to avail of both schemes in a complementary manner”.

This action plan was proposed six years ago and in the meantime we have failed miserably to rectify the problem. The Forest Service are aware of the problem, so are the Department of Agriculture Food & Rural Development and also the European Commission. Areas of farms suitable for forestry are currently being identified at the REPS planning stage, but this is likely to have minimal impact on the level of planting. With 70,000 farmers or more than 50% of all farmers targeted to join REPS by 2006 the problem for forestry is going to deteriorate. If the solution to the problem was identified over 6 years ago, it begs the question:

Why is it not being implemented?

4.3 Forest Service is not a Developmental Organisation

The functions of the Forest Service could broadly be divided into two main categories:

1. Regulating the forest sector and administering grant and premium schemes.
2. Developing and promoting the forest sector and its schemes.

The Civil Service structures and procedures are much more suited to regulating and controlling rather than developing, promoting and marketing, and it is unfair to expect the staff to carry out both functions equally efficiently. Over the past 20 years the main focus was on the regulatory function and the Forest Service is now highly regulated and controlled. Over the same period promoting and marketing the schemes never received the same degree of focus as the regulatory function, and this lack of focus is one of the main reasons why planting targets are not being achieved.

5. FUTURE DIRECTION FOR PRIVATE AFFORESTATION

It is critical that the afforestation target of 20,000 Ha per annum is achieved to ensure the sustainability of the timber processing sector by: (1) Making Annual Forestry Premiums competitive; (2) Integrating Forestry and REPS schemes; (3) Creating a new structure to promote and develop the forestry sector. Creating Diversity is also important. Sustainability of forests can be achieved under a continuous cover management system and a greater diversity of species.

5.1 Annual Forestry Premiums should be Competitive

It has already been stated that the main factor influencing farmers to plant land is the level of annual premiums. It is a major decision for a farmer to give up land to an irreversible crop. Unless the growing of trees is given the same support as other farm enterprises and the playing pitch levelled, national planting targets will never be achieved and the full potential of one of our main national resources will not be realised.

Under European Union regulations the maximum level of premium allowable is €724 per Ha. Current levels payable in Ireland vary from a minimum of €210 to a maximum of €499 per Ha. The mid term review of the CAP Programme 2000 – 2006 to be undertaken next year affords an opportunity to address this problem, and I am hopeful that the level of support for forestry will be made competitive with other farm enterprises for the first time ever.

5.2 Integrating Forestry and REPS Schemes

One of the objectives of the REPS scheme is to promote ways of using agricultural land which are compatible with the protection and improvement of the environment, the landscape, natural resources, soil and genetic diversity, while one of the aims of the Forestry Scheme is to contribute to forms of countryside management more compatible with environmental balance. With similar objectives, it is not logical that these two schemes should be exclusive and in competition with each other.

In my view the objectives of both schemes are complementary and would best be achieved at farm level if there was an integrated REPS/Forestry Scheme for farmers seeking to manage their farms in a more environmentally favourable way and plant part of their lands. One of Fischlers recent proposals is that cross compliance supporting the enforcement of good farming practices in relation to environment and occupational safety standards should be applied as a Whole Farm Approach. Environmental Schemes like forestry and REPS should also adopt a Whole Farm Approach. I would strongly urge the Forest Service to explore the feasibility of this proposal in advance of the Mid Term Review of CAP.

5.3 New Structure to Promote and Develop the Forestry Sector

Achieving a 20,000 HA planting programme on an annual basis will require a continuous focus, monitoring of performance, promotion and marketing of the schemes to farmers. The systems and structures under which civil servants operate are not sufficiently flexible to promote the type of innovative marketing necessary to sell the schemes to farmers. Separating the developmental role from the regulatory and administrative functions would give a new focus to the 20,000 Ha. per annum target, and I have no doubt that a new body working in partnership with the industry and the Forest Service in an open and transparent way would deliver. With a new Minister starting his term of office charged specifically by the Government to achieve the planting targets, this is an opportune time to have the proposal independently evaluated and should not be missed.

5.4 Creating Diversity

The target for broadleaf planting in 2006 has been set at 30% of overall planting. A plan to achieve this should be immediately agreed between the Forest Service and the industry and included in the Mid Term review.

In my opinion the 30% broadleaf target can be achieved by increasing the level of the broadleaf premium and the differential between conifer and broadleaf premiums, the Native Woodland Scheme and setting a compulsory broadleaf planting requirement for each site as follows:

<u>Site Type</u>	<u>Minimum Broadleaf Requirement</u>
Site Permitting Broadleaves	30%
Enclosed Land	15%
Unenclosed Land	5%

Ideally the broadleaves should be planted in groups throughout the plantation creating a diversity of species to facilitate management under a continuous cover system and providing the opportunity of achieving a 50% broadleaf cover in the second rotation.

Achieving a 50% broadleaf cover may be an option in the second rotation because of the shelter provided by continuous cover and the use of natural regeneration. Trying to achieve it in the first rotation is not sustainable either silviculturally or economically because of the quality of land currently being planted. However, 30% broadleaf cover is achievable, there is a commitment to reach by 2006, and a plan to ensure we reach the target should be implemented immediately. The consequences of not reaching 30% could be extremely serious and will call into question the level of support that may be available from the EU after 2006.

6. CONCLUSION

Private Afforestation has only been 20 years growing – “a lot has been done”. While there is “a lot more to do” over the next 20 years, with better communications, more transparency and stakeholders working in partnership, I am confident that the future will be even more successful than the past.

A COMPARISON OF CENTRAL EUROPEAN AND IRISH FORESTRY

Mr. Richard H. Ramsauer, Ramsauer Consulting, Austria

SUMMARY

In general, forestry practised in Central Europe is characterised by the following features:

- continuous forest cover since the glacial period;
- most forest lands have been under use for many generations;
- very little virgin forests;
- all trees are of local genetic origin;
- few species imported, with no real importance;
- tree mixture changed by time;
- forestry methods changed by time;
- lately less plantation of young trees – more reliance on natural regeneration;
- natural seeding methods contribute up to 50%;
- forests growing fast into poor farmland;
- movement towards original tree mixture;
- ownership structure stable for long time;
- many very small area forest owners, few big private owners and big state forests;
- biodiversity is working very well;
- several national parks founded in forest areas;
- multi-functionality working very well (economic, social, environmental);
- important source for industrial developments;
- multi-species situation creates source for many types of industries;
- important source for farm income;
- important source for recreation and tourism; and
- forestry creates a wide range of income from different land use.

From an Austrian forester's perspective, forestry in Ireland is characterised by the following:

- continuity interrupted by excessive wood use;
- forestry culture has been lost in the countryside;
- forestry mainly organised by the state;
- forestry is no real source for farmers (yet);
- no real privately-driven forestry;
- small range of wood industries, due to lack of species;
- original forest cover comprised mainly broadleaf species;

- reforestation programmes dominated by Sitka spruce;
- medium- and long-term results questionable; and
- phenotypes show obvious weakness (little stability, loss of needles, windfalls).

Some questions about Irish forestry include the following:

- where are the original species?;
- how shall Sitka spruce secure multi-functionality?;
- how can old forests with tree mixtures close to the original forest cover be achieved?;
- is there a balance between short- and long-term goals?;
- how real are all the official calculations and assumptions?; and
- what are the reasons and motivations for the FSC to certify elements of Irish forestry?

Irish forestry could learn a lot from the centuries of mistakes, modifications and models for sustainable and multi-functional forestry in Central Europe, and adopt best practice for implementation in the country. The domination of Sitka spruce within the afforestation programme may not be the answer for Ireland to achieve the type of multi-functional forestry stated under official policy.

Comparaison des activités forestières d'Europe centrale et d'Irlande par un forestier autrichien

Exposé de M. Richard H. Ramsauer

Résumé

Globalement, les activités forestières pratiquées en Europe centrale se caractérisent par les éléments suivants:

- Couvert forestier continu depuis l'ère glaciaire;
- Terres boisées exploitées, pour la plupart, depuis plusieurs générations;
- Très peu de forêts vierges;
- Tous les arbres sont d'origine génétique locale;
- Peu d'essences importées, sans importance réelle;
- Le mélange d'essences a évolué au fil du temps;
- Les méthodes de foresterie ont évolué au fil du temps;
- Récemment, moins de plantations de jeunes arbres – recours accru à la régénération naturelle;
- Les méthodes naturelles d'ensemencement représentent jusqu'à 50 %;
- Forêts croissant rapidement sur les terres agricoles pauvres;
- Évolution vers le mélange d'essences originel;
- La structure de la propriété est stable depuis longtemps;
- De nombreux très petits propriétaires forestiers, peu de gros propriétaires forestiers et de grandes forêts nationales;
- La diversité biologique fonctionne très bien;
- Plusieurs parcs nationaux fondés dans les régions forestières;

- La multifonctionnalité (économique, sociale, écologique) semble être très efficace;
- Importante source d'activités industrielles;
- La multiplicité des essences permet de nombreux types d'industrie;
- Importante source de revenus agricoles;
- Importante source d'activités récréatives et touristiques;
- La foresterie génère un vaste éventail de revenus provenant de différentes utilisations du sol.

Du point de vue d'un forestier autrichien, les activités forestières pratiquées en Irlande se caractérisent par les éléments suivants:

- Continuité interrompue par une exploitation excessive du bois;
- L'art de la sylviculture s'est perdu dans les campagnes;
- Foresterie principalement organisée par l'État;
- La sylviculture n'est pas (encore) une source réelle de revenus pour les exploitants agricoles;
- Aucune foresterie véritablement privée;
- Faible éventail d'industries du bois en raison de la faible variété des essences;
- Couvert forestier originel composé principalement de feuillus;
- Programmes de reboisement dominés par l'épicéa de Sitka;
- Résultats à moyen et long terme discutables;
- Les phénotypes font apparaître d'évidentes faiblesses (faible stabilité, perte des aiguilles, chablis).

En ce qui concerne les activités forestières pratiquées en Irlande, il se pose les questions suivantes:

- Où sont les essences originelles?
- Comment l'épicéa de Sitka va-t-il assurer la multifonctionnalité?
- Comment créer de vieilles forêts ayant des mélanges d'essences proches de ceux du couvert forestier originel?
- Existe-t-il un équilibre entre les objectifs à court et moyen terme?
- Quelle est la fiabilité des calculs et des hypothèses officiels?
- Quelles sont les raisons et motivations qui inciteraient le FSC (Forest Stewardship Council) à certifier des éléments de la foresterie irlandaise?

Les forestiers irlandais pourraient tirer d'importants enseignements des siècles d'erreurs commises en Europe centrale ainsi que des modifications et des modèles de foresterie durable et multifonctionnelle qui y ont été adoptés, et retenir les meilleures pratiques en vue de leur mise en œuvre dans le pays. La domination de l'épicéa de Sitka dans le cadre du programme de boisement n'est peut-être pas, pour l'Irlande, la meilleure solution si le pays veut mettre en place le type de foresterie multifonctionnelle énoncé dans sa politique officielle.

Сравнение лесохозяйственной деятельности в Центральной Европе и Ирландии: мнение австрийского специалиста по лесному хозяйству

Основной документ, подготовленный г-ном Ричардом Х. Рамсауэром

Резюме

В целом лесоводческая деятельность Центральной Европы имеет следующие характерные особенности:

- наличие постоянного лесного покрова начиная с ледникового периода;
- большая часть лесных площадей эксплуатировалась на протяжении многих поколений;
- незначительное число девственных лесов;
- все деревья имеют местное генетическое происхождение;
- немногие породы деревьев импортированы и не играют важной роли;
- породный состав со временем претерпел изменения;
- методы лесоводческой деятельности со временем изменились;
- в последнее время стало меньше молодых лесопосадок, больший упор делается на естественное возобновление леса;
- до 50% посадок осуществляется методом самосева;
- леса быстро разрастаются на пришедших в упадок сельскохозяйственных землях;
- наблюдается возврат к первоначальному породному составу;
- существование стабильной структуры владения в течение длительного периода времени;
- наличие многочисленных владельцев мелких лесных угодий, незначительное количество крупных частных владельцев и больших государственных лесов;
- биоразнообразие дает прекрасные результаты;
- в лесных зонах создано несколько национальных парков;
- наличие многофункциональности (экономической, социальной и экологической), которая дает прекрасные результаты;
- лесоводство - важный источник промышленного развития;
- многообразие пород питает многие отрасли промышленности;
- лесоводство - важный источник доходов фермерских хозяйств;
- лесоводство обеспечивает отдых и туризм; и
- лесоводческая деятельность обеспечивает широкий спектр доходов от различных видов землепользования.

По мнению австрийского специалиста, лесное хозяйство Ирландии характеризуется следующими признаками:

- чрезмерная эксплуатация лесов привела к разрыву исторической цепи;
- культура ведения лесоводческой деятельности в сельской местности оказалась утерянной;
- лесоводческая деятельность организуется в основном государством;
- лесоводческая деятельность не является реальным источником доходов для фермеров (пока что);
- фактически отсутствует частное лесоводство;
- предприятия лесной промышленности отличаются однообразием из-за малого количества пород деревьев;
- первоначальный лесной покров состоял в основном из деревьев широколистных пород;
- в программах восстановления лесов преобладала ель ситхинская;
- среднесрочные и долгосрочные результаты являются спорными; и
- фенотипы являют очевидные признаки слабости (низкая стабильность, потеря иголок, ветровалы).
- Напрашивается ряд вопросов, касающихся ирландской лесоводческой деятельности:

- куда делись первоначальные породы?
- каким образом ель ситхинская обеспечит многофункциональность?
- как можно добиться восстановления в старых лесах покрова, близкого по составу к покрову первоначальных лесов?
- существует ли равновесие между краткосрочными и долгосрочными целями?
- насколько реальны все официальные расчеты и допущения? и
- по каким причинам и мотивам СРЛ сертифицировал элементы ирландской лесоводческой деятельности?

Ирландское лесное хозяйство могло бы многому научиться из ошибок прошлых столетий, изучая произошедшие изменения и используя модели устойчивого и многофункционального ведения лесного хозяйства в Центральной Европе, чтобы приспособить наилучшую практику к условиям своей страны. Преобладание ели ситхинской в программе облесения не может быть ответом Ирландии на вопрос о создании того многофункционального лесного хозяйства, о котором заявлено в официальной политике.

**IRISH TIMBER GROWERS ASSOCIATION - REPRESENTING AND SUPPORTING
WOODLAND OWNERS THROUGH PRACTICAL INITIATIVES**

Mr. Donald Whelan, Technical Director, Irish Timber Growers Association, Ireland

SUMMARY

The Irish Timber Growers Association (ITGA) was established in 1977 to support and represent private woodland owners and to promote the development and expansion of private sector forestry in Ireland. The current membership of the Association includes small farm forest owners, forestry co-operative members, larger private woodland estates and forestry pension funds. This large membership and wide range of forest ownership ensure that the Association has a strong representative voice for members.

The total area under forest in Ireland currently amounts to approximately 665,000 hectares or over 9% of our total land area. The area of private woodlands amounts to approximately 270,000 hectares or 41% of the total forest area.

The development of the private forestry sector in Ireland over the past 13 years has been dramatic. Farmers and landowners have responded to the attractive grant and premium support from the EU as part of the radical restructuring of the Common Agricultural Policy and the general downturn in the fortunes of the agricultural sector. In 2001, over 91% of afforestation by area was classified as farmer planting.

The average size of a privately owned forest in Ireland is less than 9 ha. This is not untypical of European forestry in general, where there are over 12 million private forest owners with an average forest holding of less than 5 ha. The challenges facing forest owners and Growers Associations are therefore similar in a number of respects throughout Europe. The Irish Timber Growers Association has looked at various organisational models of forest owner's associations in Europe and has adapted its structure to best meet the requirements and demands of Irish growers. The structure that the ITGA has adopted is focused on achieving the following aims, many of which are common to other European grower organizations, and perhaps to growers elsewhere in the world

Main aims of the Irish Timber Growers Association include the following.

To encourage and enable growers to take an active interest in the management of their plantations, stressing the importance of growing quality timber.

To assist in providing structures which facilitate the group harvesting, marketing and haulage of roundwood from private plantations. With small, fragmented holdings, small timber volumes in thinnings, often poor access and relatively long extraction distances, private forest owners must work together to improve their collective economies of scale.

To provide a strong representative voice for growers in the development of future forestry strategy, regulation and legislation in both Ireland and the EU.

This paper looks at the many challenges facing Irish timber growers, which are similar to those of our European counterparts, and outlines the structure that the Association had adopted to meet these challenges.

INTRODUCTION

The Irish Timber Growers Association (ITGA) is the national representative body of private woodlands owners in Ireland. It was established in 1977 and is uniquely dedicated to the representation of woodland owners and is also concerned with the promotion, development and expansion of private sector forestry in Ireland.

The current membership of the Association includes small farm forest owners, forestry co-operative members, larger private woodland estates and forestry pension funds. This large membership and wide range of forest owners ensures that the Association has a strong representative voice for members.

The ITGA is operated through a voluntary executive Committee comprising of 19 people, primarily woodland owners who meet monthly. A Chairman, Vice Chairman and Treasurer are elected by the Committee as voluntary officers. A professional Secretariat (the Irish Co-operative Organisation society) is employed on contract to operate the secretariat and undertake the administration of the Association. A Technical Director is also employed on a contract basis by the Association to provide technical advice to the Committee and membership and also produce Newsletters and assist in the publication of the annual Yearbook, organise fielddays and seminars and represent the association at various forums and initiatives. Both the Secretariat and Technical Director work and report to the Executive Committee on a monthly basis. Recently, a Timber Growers Forum has been set up by the Association which will meet quarterly at locations around the country. The Forum is comprised of timber grower members from around the country and allows for greater feedback from a wider and larger cross section of our membership. This initiative, it is hoped, will assist with the development of future policy for the Association and allow ITGA tailor their services to member's needs and requirements.

OUTLINE ASSESSMENT OF THE PRIVATE FOREST ESTATE IN IRELAND

At the time the ITGA was set up in 1977, less than 23% of forests in Ireland were in private ownership with the remaining 77% owned by the State. In all only approximately 5% of our land area in Ireland was covered with woodlands. The total area under forest in Ireland currently amounts to c. 665,000 hectares or over 9% of our total land area. The area of private woodlands now amounts to approx. 270,000 hectares or 41% of the total forest area. The ITGA has also grown significantly mirroring this expansion in private sector forestry and has evolved to meet the various demands posed by the development of private afforestation.

The development of the private forestry sector over the past thirteen years, in particular, has been dramatic. Farmers and landowners have responded to the attractive grant and premium support from the EU as part of the radical restructuring of the CAP and the general downturn in the fortunes of the agricultural sector. In 2001 over 91% of afforestation by area was classified as farmer planting.

Typical profile of a Private Forest Owner:

- 1/ Full or part time Farmer,
- 2/ Little or no forestry tradition or expertise,
- 3/ Generally Grant and Premium motivated.

Farm forestry plantations are generally characterised by:

- 1/ Small average size
- 2/ Fragmented nature,
- 3/ Predominantly planted in the past 13 years,
- 4/ Diversity of species,
- 5/ Often poor access to plantations.

1/ Small average size and

2/ Fragmented nature

Private forest holdings and farm forestry plantations in particular are generally characterised by their small average size and fragmented nature. An analysis undertaken for the COFORD Report entitled ‘Forecast of Roundwood Production from the Forests of Ireland 2001-2015’ of the size distribution of the 8,667 grant approvals for the period 1990-1996 indicates that the average plantation size was 9.9 ha. 2,472 of these approvals were for plantations in excess of 10 hectares and these collectively account for 69% of the total area established.

Figure 1 shows these data. The largest areas of the total private planting programme in the period 1990-1996 consists of plantations between 10 and 50 ha, while 19% of the area consists of plantations greater than 50 ha in size.

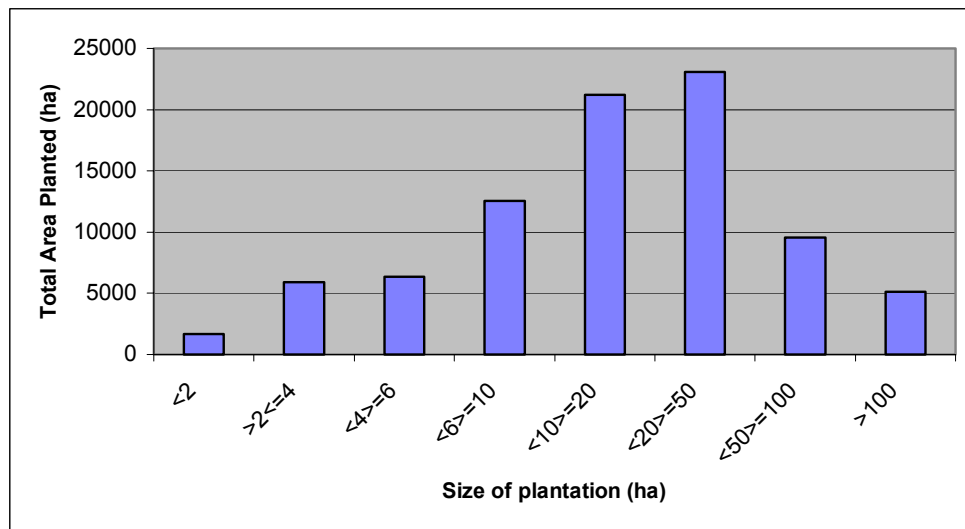


Figure 1: Size Distribution of Private Planting Approvals 1990-1996

Reproduced with permission from COFORD Report entitled ‘Forecast of Roundwood Production from the Forests of Ireland 2001-2015’ by Gerhard Gallagher and Joe O’ Carroll (2001).

3/ Predominantly planted in the past 13 years,

Table 2: Public (now Coillte) AND PRIVATE SECTOR Afforestation (hectares) 1985-2001

YEAR	PUBLIC	PRIVATE	TOTAL
1985	4,625	617	5,242
1986	4,688	2,280	6,968
1987	5,395	2,954	8,349
1988	7,111	4,596	11,707
1989	6,629	8,497	15,126
1990	6,670	9,147	15,817
1991	7,855	11,292	19,147

1992	7,565	9,134	16,699
1993	6,827	9,171	15,998
1994	6,622	12,837	19,459
1995	6,367	17,343	23,710
1996	4,426	16,555	20,981
1997	851	10,583	11,434
1998	2,926	10,002	12,928
1999	891	11,776	12,667
2000	1,465	14,231	15,696
2001	316	15,147	15,463
TOTAL			247,391

4/ **Diversity of species,**

5/ **Often poor access to plantations.**

The Challenges to be met in organising timber growers for the future include:

Lack of timber growing culture in the farming community,

Ensuring good management and the economic harvesting, marketing and haulage of roundwood from small fragmented farm plantations,

Development of future markets for forecasted output from private forests,

Potential over regulation of Irish forestry,

Potential future certification requirements,

Development of appropriate private forest inventory and information technology.

CHALLENGES TO BE MET IN ORGANISING TIMBER GROWERS FOR THE FUTURE

Lack of Timber Growing Culture:

The first challenge to be met is the lack of a forestry tradition and timber growing culture among those afforesting lands. Understandably, most timber growers and farm forest owners have little or no experience of forestry or forestry operations. In a 1998 published COFORD funded study undertaken by Sarah Wall and Aine ni Dhubhain entitled 'Management requirements for Farm Woodlands' it was stated that '*several times throughout this study the paucity of information and knowledge among private woodland owners has been highlighted. The vast majority of woodland owners in this survey (88%) indicated they would like to learn more about growing trees*'. While the availability of forestry training courses through Coillte and Teagasc has certainly increased in recent years this situation must be further addressed on an ongoing basis. Early grower involvement in forest management is crucial to bridging that cultural gap between farming and forestry, and it is important that emphasis on practical knowledge and skills training e.g. planting, herbicide application, formative shaping etc. should be an

integral part of the training courses. If a sufficient level of interest is aroused early it may be maintained into the crucial post establishment phase and beyond.

As a consequence of the lack of forestry tradition, the level of owner participation in the establishment and management of private forestry plantations is low. This low level of participation must be increased to ensure well managed private forests into the future.

It is important that all timber growers can access professional advisory and support services throughout the forest rotation from qualified foresters. Farm forest owners must be informed of the various sources of professional forestry advice and information available in the market.

Ensuring good management and the economic harvesting, marketing and haulage of roundwood from small fragmented farm plantations;

The production of commercial timber is the primary objective of most private woodlands. The profile of a typical private woodland suggests that it does not have attractive economies of scale for potential timber buyers. Because of their small average size, fragmented nature and often difficult access, thinnings in particular may be difficult to market and harvest. With the resulting poor economies of scale one must conclude that without the establishment and implementation of the appropriate structural and support services for farm forestry owners the timber resource that is offered by the farm forestry sector will not be fully realised.

Development of future markets for forecasted output from Private Forests:

Given the increase in volume of small diameter roundwood, particularly pulpwood, which is forecast to be available from private growers by 2015, it is obviously vitally important that further markets are developed for this small diameter timber so that these forecasted volumes can be accommodated.

The Merrill Lynch/AIB Capital Markets Report published in 2000 on the options for the corporate development of Coillte Teoranta identified the marketing and selling of the growing volumes of Irish sawlog coming on stream as *“the single greatest challenge facing Irish forestry”*.

In order to face these challenges of marketing and selling our timber, it is essential to look at the forecast for timber production and potential future markets. COFORD’s recent publication forecasts that annual roundwood production from Irish forests could reach 5 million m³ by 2015 from a current production output of circa 3.6 million m³ (See Figure 2).

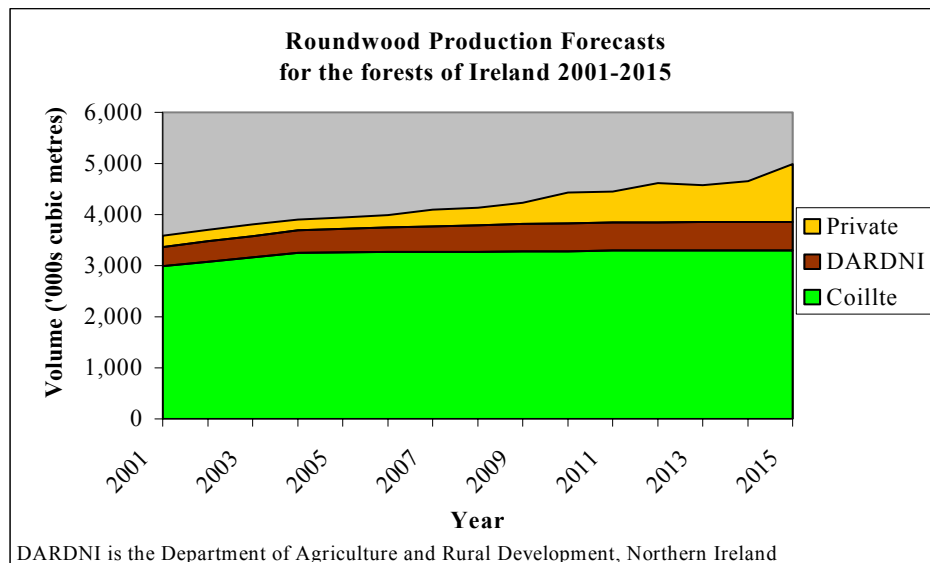


Figure 2: Combined Roundwood Production Forecasts 2001-2015

Reproduced with permission from COFORD Report entitled 'Forecast of Roundwood Production from the Forests of Ireland 2001-2015' by Gerhardt Gallagher and Joe O' Carroll (2001).

Figure 3 below shows that the potential supply from the private sector will rise steadily during the forecast period, to over 1 million m³ by the year 2015. Interestingly, from 2006 to 2015 most of the increase in roundwood production will come from private forests.

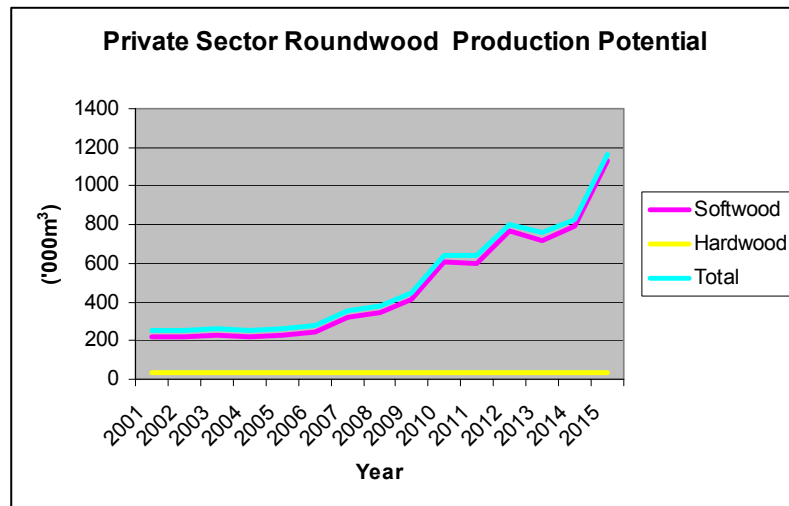


Figure 3: Private Sector Roundwood Production Potential 2001-2015

Figure 3 clearly illustrates the dramatic rise in the production potential of the private forest sector. This is largely due to the fact that the earliest grant aided forests are now reaching the production stages.

By 2015 the private sector's market share of roundwood production will rise to 23% of the entire production potential for the country. To put this in context, it is estimated that the private sector supplied only 100,000 m³ of roundwood in 2000. It is interesting to look at the sources of this production increase, over the forecast period 2001-2015 all of the 81% increase in pulpwood production will come from the private sector. Similarly, the vast majority of the increase in small sawlog will also come from the private sector (see Figure 4).

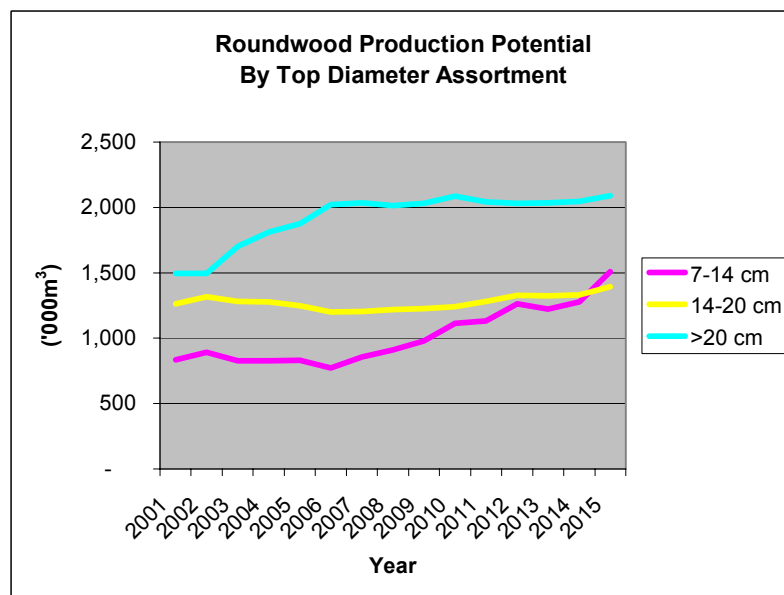


Figure 4: Total Softwood Production Potential by product assortment.

Both Figures reproduced with permission from COFORD Report entitled 'Forecast of Roundwood Production from the Forests of Ireland 2001-2015' by Gerhardt Gallagher and Joe O' Carroll (2001).

A more recent study indicates that there will be a projected surplus of 600,000 cubic metres of pulpwood and residues by 2005 for which there is no current market. With the further projected increase in pulpwood supply from forests (excluding residues) by 2015 of almost 700,000 cubic metres, a total projected surplus of c.1.3 million cubic metres of pulpwood and residues is likely by 2015, unless new markets are developed. This serious potential surplus must be immediately addressed. Given the very significant lead in time required to attract and establish any pulpwood using industry, it is vital that a strategy to meet this challenge is addressed now in association with timber producers. There is one potentially very significant initiative underway in which a small Working Group is actively looking at Wood for Energy. As part of this initiative, last June/July Edenderry Power, which is a peat burning electricity power plant included 10% of its input as sawdust or wood chips on a trial basis. The results of this trial are very encouraging. In short, an analysis undertaken showed that co-firing the power plant with woodchips had no effect on boiler efficiency and there was an improvement in emissions from the Station in that less Sulphur Oxide emissions resulted from co-firing with woodchips. **Wood is a natural renewable resource and carbon neutral. With only 2% of our national energy requirements being derived from renewable resources this is potentially a very significant development.** This development could now open the door for the two further peat power plants under construction, Shannonbridge and Lanesboro, to utilise a proportion of wood as fuel in the facilities.

The potential to market additional products and by-products from private forests must also be considered. In addition to the possibilities of marketing wood for energy, carbon trading from private forests in the future should be examined and appropriate structures should be established to promote such initiatives.

Potential over regulation of Irish forestry:

More demanding grant conditions, environmental procedures and constraints and forestry regulations suggest that Irish forestry is now at risk of being over regulated. Public consultation is also now required for many forestry operations and the time and costs involved in complying with all these demands pose a very real threat to economically sustainable forestry. It appears that forestry is a target for environmentalists and ultimately the vehicle for their aspirations in relation to biodiversity, landscape and various associated environmental issues. The forestry profession must take a more active role in informing the public of the very real environmental benefits of our forest resource and the advantages in expanding our woodland area.

Potential future Certification requirements:

It is important that woodland owners are seen to meet the demands of Sustainable Forest Management (SFM). When and if necessary they should be in a position to have their forests certified to an appropriate certification standard at little or no cost. In time, it is important that ITGA and other entities facilitate the group certification of private woodlands where required.

Development of appropriate private forest inventory and information technology:

It is of vital importance that a well resourced inventory of private woodlands is undertaken. Some progress is being made in this area by the Forest Service and COFORD. The forest inventory must be of some practical benefit in the management of private woodlands and the Irish Timber Growers Association have submitted proposals that the inventory should include the following information;

Windthrow Hazzard Classification information, forest health details, information on environmental constraints, infrastructural details, timber quality and regional roundwood volume forecast data.

It is important that private woodland owners can benefit from the use of information technology in forestry. Again it is important that appropriate structures are put in place to promote and support new technology initiatives in forestry so as growers can collectively benefit from this technology. Timber Growers organisations must enable their members to maximise the benefits and use of information technology and this has important implications for the entire forest industry. This would also involve working with the Forest Inventory and Planning System to plan the harvesting and marketing schedules from private woodlands into the future.

ORGANISING TIMBER GROWERS FOR THE FUTURE

Over the past two decades as we have seen the private forestry sector in Ireland has been very much focused on afforestation and on achieving the afforestation targets as set out in the Governments 1996 Strategic Plan for the Development of the Forestry Sector. It is essential that timber growers and the sector as a whole now look to maximising the returns from our forest resource. To do this we must recognise the unique characteristics of both farm forests and their owners and develop structures to ensure an effective medium to long term management strategy and its successful implementation.

Successful timber grower's organisations of the future must provide the following for their members;

1/ Farm forestry owners must be well informed and well organised in the future in order to successfully meet the challenges outlined in this paper. Access to ongoing support services is vital to encourage and enable growers to take and active interest in the management of their woodlands.

The range of services provided by the ITGA to ensure its membership is thus informed includes the production of quarterly Newsletters, the organisation of various fielddays, seminars and the production of an annual Yearbook and Directory. ITGA also circulate relevant forestry information to members including the COFORD Connects publications, updates and research notes.

2/ Provide structures which facilitate the group harvesting, marketing and haulage of roundwood from private plantations. With small, fragmented holdings, small timber volumes in thinnings, often poor access and relatively long extraction distances, farm forest owners must work together to improve their collective economies of scale. A group of woodlands may satisfy the demands of a potential timber buyer by offering a substantially greater volume of timber from a number of farm woodlands within close proximity of each other. This can be achieved by a co-operative approach by local growers who have been organised into producer groups. This is the most economic way to sell timber from our many farm woodlands and will require careful long term infrastructural and logistical planning.

For example, through ITGA's involvement with the Forestry Development Association Co-Op, which is a joint venture with Glanbia plc, it is intended to facilitate the group marketing of thinnings and fellings from farm forestry plantations in the future. The development of this co-operative group marketing approach is a fundamental objective of the FDA Co-Op. As a forerunner of the producer groups, which it is intended would eventually market timber from farm plantations, discussion groups have now been formed by the Co-Op. At a local level the interest of neighbouring farm woodland owners are channelled into these discussion groups – a tried and tested format long familiar to farmers. Designed to be informal and meeting four times a year, FDA Co-Op has now established six discussion groups with very positive results. The key point is that in this localised environment the message of long term commitment and active management of the farm woodland is being understood and accepted. The discussion group format has been working very successfully in Irish farming for decades and should be actively promoted in the case of farm forestry growers as a means of transferring knowledge, generating debate and engendering the spirit of co-operation.

3/ Growers organisations must provide a strong representative voice for their membership in the development of future forestry strategy, regulations and legislation.

The ITGA represents the interests of its membership at various different policy and strategic forums including the Irish Forest Industry Chain, CEPF, the Irish Forestry Certification Initiative Steering Committee, the Forest Industry Health and Safety Working Group, the Wood for Energy Working Group, the Forest Industry Forum and the Timber Industry Development Group until their work was recently completed and various other Irish forestry bodies.

CONCLUSIONS

As we have seen the private forestry sector has characteristics which pose unique challenges in relation to the management and the marketing of farm forestry produce in the future. Successfully meeting these challenges has fundamental implications for the forestry grower, the rural economy and the national forest industry.

Education, training and support services hold the key to informing farm forestry growers of best management practices. This can be achieved through a cohesive approach by various forestry organisations and enterprises both State and private.

The sale of timber from farm forests poses a challenge for which a group marketing approach is likely to prove the most appropriate future strategy. The co-operative approach has been tried and tested for many years by Irish farmers and this approach to forest management and timber sales from farm woodlands should offer growers an economic return on their investment. Timber grower organisations of the future, which develop this strategy, will be best placed to service their members increasing requirements.

It is apparent that Timber Growers Organisations are ideal vehicles to meet many of the challenges as outlined above. The Scandinavian countries would suggest that an effective way to achieve these objectives is to develop strong timber growing organisations which not only provide information and back up services to their grower members but also get actively involved in the marketing, harvesting, haulage and even the processing of their members forest produce.

The Irish Timber Growers Association through its quarterly publications, Annual Yearbook and Industry Directory, Fielddays, Annual Seminars, its FDA co-op joint venture with Glanbia and affiliation with the Western Forestry co-op is now ideally placed to further develop the initiatives referred to in this paper and enable its 3,500 members to maximise the returns from their woodlands.

**THE NATIONAL PROGRAMME FOR THE AUGMENTATION OF FOREST COVER AND
ITS IMPLEMENTATION IN THE REGION OF WARMIA AND MAZURY**

**Mr. Stanislaw Dabrowski, Public Relation Officer, The State Forests National Forest
Holding Regional Directorate Olsztyn, Poland**

SUMMARY

The National Programme for the Augmentation of Forest Cover, adopted by the Government of the Republic of Poland in 1995, addresses basic tasks to the State Forests and anticipates an increase in the proportion of the country under forest from 28% to 30% by 2020, and 33% by 2050. This is to be achieved through the afforestation of land deemed economically unsuitable for agriculture.

The programme envisages the afforestation of 600,000 ha (250,000 ha state-owned and 350,000 ha privately owned) former agricultural land over the period 1995-2020. It assumes that an area of about 100,000 ha (20,000ha to year 2000, 40,000 ha to 2010, and 40,000 ha to 2020) will be covered by forest in a process of natural succession.

It is envisaged that the costs of afforestation of state-owned areas will be covered by the State budget (30.8%), the National Fund for Environmental Protection and Water Management (23.0%) and the Ecofund, Forest Fund and (in 1995-97) the PHARE programme (46.2%). It is envisaged that the costs for the afforestation of areas under private ownership in the Warmia and Mazury Region will be covered by the owners (66.8%), the Forest Fund (28.2%), the Budget of the Regional Government (1.8%) and the Regional Fund for Environmental Protection and Water Management (3.2%).

The target for the first stage of the National Programme was exceeded, with an area of 110,000 ha afforested: 69,000 ha state-owned and 41,000 ha under private ownership (compared to the set ratio of 50:50). During Stage I, 13,000 ha were afforested in the Region of Warmia and Mazury: 12,000 ha state-owned and 1,000 ha under private ownership. As a result of afforestation, forest cover in the Warmia – Mazury Region has increased from 19.8% in 1945 to 29.3% in 2000, with a projected figure of 31.4% by 2020.

**Le Programme national d'accroissement de la superficie boisée et sa mise en œuvre
dans la région de Warmia et Mazurie**

Exposé de M. Stanislaw Dabrowski

Résumé

Le Programme national d'accroissement de la superficie boisée, adopté par le Gouvernement polonais en 1995, expose les tâches fondamentales du Service national des forêts et prévoit de porter la proportion du pays recouverte de forêts de 28 % à 30 % d'ici à 2050, ce qui s'effectuera par le boisement de terres jugées économiquement impropres à l'agriculture.

Dans le cadre de ce programme, il est prévu de boiser, pendant la période 1995-2020, 600 000 d'anciennes terres agricoles (250 000 hectares appartenant à l'État et 350 000 étant sous le régime de la propriété privée). Il suppose qu'une superficie d'environ 100 000 hectares (20 000 hectares d'ici à 2000, 40 000 d'ici à 2010 et 40 000 d'ici à 2020) se couvrira de forêts par succession naturelle. Le plan de travail est le suivant:

Phase	Tâche	Propriété de l'État (ha)	Propriété privée (ha)	Total (ha)
I (1995-2000)	Boisement	50 000	50 000	100 000
	Succession naturelle	20 000	-	20 000
II (2001-2010)	Boisement	100 000	140 000	240 000
	Succession naturelle	40 000	-	40 000
III (2011-2020)	Boisement	100 000	160 000	260 000
	Succession naturelle	40 000	-	40 000
Total		350 000	350 000	700 000

Le boisement des terres appartenant à l'État devrait être financé par le budget de l'État (30,8 %), le Fonds national pour la protection de l'environnement et la gestion des eaux (23 %) ainsi que le Fonds écologique, le Fonds pour les forêts et (en 1995-1997) le programme PHARE (46,2 %). Quant au boisement des terres de la région de Warmia et Mazurie qui sont placées sous le régime de la propriété privée, il devrait être financé par les propriétaires (66,8 %), le Fonds pour les forêts (28,2 %), le budget régional (1,8 %) et le Fonds régional pour la protection de l'environnement et la gestion des eaux (3,2 %).

L'objectif de la première phase du Programme national a été dépassé, avec une superficie boisée de 110 000 hectares, dont 69 000 hectares de l'État et 41 000 hectares de terrains privés (contre un ratio fixé de 50:50). Pendant la phase I, 13 000 hectares ont été boisés dans la région de Warmia et Mazurie, dont 12 000 hectares de terres de l'État et 1 000 hectares de terrains privés. À l'issue de ce boisement, la superficie boisée de la région de Warmia et Mazurie est passée de 19,8 % en 1945 à 29,3 % en 2000, avec une projection de 34,4 % en 2020.

Национальная программа увеличения лесного покрова и ее осуществление в районе Вармии и Мазурии

Основной документ, подготовленный г-ном Станиславом Дабровски

Резюме

Национальная программа увеличения лесного покрова, принятая правительством Республики Польша в 1995 году, устанавливает основные задачи Администрации государственных лесов и предусматривает увеличение доли лесных площадей с 28% до 30% к 2020 году и до 33% к 2050 году. Это будет достигнуто за счет облесения земель, признанных экономически невыгодными для ведения сельского хозяйства.

Программа предусматривает облесение 600 000 га (250 000 га государственных и 350 000 га частных) бывших сельскохозяйственных земель за период с 1995 по 2020 год. В программе предполагается, что примерно 100 000 га (20 000 га к 2000 году, 40 000 га к 2010 году и 40 000 га к 2020 году) будут покрыты лесами в порядке природной смены растительности. План работы является следующим:

<i>Этап</i>	<i>Задача</i>	<i>Государственные (га)</i>	<i>Частные (га)</i>	<i>Всего (га)</i>
I (1995-2000)	Облесение Природная смена растительности	50 000 20 000	50 000 -	100 000 20 000
II (2001-2010)	Облесение Природная смена растительности	100 000 40 000	140 000 -	240 000 40 000
III (2011-2020)	Облесение Природная смена растительности	100 000 40 000	160 000 -	260 000 40 000
Всего		350 000 га	350 000 га	700 000 га

Предусматривается, что затраты на облесение государственных площадей будут покрываться из средств государственного бюджета (30,8%), Национального фонда по защите окружающей среды и водопользования (23%), и Экофонда, Лесного фонда, а также (в 1995-1997 годах) программы PHARE (46,2%). Предполагается, что затраты на облесение частных площадей в районе Вармии и Мазурии будут покрываться из средств собственников (66,8%), Лесного фонда (28,2%), бюджета региональных органов управления (1,8%) и Регионального фонда по защите окружающей среды и водопользования (3,2%).

Площадь облесения составила 110 000 га: 69 000 га государственных площадей и 41 000 га частных (в сравнении с установленной пропорцией 50:50). В ходе осуществления I этапа было произведено облесение в районе Вармии и Мазурии: 12 000 га государственных площадей и 1 000 га частных. В результате облесения лесной покров в районе Вармии и Мазурии возрос с 19,8% в 1945 году до 29,3% в 2000 году, причем к 2020 году планируется довести эту цифру до 31,4%.

At the moment of its emergence as a State in the 10th and 11th centuries, Poland was c. 85% forest. However, it only took until the 13th century. Then the figure fell to 50%, as a result of intensive felling to meet the needs of developing agriculture, villages, towns then metallurgy and glassmaking.

By the 14th century, cover had fallen to just 43%, while the beginning of the 19th century the figure was 30%.

The subsequent effects of partitioning combined with the devastation of two World Wars to leave Poland within its present borders with only 21% forest cover in 1946.

Thus, from 1947 onwards, intensive efforts at reafforestation were made. The bulk of the work was done between 1956 and 1966. In fact, c. 500,000 ha were reforested in the period, equating to 45% of all post-war planting.

As a result of these efforts, some 29% of Poland is now under forest cover. Despite this improved situation, the level of cover in Poland is still too low, and should approximate to the average for Europe, which is of c. 30%.

The need of afforestation abandoned and degraded grounds was stressed and mentioned in many international documents e.g.:

- Agenda 21 from Rio de Janeiro World Summit in 1992,
- U.N. Convention on Climatic Change – Montreal 1994,

- U.N. Convention on Biological Diversity – 1995,

and in Polish ones:

- National Ekological Strategy – 1991,
- National Policy on Forests – 1997,
- The Forests Act – 1991,
- The Physical Planning Act – 1994, and
- the National Programme for the Augmentation of Forest Cover fits to them.

To reach 30% of forest cover in Poland it requires the reafforestation of an additional 700 000 ha of the land, an undertaking which is already being put into effect by the State Forests, as the governmental programme for the augmentation of forest cover is implemented.

The programme involves the planting of land unsuitable for agriculture, mainly within the now-defunct State Farms. These actions are ones which increase forest cover and all values of the environment – protecting soil, surface, ground and underground water, climate, landscape etc.

The National Programme for the Augmentation of Forest Cover anticipates the reafforestation of c. 700 000 ha of land by the year 2020, and total of 1 500 000 ha in the longer term. Until 2050 it also details the economic mechanisms necessary for implementation and stimulating forest management on some land marginal for agriculture, planning priorities at gmina level and a timetable for implementation.

The National Programme for the Augmentation of Forest Cover, adopted by the Government of the Republic of Poland in **1995**, addresses basic tasks to the State Forests and anticipates an increase in the proportion of the country under forest from 28% to 33% by 2050. This is to be achieved through the reafforestation of land which is unsuitable for agriculture for economic reasons.

The Programme presumes afforestation of 600 000 ha (250 000 ha – state owned and 350 000 ha private ones) former agricultural land, in a period 1995-2020.

It assumes that the area of about 100 000 ha (20 000 ha to 2000 year, 40 000 ha to 2010, and 40 000 ha to 2020) will be covered by forest in a process of natural succession.

The plan of work is as follows:

<i>Stage</i>	<i>Task</i>	<i>State-owned (ha)</i>	<i>Privately owned (ha)</i>	<i>Total (ha)</i>
I (1995-2000)	Afforestation	50,000	50,000	100,000
	Natural succession	20,000	-	20,000
II (2001-2010)	Afforestation	100,000	140,000	240,000
	Natural succession	40,000	-	40,000
III (2011-2020)	Afforestation	100,000	160,000	260,000
	Natural succession	40,000	-	40,000
Total		350,000 ha	350,000 ha	700,000 ha

It was assumed that the costs of afforestation of state owned areas would be covered by:

- State budget in
 - National Found for Environmental Protection and Water Management 30,8% (69% in W. and M.)
23,0% (9,7% in W.M.)
- The Ecofound, forest Found and (in 1995-1997) PHARE programme 46,2% (6,9% in W.M.)
- The loan from The World Bank 0% (12,1% in W.M.)
- others - Labour Found 0% (2,3% in W.M.)

When of private areas (in Warmia and Mazury Region) by:

- The owners 66,8%
- Forestry Found 28,2%
- Budget of the Regional Governer 1,8%
- Regional Found for Environmental Protection and Water Management 3,2%

The task of the first stage of National Programme was done in 110%, the area of 110 000 ha was afforested, in it 69 000 ha it was state owned area and 41 000 ha were private (according to Programme it would be 50/50).

During I stage of National Programme in Region of Warmia and Mazury 13 000 ha (12 000 ha state owned and 1000 ha private ones) were afforested.

The Voivodeship of W.M. was reestablished according to reorganization of Polish administration in **1998** The Regional Parliament resolved „The Strategy on Socio-Economic Development of Warmia and Mazury Region „. According to this Strategy **The Programme for the Augmentation of the Forest Cover of Warmia and Mazury in the years 2001-2010 was done, discussed and confirmed by the Local Authority. It is a part of The National Programme and it is perceived as an element of sustainable development of a region.**

The total area W. and M. Region is	2420,3 thousand ha	100%
In it forests cover	710,3	29,3%
lakes and rivers	1,4	5,7%
agricultural land	1304,9	53,9%

There are 3 big natural ground water reservoirs, located under the ground of 180 thousand ha.

In former time more than 50% of agricultural areas in W. and M. Region were owned by State and used by a big State Farms. 600 thousand ha are still administered by Agricultural Property Agency of the State Treasury, c. 151 thousand ha are abandoned, neglected, and 25 thousand ha are classified among reafforestation.

There are mainly poor soils, but not only, some are of bad lay of land etc. Private owners of the similar grounds are ready to afforest them as well.

In this situation the Regional Programme for 2001-2010 presumes afforestation of 35 100 ha.

It will make forest cover at c. 31% in 2010, and thanks to continuation at least 31,4% by 2020.

The land which is to be afforested have to be determined in a local physical management plan or in the permitting notice of local authority in a case of lack of the physical plan.

The Forest Act says that the forest resources have to be enlarged.

It determined the kinds of land which can be afforested, they are:

Wastelands, lands of poor soils and other unsuitable for agriculture, dunes, steep slopes, bluffs, hollows, mine dumps, worked –out gravel-pits, the lands at lakes shores, on the watersheds, and over the groundwater reservoirs and other grounds located around the springs of the streams and rivers, along the riversides land.

It is forbidden to afforest ecological sites, permanent peats, meadows, peculiar swamps, bogs etc.

In the Regional Programme of Augmentation of the Forest Cover the main attention was paged to that.

Then afforestations are being done to use in a proper way wastlands and abandoned land marginal for agriculture to augment a forest cover, to create ecological corridors between separated areas of big ecological value, to increase biodiversity, to create new lanscape, to create new jobs in a region of big unemployment, to increase all genetic, ecological and social values of the forest and a region.

As a result of afforestation, the forest cover of Warmia-Mazury Region is changing from 19,8% in 1945, to 29,3% in 2000 and at least 31,4% by 2020.

**THE SOCIETY OF IRISH FORESTERS - THE VOICE OF THE IRISH FOREST INDUSTRY
PROFESSION**

Mr. Tony Mannion, Ireland

SUMMARY

As detailed site investigation to determine the productivity of Irish soils for forestry was undertaken in Co. Mayo as a preliminary part of the Forest Inventory and Planning System commissioned by the Irish Forest Service. In order to measure the potential of soils for afforestation, measurements of general yield class were taken in stands on a range of soils. A geographical information system (GIS) was used to combine and analyse data from the site survey with additional environmental and climatic information. Regression techniques were employed to estimate the potential general yield class of Sitka spruce (*Picea sitchensis* (Bong). Carr) from the range of factors used in the study. A model was developed that predicted general yield class using soil type, elevation and location. The GIS was used to extrapolate and generate maps of potential productivity for the entire county of Mayo, located on Ireland's western seaboard. The recent large scale mapping of soils using the Teagasc Irish Forest Soils methodology (developed at the Kinsealy Research Centre) and the availability of a digital elevation model facilitated the potential productivity map and also provided the basic soils input for the development of a windthrow hazard classification map. The resulting methodology produces well-fitting models of timber yield that can be used in a GIS as an aid to determining areas that have limited productive capacity. It also identifies areas that are liable to windthrow using recognised methods, and aids the decision-making process of afforestation at a regional level.

**La Société des forestiers irlandais, porte-parole des forestiers professionnels
en matière de boisement et de développement forestier**

Exposé de M. Tony Mannion

Résumé

À l'instar de toutes les activités forestières, celles de boisement mises en œuvre aux fins d'une gestion durable des forêts doivent être dirigées par des forestiers professionnels formés et rompus à leur mise en œuvre. Il est également essentiel que l'industrie forestière et ses acteurs tirent pleinement parti de la hauteur de vues et de l'autorité de forestiers professionnels, et que ces derniers puissent se concerter et se faire clairement entendre par l'intermédiaire d'une organisation professionnelle représentative.

En Irlande, cette organisation professionnelle est la Société des forestiers irlandais (SIF). Fondée en 1942, la SIF représente la profession forestière sur l'île d'Irlande. Elle compte plus de 700 membres et est à la fois une société à responsabilité limitée par garantie et une organisation caritative agréée. Elle a pour mandat «de diriger et de représenter la profession forestière, qui a pour vocation de satisfaire de façon durable les besoins de la société irlandaise en forêts grâce à l'excellence de sa pratique forestière». Plusieurs principes sous-tendent ce mandat, notamment:

- Mise en place d'une autorité représentant la profession;
- Professionnalisme et excellence en matière de gestion forestière, reposant sur de solides connaissances et compétences;
- Durabilité de la gestion des forêts et préservation des écosystèmes;

- Consultation et participation de toutes les parties prenantes à l'élaboration de la politique forestière;
- Promotion de la cohésion sociale, de l'interaction et de la concertation entre les membres.

La Société propose trois types d'adhésion: membre technicien (y compris un groupe de forestiers consultants), membre associé et étudiant. Ses membres sont employés dans tous les secteurs de l'industrie forestière: entreprises publiques et privées; pépinières; gestion des forêts; exploitation, sciage et transformation du bois; recherche et enseignement. La SIF s'emploie activement à promouvoir l'application de normes professionnelles dans le secteur forestier public et privé, et à réglementer la profession forestière. À cette fin, les membres sont liés par un code de déontologie. La SIF influence également l'enseignement forestier afin de maintenir en Irlande un niveau professionnel très élevé. Un programme de perfectionnement professionnel continu est actuellement mis en œuvre à titre d'essai et fait l'objet d'améliorations. Il est prévu de lier ce programme avec des établissements d'enseignement supérieur.

Les activités de la Société sont notamment les suivantes:

- Publication de documents directifs et de communiqués de presse, et sensibilisation du public à la profession forestière;
- Organisation de journées champêtres, de colloques, de voyages d'étude (en Irlande et à l'étranger) et de débats publics sur des questions d'actualité relatives à la foresterie;
- Publication d'*Irish Forestry*, revue contenant des articles originaux – scientifiques et autres – sur la foresterie ainsi que des critiques d'ouvrages publiés;
- Publication de *The Irish Forester*, bulletin trimestriel;
- Dialogue permanent avec les acteurs de l'industrie forestière;
- Discussions et négociations avec le Service irlandais des forêts concernant les politiques forestières nationales et leurs incidences sur l'ensemble de l'industrie forestière;
- Publication d'une liste de membres techniciens consultables, à l'intention du public et des personnes désireuses de bénéficier d'avis professionnels en matière de foresterie.

La Société est également liée, en Irlande et ailleurs, à un réseau élargi de spécialistes des forêts grâce à son adhésion à l'Union européenne des forestiers (UEF), au Forest Stewardship Council (FSC), à l'Irish Forestry Certification Initiative (IFCI) et à l'Irish Forest Industry Chain (IFIC).

Le document a pour vocation de présenter la SIF, porte-parole unique des forestiers professionnels, qui s'emploie à ce que cette profession puisse infléchir les politiques nationales et soit en mesure de contribuer effectivement à des activités telles que le boisement dans le contexte d'une gestion durable des forêts.

**Общество лесоводов Ирландии: участие профессиональных лесоводов в развитии
лесного сектора и национальном облесении**

Основной докладчик: г-н Тони Маннион

Краткое изложение

Как во всех видах деятельности в области лесного сектора, облесение в контексте устойчивого лесопользования должно проводиться под руководством профессионального лесоведа, имеющего соответствующее образование и опыт для успешного осуществления этой задачи. Крайне важным является также, чтобы лесная промышленность и потребители действовали в соответствии с указаниями и под руководством профессиональных лесоводов и чтобы сами лесоводы имели свой профессиональный представительный орган, который представлял бы их интересы.

В Ирландии таким профессиональным органом является Общество лесоводов Ирландии (ОЛИ). Основанное в 1942 году, оно представляет профессию лесоведа на острове Ирландия. В него входят свыше 700 членов, и оно является одновременно компанией с ограниченной ответственностью и зарегистрированной благотворительной организацией. Главная задача ОЛИ состоит в том, чтобы: "представлять и развивать профессию лесоведа в соответствии с потребностями общества в устойчивом управлении лесами Ирландии посредством совершенствования практики ведения лесного хозяйства". У этой главной задачи есть ряд основополагающих критериев, включая:

- защита интересов лесоводов;
- обеспечение профессионализма и поддержание высокого уровня лесопользования на основе глубоких знаний и опыта;
- достижение устойчивого лесопользования и консервация экосистем;
- проведение консультаций с заинтересованными сторонами и их участие в разработке политики в области лесного хозяйства;
- содействие социальному согласию, взаимодействию и единству цели.

В Обществе существует три вида членства: техническое (включая группу лесоводов-консультантов), ассоциативное и студенческое. Члены общества работают во всех областях лесной промышленности, включая государственное и частное лесоводство, питомники, управление лесным хозяйством, утилизацию древесины, распилку и обработку, проведение научных исследований и обучение. ОЛИ придает большое значение содействию установления профессиональных стандартов в государственном и частном лесном секторе и регламентации профессии лесоведа, и в этой связи члены Общества обязуются следовать Кодексу этического и профессионального поведения. В целях поддержания самых высоких профессиональных стандартов ОЛИ также вносит свой вклад в систему образования в области лесоводства в Ирландии. В настоящее время разрабатывается экспериментальная программа непрерывного профессионального развития. Готовятся планы по введению этой программы в учебные курсы образовательных учреждений третьего уровня.

Общество занимается:

- публикацией программных документов и пресс-релизов и распространением знаний о профессии лесоведа среди широкой общественности;
- проведением практических занятий, симпозиумов, курсов обучения (внутри страны и за рубежом) и публичных дискуссий по важным вопросам лесоводства;
- изучением журнала "Лесоводство в Ирландии", на страницах которого публикуются оригинальные научные и другие статьи по лесоводству и рецензии книг;
- изучением квартального информационного бюллетеня "Лесовод Ирландии";
- развитием контактов с организациями и лицами, интересующимися лесной промышленностью;

- проведением дискуссии и переговоров с Лесной службой Ирландии по вопросам национальной политики в области лесоводства и ее влияния на лесную промышленность в целом;
- публикацией списка технических членов, которые могут оказывать консультативные услуги; этот список распространяется среди широкой общественности и тех людей, которые нуждаются в получении профессиональной помощи по вопросам лесоводства.

Общество также связано с широкой сетью учреждений и организаций в области лесного хозяйства внутри страны и далеко за ее пределами, принимая участие в работе Европейского совета лесоводов (ЕСЛ), Лесного попечительского совета (ЛПС), Ирландской инициативы сертификации лесного хозяйства (ИСЛХ) и Ассоциации лесной промышленности Ирландии (АЛПИ).

Настоящий документ имеет целью показать вклад ОЛИ в работу по формированию единого мнения среди профессионалов-лесоводов относительно национальной политики в области лесоводства, с тем чтобы лесоводы могли принять активное участие в разработке инициатив, таких, как облесение в контексте устойчивого лесопользования.

As with all forestry activities, afforestation within the context of Sustainable Forest Management (SFM), must be led by professional foresters who are trained and experienced to carry out the task. It is also of critical importance that the forest industry and its stakeholders are well served by the vision and leadership of professional foresters, and that those foresters have a clear and united voice in the form of a professional representative body. In Ireland, that professional body is the Society of Irish Foresters (SIF). Founded in 1942, it represents the forestry profession on the island of Ireland. It has over 700 members, is a company limited by guarantee, and is a registered charity.

MISSION STATEMENT:

To lead and represent the forestry profession, which meets, in a sustainable manner, society's needs from Irish forests, through excellence in forestry practice.

There are a number of underlying values to this Mission Statement.

- *Leadership for the profession;*
- *Professionalism and excellence in forest management;*
- *Founded on a sound knowledge base and expertise;*
- *Sustainability in forest management and conservation of ecosystems;*
- *Consultation with, and the involvement of, all stakeholders in shaping forestry policy;*
- *Promoting social cohesion, interaction and unity of purpose among members.*

MEMBERSHIP:

The Society has 3 types of membership –

- Technical Members who must hold a degree or diploma from a recognised 3rd level institution or the Foresters' Certificate of the Society. They must also be desirous of promoting the objectives of the Society;

- Associate Members do not need to hold a technical forestry qualification, but must be desirous of promoting the objectives of the Society;
- Student Members should be pursuing a primary degree or diploma in forestry subjects at a 3rd level institution recognised by the Society.

All intending members to be proposed and seconded by existing members.

Members are employed in all sectors of the forest industry, including public and private forestry, nurseries, forest management, timber utilisation, sawmilling and processing, research and education.

The Society also has a Consultant Foresters cadre within its membership. This group has the following objectives:

- To provide an identifiable grouping of consultant foresters recognised as professionally qualified specialists in forestry;
- To have cognisance of all matters affecting the interests of members whether concerning professional conduct or otherwise relating to the forestry profession;
- To comment publicly and lobby on topics which are sufficiently important to the forest industry and to consultant foresters in particular;
- To take part in the setting and upholding of forest industry standards;
- To provide the public with the assurance of a quality service and to safeguard the public interest;
- Compliance with the Code of Ethics and Professional Conduct of SIF.

The Consultant Foresters Group of the Society must satisfy the following membership criteria:

- Graduate Foresters, i.e. holders of B. Agr.Sc (Forestry), or an equivalent third level qualification in forestry approved by the Society of Irish Foresters;
- A minimum of two years professional experience in forestry;
- Technical Members of the Society of Irish Foresters;
- Agree to partake in Continuous Professional Development;
- Sole Trader or Company Director, Associate or Partner of a forestry consultancy business;
- Holders of professional indemnity insurance cover to a minimum of €325,000.

PROFESSIONAL STANDARDS:

SIF places serious emphasis on promoting professional standards in public and private sector forestry, and the regulation of the forestry profession, and to this end members are bound by a Code of Ethics and Professional Conduct. The purpose of this Code is to govern the professional conduct of members of SIF.

Compliance with this code demonstrates the respect of SIF members for the land and the social, economic, environmental and cultural values of forests. It demonstrates commitment to sustainable forest management and the wise management of ecosystems. It will ensure just and honourable professional and human relationships, mutual confidence and respect and serves to guarantee the availability of competent professional services to clients, employers and the wider society.

SIF also influences forestry education in Ireland, with a view to maintaining the highest professional standards. A programme of Continuous Professional Development (CPD) is currently in position on a pilot basis, and is being developed. Plans are advanced to link in CPD with the 3rd level education institutions.

SIF OPERATIONAL PLAN

Objectives:

a) To promote a greater knowledge and understanding of forestry, in all its aspects, and to advance the economic, social and public benefit values arising from forests.

This is based on SIF policy, as for example set out in a number of policy position statements on Sustainable Forest Management, Professional Standards in Forestry, Investment in Forestry, Diversification of Species and Semi-natural Woodland, which provide the SIF position on key issues. It also involves improvement of internal and external public relations, and contact and influence with policy makers. Additionally, it involves the ongoing review of current activities and the implementation of a range of activities to meet the needs of the members and other stakeholders.

Actions:

- Definition of the benefits arising from forests;
- Devise and establish appropriate strategies and lines of communication to influence policy makers;
- Co-operate with other groups and organisations in the promotion of forestry. Review and refine the SIF role as members of the Irish Forest Industry Chain (IFIC), Irish Forest Certification Initiative (IFCI), Tree Council of Ireland (TCI) and Union of European Foresters (UEF);
- Liaise with other forestry organisations such as the Irish Timber Growers Association (ITGA), COFORD, Institute of Chartered Foresters (ICF), etc., in the ongoing promotion of forestry in Ireland;
- Engage with National Forest Authority and appropriate EU Directives in the formulation and implementation of forest policy;
- Review the range of current activities and develop and implement an appropriate range of activities and events targeted at the needs of members and other groups;
- Nominate Technical Members for Directorships on appropriate bodies and seek increased representation on appropriate committees;
- Utilise professional PR to promote SIF viewpoints and activities;
- Provide a framework for the involvement of all stakeholders in SIF activities.

b) To establish, secure and monitor standards in forestry education and professional practice

Under this objective, the SIF sets out a membership structure and criteria for each level of membership. Forestry course curricula in universities and institutes of technology are reviewed and the SIF has set up a system for the members' professional progression, regardless of membership status, to provide the opportunity for members to become professionally qualified to practise as a forester. It implements a Code of Ethics and Professional Conduct with supporting structures, all of which require ongoing promotion. A programme of Continuous Professional Development (CPD) has also been developed.

Actions:

- Define a membership structure and set out levels of membership;
- Set up a system for members' professional development through the SIF;
- Engage with universities and institutes of technology in the matter of forestry course curricula, outreach and extension courses;
- Implement the Code of Ethics and Professional Conduct, with a procedure for dealing with complaints and discipline;

- Promote standards of professional practice – including a commitment to Continuous Professional Development;

c) To foster a greater unity and sense of cohesion among members and provide an appropriate range of services to members

The SIF recognises that one of its functions is to foster a greater sense of purpose among its members. It has become more ‘service’ orientated and encourages members to look more to the SIF for representation and support in their working lives.

Actions:

- Continue to establish the needs of the members;
- Set out the infrastructure and range of services to meet these needs (including Professional Indemnity insurance scheme, specialist training courses etc.);
- Represent the interests and needs of the members to policy makers;
- Negotiate with 3rd parties, including the National Forest Authority and/or EU Directives, on issues/matters that impact on the professional careers of members;
- Encourage equal employment opportunities.

d) To establish the SIF on an independent and self-sustaining financial basis

The SIF must strive to become more financially independent.

Actions:

- Increase revenue (increase membership, provision of services);
- Implement a financial management strategy including the monitoring of income and expenditure budgets;
- Seek external sponsorship;
- Seek funding through various National and EU Grant Aid Schemes.

Management:

The SIF Council is greatly helped in the overall management of the Society and the implementation of the development plan by the putting into position of:

- Management Unit consisting of President, Vice-President, Secretary, Treasurer and Technical Director;
- Six (6) Management Boards dealing with Finance, Public Relations, Education, Professional Standards, Membership Services and Meetings, and Publication of the Journal;
- A permanent office staffed with a Technical Director (part time) and Administrator (full time).

Activities:

The activities of the Society include the following:

- Meeting members’ needs and requirements;
- Issuing of policy documents, news releases and promoting an awareness of the profession among the general public;
- Holding field days, symposia, study tours (home and overseas) and public talks on topical forestry issues;
- Publishing Irish Forestry, a journal containing original scientific and other articles on forestry and reviews of published works;

- Publishing The Irish Forester, a quarterly newsletter;
- Ongoing dialogue with stakeholders re the forest industry;
- Discussions and negotiations with the National Forest Authority regarding national forest policy and its impact on the overall forest industry;
- Interaction with forestry organisations/societies worldwide;
- Publishing a list of technical members who are available for consultancy, which is made available to the public and to those interested in availing of professional forestry advice.
- Maintenance of Society Website: www.societyofirishforesters.ie

CONCLUSION:

This paper has, I hope, presented SIF through its Mission Statement, membership, operational plan and activities, as an example of achieving a unified voice among professional foresters, in order to ensure that the profession steers national policy and is well positioned to input effectively into initiatives such as afforestation within the context of sustainable forest management.

SIF also believes that afforestation in the context of SFM is part of global sustainable development and as such helps in the conservation of natural and semi-natural forest worldwide.

THE CONTRACTORS' VIEWS ON AFFORESTATION IN THE CONTEXT OF CERTIFICATION AND SUSTAINABLE FOREST MANAGEMENT (SFM)

**Mr. Donald Fitzpatrick, Chief Executive, Irish Forestry Contractors Association,
Ireland**

Afforestation work in Ireland today is carried out almost entirely, by contractors and their workers. Contractors are individuals or entrepreneurs who usually specialise in a particular job and they specialise in such as trees, fertiliser, fencing materials, herbicides etc. They are paid on a lump sum basis when the job is completed, so they must have finance available to run their business. They can be employed directly by the landowner or by a forestry development company. Their productivity and earning potential can be affected by bad weather, labour shortages and work stoppages. I will deal with these issues in more detail later on but I would now like to outline how contracting developed in Ireland and where we would like to take it into the future, within the parameters of Sustainable Forest Management.

Afforestation in Ireland up to the 1950's was carried out by the State on marginal land unsuited to agriculture. Much of this planting resulted from the sub-division of landlords estates and the State recruited a permanent work-force to develop and manage the forests. In the 1950's State policy was to actively acquire and plant land unsuited to agriculture. A target of 10,000 hectares per annum was set and about 500,000 hectares of marginal land was deemed potentially profitable for forestry. Technical advances in ploughing and drainage allowed forestry to expand onto the peatlands and podsols. Exotic conifer species from North America such as Sitka Spruce and Lodgepole Pine were successfully introduced to Ireland. The First and Second Programmes of Economic Expansion (1959-1969) continued with the policy of (a) afforestation of land unsuited to agriculture and (b) a target of 10,000 hectares per annum. Although there was an aspiration for a financial return from afforestation, the over-riding objective was (a) strategic – to provide sawn softwood in times of emergency and **(b) social – to provide and maintain rural employment.** Consequently, a large workforce was employed by the State to develop and maintain the growing forestry estate. A management structure of forests, districts and divisions was created. Each forest unit employed up to 20 or more full-time workers under the supervision of two or three foresters. These workers were recruited from the local community and forestry was welcomed, as it was seen to create employment and reduce emigration. A tradition of family involvement in forestry work evolved. An annual work programme was agreed for each forest and a bonus scheme was introduced to provide incentives for the workers to increase their earnings and productivity. Each year the State allocated money to carry out the agreed work programme and fund an employees' pension scheme.

When Coillte Teoranta, the semi-State company, was set up in 1989 to take over the management of State forests on a commercial basis, they inherited 1735 industrial workers and 741 administrative employees. Coillte introduced voluntary redundancy schemes to reduce the number of employees and by 1995 they employed 765 industrial workers and 561 administrative personnel. By 2001 the number of industrial employees had decreased to 490 while their administrative employees had risen to 592. Some of these former Coillte workers decided to become contractors mainly in the planting and maintenance areas. They had skills and experience acquired over many years and were generally facilitated with work contracts by Coillte. More of them took up employment with established Contractors but within a few years most of these ex-Coillte employees were no longer involved in forestry work. Contractors were then finding it difficult to recruit workers from the general workforce. Alternative employments offered better wages, better conditions of employment, better prospects – all of these factors attracted workers away from forestry into factories, building sites and road construction projects. The traditional rural-based workforce that had grown up with the expansion of State forestry, was no longer available to contractors.

The State had also changed its policy on the employment potential of forestry by ceasing to recruit forestry workers either directly or through Coillte. In 1996 Government policy on forestry was outlined in *Growing for the Future – A Strategic Plan for the Development of the Forestry Sector in*

Ireland. At that time forest cover amounted to 8% of the land area or 570,000 hectares of which Coillte owned 390,000 hectares or 68% of the forest estate. It was estimated that 16,000 people were employed in the forestry sector; 7000 in direct employment and 9,000 in indirect employment. It was forecasted that by 2020 an extra 11,000 jobs would be created in the forestry sector, in the context of implementation of the Strategic Plan. If you subtract Coillte's total workforce of around 1300 employees at the end of 1995 from the 7000 direct employment figure you are left with 5700 workers directly employed in forestry. How many of those were contractors or employees of contractors is not known, but our estimate of the current contractors workforce is no more than 2000 people.

With State involvement in direct employment decreasing it was left to contractors to become the employers of workers for forestry operations. Afforestation and Establishment contractors in particular, were and are dependent on manual labour. Unlike timber harvesting contractors who mechanised their operations; the Establishment contractors are dependent on a manual labour force. Mechanisation of planting is restricted to the better quality land and will not eliminate the need for manual workers. Likewise the subsequent maintenance operations are dependent on having manual workers available. The State employed forestry workers were unionised and were entitled to tax-free allowances for travelling and subsistence. These entitlements were retained by Coillte's workers when they became semi-state employees. However, forestry contractors were and are being discriminated against by the Revenue Commissioners who will not allow the payment of tax-free subsistence allowances to employees of forestry contractors. Yet the Revenue allows Coillte's workers and even workers in the construction industry to receive tax-free subsistence payments. This is a major disadvantage for forestry contractors as they cannot offer similar terms to their potential employees.

We would like to hear how other countries treat their forestry workers in this regard ?

With State employment of forestry workers decreasing and contracted Labour increasing, there was a need for a representative organisation to look after contractors interests. So, in 1994 the Irish Forestry Contractors Association was formed by contractors with grant assistance from the *EU Operational Programme for Agriculture, Rural Development and Forestry 1994-1999*. Our membership was and is mainly from the timber harvesting and haulage sectors. Establishment contractors are difficult to recruit to our Association as many of them are seasonal workers in forestry and they also work in agriculture or construction. They operate on a smaller financial turnover and they do not have substantial investment in machinery or equipment unlike the harvesting contractors. They are much more weather-dependent and the work can be held up due to frost and rain. In these circumstances it is difficult to hold onto staff and make long-term plans. Some contractors have recruited foreign workers on work permits because Irish workers were not available. Planting contracts tend to be short-term and payment can be delayed until the grant is paid to the farmer or Development Company. This often results in contractors getting out of forestry work as they cannot make it pay. The full-time establishment contractors must take on other work to retain their workers. This could be landscaping and amenity work for example.

So, what has all this to do with Sustainable Forest Management ? Well, we believe that Sustainability means sustaining a qualified, experienced workforce that is properly motivated and rewarded. Sustainable Forest Management encompasses Environmental, Economic and Social values which need to be safeguarded. The indicators used in the Irish National Forest Standard provide a way of assessing forest conditions in relation to the criteria for sustainable management. Indicator 6.2 for example deals with **"The socio-economic and employment contribution of the forestry sector"**.

It states that:

"Direct 'in forest' employment has decreased in recent years due to the mechanisation of many forest operations. At the same time, direct employment, mainly in the private forestry sector and in downstream processing, has continued to increase with the development of private contracting companies, consultancy and the panelboard industries. Substantial investment has taken place in the sawmilling industry. While no comprehensive statistics are available, it has been estimated for one area in Munster that the appropriate multiplier (direct + indirect employment) is 15.4 full time equivalents per 1,000 ha of forest. It has been estimated for the same area that each €1,270 in direct expenditure on forest management can result in the generation of €5,400 in other direct and indirect

expenditure. The indication is that this employment and economic activity is generated close to the forest area. However, few data are available to assign monetary values to community dependence on wood and non-wood forest products. In recent years, State and EU funding for forest development has focused on the conversion of agricultural land to forest and on compensating farmers for loss of income from this land.

Measures relating to employment potential are:

6.2.1. *At national level, the extent to which the forest industry maintains its national socio-economic and cultural functions may be assessed from:*

- ***the contribution of expenditure in the forestry sector to the development of other direct and indirect economic activity;***
- ***the number of full-time job equivalents in the forestry sector, and their gender balance;***

6.2.2. *At local level, the contribution of individual forest areas to socio-economic and cultural development can be measured by:*

- ***the number of local jobs generated;***

So what are our Associations proposals for a Sustainable forestry workforce?

1. **To carry out a census of existing forestry workers** (not full-time job equivalents) to establish the numbers actually employed on a full-time basis. This would be the criteria against which future employment trends would be measured.
2. **A career path for forestry operatives.** We are developing an induction and training programme for forestry operatives through the National Training Authority FAS. This *Traineeship Programme* will combine direct classroom training with workplace training in the forest. The direct training will give all trainees a knowledge of basic forestry operations and health & safety. Following this the trainees will be assigned to selected contractors or mentors for specialised training and work experience in their chosen work activity e.g. Establishment operations or Timber Harvesting or Timber Haulage. They will be assessed and certified on a competency basis for the different modules. The *Traineeship* would normally last for 1 year. This is the first attempt to create a formalised career path for forestry operatives in Ireland, which it is hoped will attract new recruits into the industry.
3. **Registration of Contractors.** Self-assessment Companies and Forestry Consultants must be approved by the Forest Service in order to operate within the Afforestation grant schemes. We would like to see a register of approved contractors set up. Criteria for inclusion should include:
 - Competency Certification through assessment of expertise or accreditation for prior experience.
 - Health & Safety awareness
 - Current Public and Employer Liability insurance
 - Current Tax Clearance Certificate
4. **An IFCA Field Officer.** Our Association is served by two full-time employees – myself as Chief Executive and an Office Administrator. The Forest Service commissioned an independent study on our Association which has recommended appointing a Field Officer to liaise with contractors on training, membership development and SFM awareness which must brought directly to the workers on their own worksites.

5. **Employers support** through:

- Long-term contracts.

Employers should recognise the need to provide continued work for established contractors and form better allegiances with their contractors.

- Prompt Payment

Contractors must pay staff and suppliers weekly. Cash-flow is critical for them.

6. **State Support**

The Revenue Commissioners must change their policy of discrimination against forestry contractors employees receiving tax-free subsistence payments.

Continued funding for the IFCA to represent Contractors.

7. **Sustainable Forest Management (SFM)**

Environmental / Economic / Social.

Believe it or not, but forestry workers have been using Environmental, Economic and Social criteria long before SFM was mentioned in Ireland. Every day they ask themselves 3 questions.

- a. Am I in the right environment?
- b. Is this job economic ?
- c. Will this pay for my social life ?

So if you want Sustainable forestry – sustain your workers – they are an endangered species !

Operational aspects of afforestation

Under this topic the following papers were presented:

Mr. Niall Farrelly, Mr. M. Bulfin, Mr. T. Radfor, (Ireland) on Using Geographical Information Systems and Field Classification Methods to Establish Relationships Between Site, Climatic Factors and Growth of Sitka spruce (*Picea sitchensis* (Bong.) Carr) in Co. Mayo, Ireland

Messrs. I. Abrudan, V. Blujdea, V. Kostyushin, C. Pahtontu, H. Philips, Ms. S. Brown, Ms. M. Voicu (Romania) on Prototype Carbon Fund: Afforestation of degraded agricultural land in Romania

Mr. Jim Dillon (Ireland) on Coillte Farm Partnership Scheme – A joint venture in commercial afforestation in Ireland

M. Bulfin, T. Radford and J. Brosnan on The effect of formative shaping on the stem quality and early growth of plantation ash

Mr. Stephen A. Smith, Mr. Bill Rayner, and Ms. Sarah Green (United Kingdom) on Creating New Native Woodlands in Scotland

Mr. Oscar Barreiro (Spain) on Operational aspects of fast growing species

Mr. Arne Pommerening (United Kingdom) on Afforestation and continuous cover forestry

Mr. Michael Keane (Ireland) on The mechanisation of planting on restock sites in Ireland

Ms. Sanja Peric (Croatia) on Growth of six coniferous species in different bioclimates in Croatia

Mr. Wojciech Gil and Mr. Jan Łukaszewicz (Poland) on Afforestation in Poland: silvicultural experiences

**USING GEOGRAPHICAL INFORMATION SYSTEMS AND FIELD CLASSIFICATION
METHODS TO ESTABLISH RELATIONSHIPS BETWEEN SITE, CLIMATIC FACTORS
AND GROWTH OF SITKA SPRUCE IN CO. MAYO, IRELAND**

**Mr. Niall Farrelly, Mr. M. Bulfin, Mr. T. Radfor, Teagasc, Kinsealy Research Centre,
Ireland**

SUMMARY

A detailed site investigation to determine the productivity of Irish soils for forestry was undertaken in Co. Mayo as part of the Forest Inventory and Planning system (FIPS) commissioned by the Forest Service. In order to measure the potential of soils for afforestation, measurements of general yield class were taken in stands of Sitka spruce on range of different soil types. A Geographical Information System (GIS) was used to combine and analyse data from the site survey with additional environmental and climatic information. Results indicated that soils traditionally associated with agricultural production have very high yields for forest production in the county. The effect of increasing levels of elevation and exposure resulted in lower yields in the county. Decreasing yields associated with areas in northerly and westerly locations in the county was also indicated. The effect of climatic factors on yield indicated that increased precipitation and lower temperatures were associated with lower yields in the county. Regression analysis was performed on site and climatic data and indicated that the variables collected in the survey were responsible for 58% of the variation in plots surveyed. A model relating plot location and altitude to yield accounted for 43.5% of the variation in yields of sampled plots across the county.

**L'utilisation d'un système d'information géographique et de méthodes de classification
des sites à des fins de prévision du rendement des épicéas de Sitka et de cartographie de
la productivité potentielle et des risques de chablis dans le comté de Mayo (Irlande)**

Exposé de Niall Farrelly

Résumé

Une étude approfondie de sites visant à déterminer la productivité des sols irlandais à des fins de foresterie a été menée dans le comté de Mayo préalablement à la mise en œuvre du Système d'inventaire et de planification des forêts commandé par le Service irlandais des forêts. Afin d'évaluer le potentiel de boisement des sols, on a mesuré le rendement global de formations arborées plantées sur divers sols. Un système d'information géographique (SIG) a été utilisé pour combiner et analyser les données d'étude des sites avec d'autres informations relatives à l'environnement et au climat. On a procédé à des calculs de régression pour estimer le rendement global potentiel de l'épicéa de Sitka (*Picea sitchensis* (Bong) Carr) à partir des divers facteurs utilisés dans le cadre de l'étude. On a élaboré un modèle de prévision du rendement global en fonction du type de sol, de l'élévation et de l'emplacement. Le SIG a été utilisé pour extrapoler les données et produire des cartes de productivité potentielle couvrant l'ensemble du comté de Mayo, qui est situé sur la côte occidentale de l'Irlande. La récente cartographie à grande échelle des sols réalisée suivant la méthode d'étude des sols forestiers élaborée au centre de recherche Kinsealy de l'Agence irlandaise pour le développement agricole et alimentaire (Teagasc) et l'existence d'un modèle numérique d'élévation ont facilité l'établissement de la carte de productivité potentielle et ont fourni les données pédologiques de base nécessaires à l'établissement d'une carte des risques de chablis. Cette méthode permet de produire, en matière de rendement du bois, des modèles qui peuvent être utilisés dans un SIG pour faciliter la détermination des zones ayant une productivité limitée. Elle permet également de recenser, au moyen de méthodes

reconnues, les zones sujettes au chablis et facilite, au niveau régional, la prise de décisions relatives au boisement.

**Использование ГИС и методов классификации участков для определения
производительности ситхинской ели и картографирования потенциальной
продуктивности и степени опасности ветровала в графстве Мейо, Ирландия**

Основной докладчик: г-н Найел Фэрели

Краткое изложение

По поручению Лесной службы Ирландии в графстве Мейо в качестве предварительного мероприятия в рамках Системы инвентаризации и планирования лесного сектора было предпринято детальное исследование участков с целью определения продуктивности ирландской почвы для лесного сектора. С тем чтобы установить возможности почвы в плане облесения, были взяты замеры общего класса бонитета в древостое на различных почвах. Географическая информационная система (ГИС) была задействована для анализа данных, полученных в результате исследования участков. Учитывалась также общая информация по окружающей среде и климатическим условиям. По результатам целого ряда факторов, использованных в исследовании, был применен метод регрессии для оценки потенциальной производительности общего класса бонитета ситхинской ели (*Picea sitchensis* (Bong). Carr). Была разработана модель, с помощью которой была рассчитана производительность общего класса бонитета на базе данных о типе почв, высоте над уровнем моря и местоположении. ГИС была использована с целью экстраполяции и составления карт потенциальной продуктивности для всего графства Мейо, расположенного на западном побережье Ирландии. Недавнее крупномасштабное картографирование почвы с помощью Тегаскской ирландской методологии исследования лесных почв (разработанной в Исследовательском центре Кинсейла), и использование цифровой модели возвышенности облегчило создание карты потенциальной продуктивности, а также предоставило необходимую информацию о почвах для разработки классификационной карты опасности ветровала. Полученная методология создает хорошо отлаженные модели выхода древостоя, которые могут использоваться в ГИС для определения областей, имеющих ограниченный продуктивный потенциал. Она также определяет с помощью признанных методов области, подверженные ветровалу и содействует процессу принятия решений в области облесения на региональном уровне.

INTRODUCTION

At present the forest estate in the Republic of Ireland occupies 9% of the land area or 665,000 hectares (Forest Service, 2002). The strategic plan for forestry outlined in “Growing for the Future”, is to increase forest cover in Ireland to 17% by the year 2030 (Anon, 1996). An increase of 8% of the land area to the targets outlined in “Growing for the Future” will result in 570,000 hectares of additional land being afforested. Currently Sitka spruce is the most important forest species in Irish forestry occupying 60% of the forest estate or 399,000 hectares approximately (Anon, 1996). Current afforestation figures indicate that Sitka spruce represents 60% of current planting indicating that approximately 370,000 additional hectares of Sitka spruce may be planted by the year 2030. This will in turn increase the total productive area of Sitka spruce in the country to 769,000 hectares. Consequently assessment of future Sitka spruce yields is an important part of the decision making process for this increased afforestation. It is a necessity for commercial enterprises or small landowners in order to make investment decisions and to determine the level of financial gain obtained and for the planning of future forest operations. Information regarding production forecasting indicates

that the annual production of roundwood from the forests of Ireland is forecast to increase by 40% over the period 2001-2015 to five million cubic metres (Gallagher and O' Carroll, 2001). Furthermore the largest increase in production potential is among the private forest owners who are expected to be producing over 1.1 million cubic metres per annum by 2015.

Consequently prediction of productivity has become increasingly important in forestry in terms of directing the location of grant aid for afforestation, forest management and production forecasting. Thus a more detailed knowledge regarding the relationship between yield production and site quality in Ireland is needed. Indications are that approximately 1.3 million hectares of marginal agricultural land could produce yields in excess of $14 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$ if planted with Sitka spruce (Bulfin 1987^{a+b} & 1990). Production figures indicate that Sitka spruce can achieve very high yields even on marginal agricultural soils such as gleys in Ireland (O' Flanagan and Bulfin, 1970; Bulfin et al, 1973; Bulfin, 1988) with yield class values ranging from 21 to $24 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$. Carey *et al* (1985) suggested that cutaway bogs on midland peats appear to have a high production potential for forestry ($22 - 24 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$) once nutrient deficiencies have been addressed, with increasing restrictions on fertiliser use in forestry afforestation of some peatlands may need to be reevaluated. There are also indications that yields in Ireland are in excess of that available in the British Forestry Commission Yield Tables (Edwards and Christie, 1981) (Gallagher, 1972). Very high yields in excess of $30 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$ have been reported on gley soils in Co. Clare (Tottenham and Joyce, 1975; Tottenham, 2001). The widespread use of Sitka spruce in afforestation has made it possible to obtain information on the relationships between productivity and site factors for a wide range of site variables (Worrell, 1987).

The classification of the growth rate of forest crops can be based on the estimation of their general yield class (GYC), which is determined by a top height age relationship (Edwards and Christie, 1981). GYC is a site index that is expressed in terms of cubic metres per hectare per year at maximum annual increment (Rollinson, 1986). GYC allows comparisons between productive potential of species or site types as two different tree species growing on the same site may have a different site index, or the same tree species may have the same site index on two ecologically different sites (Wang at al, 1994). Therefore site index or GYC is a measure of a given species productivity.

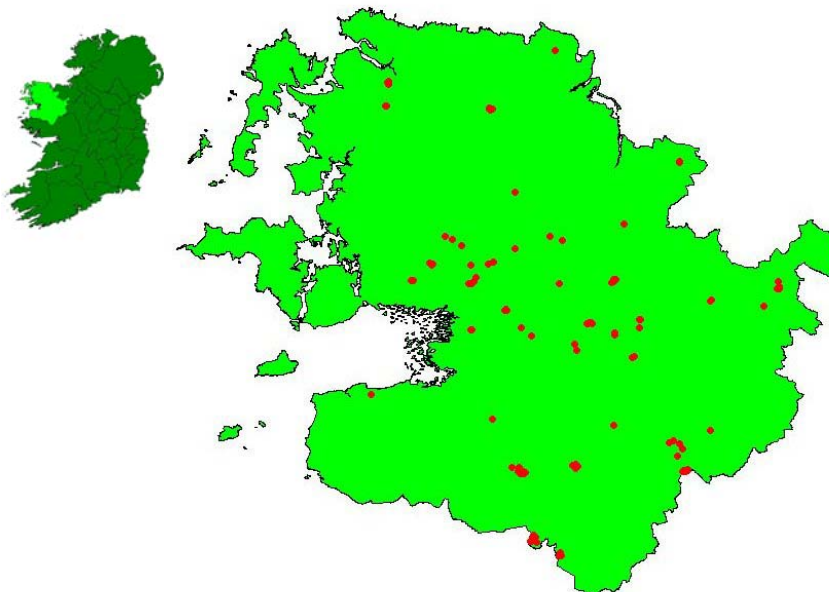
The objective of this study was to investigate the relationship between GYC, site and climatic factors in Ireland and this paper is the result of a sub set of this national study that took place in Co. Mayo.

MATERIALS AND METHODS

Sampling Strategy

Stands for sample plot locations were selected in Mayo from the Coillte forest estate using a geographic information system (GIS) database. Only pure stands of Sitka spruce were chosen. All stands chosen were be uniformly stocked and greater than 18 years of age, in order to decrease the measurement error associated with younger crops (Worrell, 1987, Worrell and Malcom, 1990a; MacMillan, 1991; Hassall et al, 1994). In all one hundred and thirteen sample plots were located within the Coillte forest estate in Co Mayo (Figure 1). The age of sampled stands ranged from 18 to 48 years, with a mean value of 31.5 years. The area of the stands ranged from 0.4 hectare to 21 hectares, with a mean value of 3.14 hectares.

Figure 1: Location of Co. Mayo in Ireland (inset) and location of sample plots in the county



Stands were classified according to soil type as numerous studies have indicated that soil type is one of the most important factors influencing productivity in Ireland and Britain (Pyatt, 1970; O' Flanagan and Bulfin, 1970; Bulfin et al, 1973; Blyth and Macleod, 1981¹; Worrell, 1987; Conry and Clinch, 1989). Stands for sampling were then randomly selected from each soil class category in order to cover as many of the soil classes as time and resources allowed. Plots were randomly located in sub-compartments away from the crop boundary to avoid possible edge effects (MacMillian, 1991). A 20 x 20 m (0.04 ha) plot was laid down to represent an individual ecosystem with uniform soil, vegetation and stand characteristics (Kenkel et al, 1989; Verbyla and Fischer, 1989). Plot location was marked by national grid coordinates, which were provided by a Trimble ProXR™ Global Positioning System (GPS). This allowed plots to have allocation, to be utilised in a G.I.S. at a later stage and ensured fast and efficient data logging.

Data Collection

In each plot a number of soil cores were taken and the soil type was described according to standard soil survey procedures used by the National Soil Survey of Ireland (An Foras Taluntis, 1963 – 1987; Gardiner and Radford, 1980). Peat soils were described as organic soils that must be at least 45 cm on un-drained land and 30 cm or greater on drained land (Hammond, 1981). In forestry plantations a peat depth over 30 cm constitutes peat in this classification as nearly all sites received some type of drainage. Gleyed and podzolised soils were classified as “peaty” if they have an organic layer, which is less than 30 cm in depth. Aspect was obtained from a compass in degrees and re-coded into the eight cardinal directions, where there was no aspect, i.e. on flat sites, the aspect recorded as zero. Aspect was also converted to the sine and cosine of its value for the purpose of analysis. The slope of the plot was then recorded in degrees using a clinometer. The exposure of the site was classified subjectively into six classes from very sheltered to very exposed.

In order to obtain additional information about the site, GIS techniques were used. As the data was collected using GPS, each plot in the survey had an exact location. The plots were displayed on-screen in a G.I.S. and a process called data extraction was used to obtain information from raster surfaces from exact plot locations. The location of each plot with precise locations relative to the Irish national grid using X and Y easting and northing coordinate were calculated. Plot elevation was obtained from a digital elevation model (DEM) raster layer with a horizontal resolution of 25 m and a vertical resolution of 1m. The distance of the plot from the Sea in kilometres was calculated. Additional climatic variables were also available in the form of raster GIS coverages (Sweeney and Fealy, 2002).

Among the climate variables that were available were annual rainfall, mean monthly rainfall, mean annual temperature, mean monthly temperature and annual global solar radiation. In order to assess the effect of various climatic variables on productivity annual precipitation, precipitation of the driest and wettest months were chosen together with a sum of the precipitation from May to October, which represented the growing season of Sitka spruce in Ireland. The temperature variables assessed were mean annual temperature, and mean temperature of the warmest and coldest months. In addition values for annual daily global solar radiation were available and also used in the analysis.

Top height was calculated from the average height of 4 trees in the 0.04 ha plot with the largest breast height diameter (Edwards and Christie, 1981). Trees that were used to measure top height are growing at a rate that is only influenced by the plot factors; hence their growth reflects the potential productivity of that plot. Trees that were forked or that had bad form were excluded. The number of growing seasons was determined from the inventory records obtained from the Coillte database. An assessment of general yield class was obtained from top height age curves for Sitka spruce (Edwards and Christie, 1981). A full list of all the data is available in Table 1.

Table 1: Site and crop variables recorded in the study with their classes or units.

Variable	Class or Units
Soil type	grey brown podzolic, brown earth, brown podzolic, podzol, regosol, lithosol, rendzina, gley, peaty podzol, peaty gley, raised peat, raised peat cutover, blanket peat
Slope	Degrees
Aspect	Recoded into north, north east, east, south east, south, south west, west, north west also cosine and sine of aspect
Exposure	very exposed, exposed, moderately exposed, moderately sheltered, sheltered, very sheltered
Elevation	Metres
Distance from the Sea	Kilometers
Annual precipitation	mm
Precipitation May - October	mm
Percipation of the wettest month (January)	mm
Precipitation of the driest month (July)	mm
Mean annual temperature	Degrees C
Mean temperature of the warmest month (July)	Degrees C
Mean temperature of the coldest month (February)	Degrees C
Annual Global Solar Radiation	Mega joules/m ² /year
Top Ht	Metres
Age	Years
GYC	m ³ ha ⁻¹ annum ⁻¹
X coordinate	Metres
Y coordinate	Metres

Statistical Analysis

One way analysis of variance (ANNOVA), using Bonferroni's t-test (Zar, 1984; Wang et al, 1994) were conducted to detect differences in GYC among groups of plots stratified according to qualitative data. Mean values, standard deviations and standard errors and 95% confidence intervals were calculated for the qualitative variables. For the continuous variables correlation coefficients were computed between GYC and related site variables. Multiple regression was used to determine what variables best accounted for the variation in GYC.

RESULTS

Relationships between Soil Type and General Yield Class

A total of 12 different soil types were encountered in the study (Table 2). The assessment of general yield class by soil type indicated that the highest yields were encountered on grey brown podzolic soils with a mean general yield class of 29.6 m³ ha⁻¹ annum⁻¹. An analysis of variance (ANNOVA) using Bonferroni's test indicated that yields on grey brown podzolic soils were significantly greater (p = 0.05) than yields on gleys, peaty gleys, and peaty podzols. The lowest productivity was encountered on blanket peat with an average general yield class of 16.9 m³ ha⁻¹ annum⁻¹. Productivity on blanket peat was significantly poorer (p = 0.05) than yields on grey brown podzolics, brown earths of a low and high base status, gleys, and raised peats (man modified). Brown earth soils of both high or low base were broadly similar in yield with an average general yield class of 26.1 and 26.9 m³ ha⁻¹ annum⁻¹ respectively and were significantly greater (p = 0.05) than peaty podzols.

Table 2: The number of stands, with mean and standard deviations (SD) and standard errors (SE) of GYC (m³ ha⁻¹ annum⁻¹), and 95% confidence intervals (CI) stratified by soil type

Soil Type	No.	Mean GYC	SD	SE	95% CI of Mean	
Alluvial	5	21.1	4.69	2.10	15.3	to 27.0
Blanket Peat	21	16.9	3.80	0.83	15.2	to 18.6
Blanket Peat (Man modified)	3	19.5	2.50	1.44	13.2	to 25.7
Brown earth of high base	5	26.1	4.71	2.11	20.2	to 31.9
Brown earth of low base	5	26.9	5.67	2.54	19.9	to 33.9
Brown Podzolic	3	22.8	1.09	0.63	20.0	to 25.5
Gley	18	22.3	5.38	1.27	19.6	to 25.0
Grey Brown Podzolic	5	29.6	2.52	1.13	26.5	to 32.7
Peaty Gley	19	20.3	4.61	1.06	18.1	to 22.5
Peaty Podzol	6	16.9	2.95	1.20	13.8	to 20.0
Podzol	2	17.9	1.17	0.83	7.4	to 28.4
Raised Peat (Man modified)	21	23.1	2.62	0.57	21.9	to 24.3

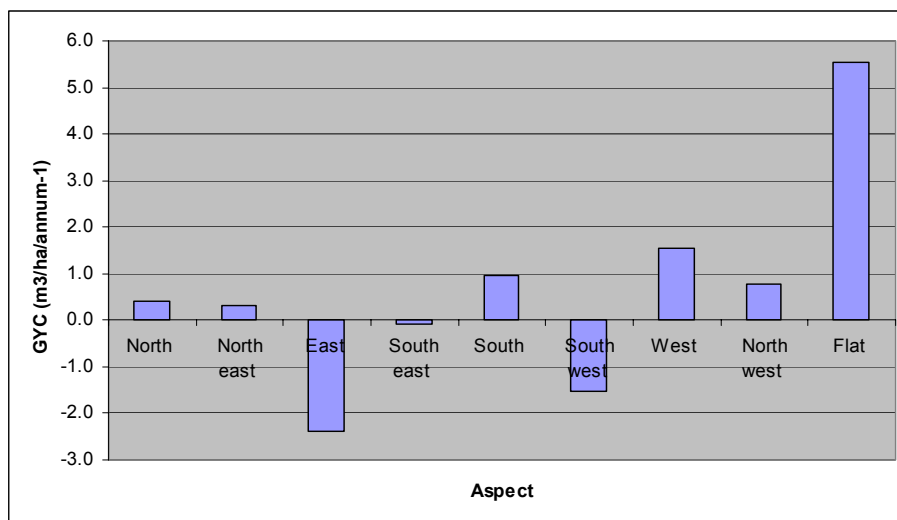
Relationships between Aspect and General Yield Class

An assessment of yield was made on all aspect classes in the study, the mean GYC for each aspect is displayed in Table 3. Plots that were located on flat areas, were located in the lowlands (below 150 m) and had on average the highest yields at 26.8 m³ ha⁻¹ annum⁻¹. An analysis of variance indicated that the effect of aspect was not a significant factor on yield. Figure 2 illustrates the average change in GYC for each aspect class.

Table 3: The number of stands, with mean and standard deviations (SD) and standard errors (SE) of GYC (m³ ha⁻¹ annum⁻¹), and 95% confidence intervals (CI) stratified by plot aspect

Aspect	No.	Mean GYC	SD	SE	95% CI of Mean	
North	12	21.7	3.70	1.07	19.4	to 24.1
North east	10	21.6	6.21	1.96	17.2	to 26.0
East	19	18.9	5.32	1.22	16.4	to 21.5
South east	16	21.2	4.42	1.10	18.9	to 23.6
South	16	22.3	6.82	1.71	18.6	to 25.9
South west	13	19.8	4.15	1.15	17.3	to 22.3
West	14	22.8	3.60	0.96	20.8	to 24.9
North west	10	22.1	5.66	1.79	18.0	to 26.1
Flat	3	26.8	3.91	2.26	17.1	to 36.5

Figure 2: Change in average general yield class associated with aspect in Co Mayo



Relationships between Exposure and General Yield Class

The effect of exposure on GYC is displayed in Table 4. Lower yield occurs on average in the exposed and very exposed sites. An analysis of variance (ANNOVA) using Bonferroni’s test indicated that the effect of exposure on yield caused significantly lower yields ($p = 0.05$) on exposed and very exposed sites compared to moderately exposed, moderately sheltered and sheltered sites.

Table 4: The number of stands, with mean and standard deviations (SD) and standard errors (SE) of GYC ($m^3 ha^{-1} annum^{-1}$), and 95% confidence intervals (CI) stratified by exposure level.

Exposure	No.	Mean GYC	SD	SE	95% CI of Mean	
Very exposed	14	16.2	2.69	0.72	14.6	to 17.8
Exposed	23	18.6	4.31	0.90	16.7	to 20.4
Moderately exposed	43	22.0	4.47	0.68	20.6	to 23.4
Moderately sheltered	24	25.0	4.93	1.01	22.9	to 27.1
Sheltered	9	23.5	4.35	1.45	20.2	to 26.8

Relationship between Continuous Site and Climatic Variables and General Yield Class

The mean standard deviation and range of the continuous site variables measured in the study and their correlation with GYC are displayed in Table 5.

Table 5: Mean, standard deviation (SD) , minimum (Min) and maximum (Max) of the site variables recorded in the study and their correlation (R) with GYC.

Variable	Mean	SD.	Min	Max	R
GYC	21.3	5.2	7.7	34.7	
Age	31.5	7.2	18.0	48.0	-0.1716*
Altitude	76.9	53.2	19.0	255.0	-0.4647****
X coor (easting)	115581.4	16180.2	84415.0	152289.0	0.2474**
Y coor (northing)	290048.1	21649.9	253888.0	338056.0	-0.5447****
Sin (aspect)	0.0	0.7	-1.0	1.0	0.1944*
Cos (aspect)	0.1	0.7	-1.0	1.0	0.1054
Slope	4.3	3.8	0.0	23.0	-0.1204
Dist. From Sea (km)	21.4	11.3	1.0	45.0	0.3800****
Ann. Precipit (mm)	1440.3	176.6	1229.3	1983.4	-0.5723****

Precipit May-Oct (mm)	670.8	73.8	579.0	905.9	-0.5770****
Precipit of wettest month-Jan (mm)	155.8	21.2	131.1	220.6	-0.5650****
Precipit of driest month-July (mm)	85.0	9.5	72.2	117.0	-0.5854****
Mean Ann. Temp (degrees)	8.9	0.4	7.2	9.5	0.4813****
Mean temp. of warmest month-July (degrees)	14.2	0.5	12.5	14.9	0.5878****
Mean temp. of coldest month-February (degrees)	4.3	0.5	2.5	5.0	0.4526****
Mean annual Global Solar Radiation (Mega Joules/m ² /year)	3128.6	40.8	3037.1	3207.1	0.5686****

* significant at the 0.10 level, ** significant at the 0.05 level, **** significant at the 0.001 level.

Relationships between each variable and general yield class are explained further below:

Altitude and Plot Location

The relationship between GYC and altitude (r^2 values of 22%) indicates a decline in productivity of over $4\text{m}^3 \text{ha}^{-1} \text{annum}^{-1}$ for every 100m increase in elevation (Figure 3). Examination of the data suggests that even for the elevation range of the data (19 to 255 m in altitude), the effect of altitude is still highly significant at the 0.01 level. The effect of plot location was also examined. The relationship between northing and easting coordinate is illustrated in Figures 4 and 5. The northing (Y coordinate) was negatively correlated (r^2 values of 30%) with GYC indicating that a move from south Mayo to north Mayo would result in a decrease in GYC of $1.2 \text{m}^3 \text{ha}^{-1} \text{annum}^{-1}$ for every 10 km. The easting (X coordinate) was also correlated with GYC (r^2 values of 6 per cent) indicating that by moving from west to east in the county resulted in an increase in $0.8 \text{m}^3 \text{ha}^{-1} \text{annum}^{-1}$ in GYC for every 10 km.

Figure 3: The relationship between altitude and GYC in Co. Mayo

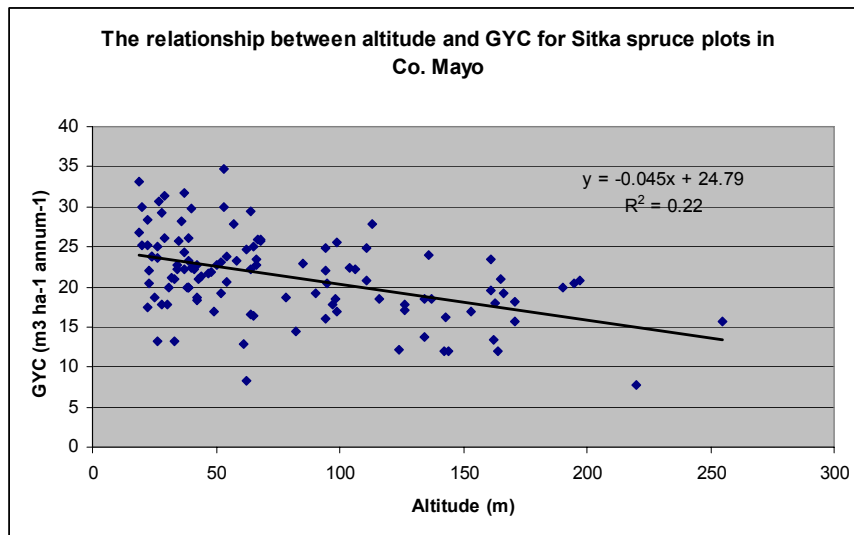


Figure 4: The relationship between easting coordinate and GYC in Co. Mayo

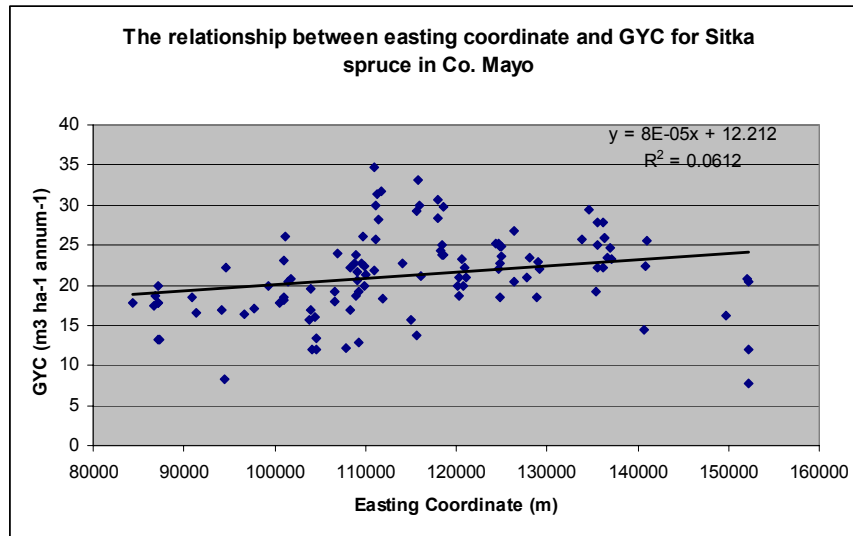
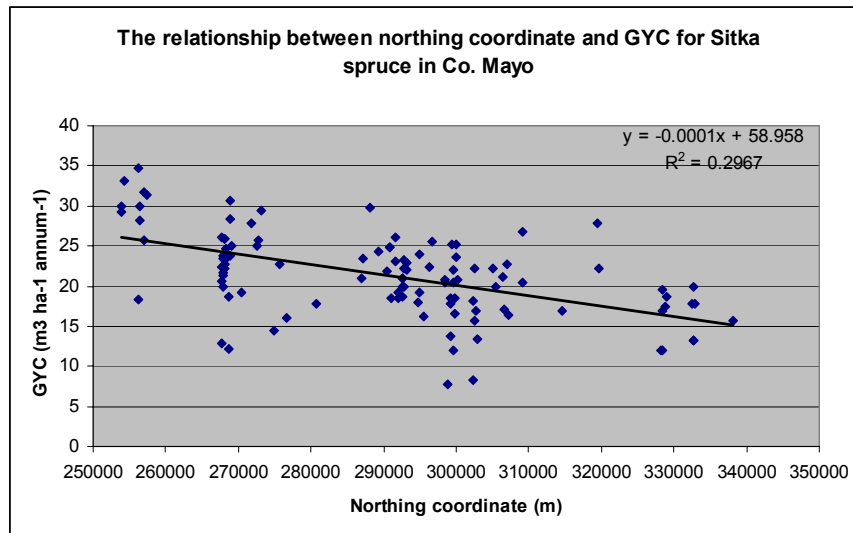


Figure 5: The relationship between northing coordinate and GYC in Co. Mayo



Age, Slope, and Distance from the Sea

A negative relationship exists between age and GYC. This relationship indicated that older stands in the study had lower productivity on average than younger stands over a 30-year age range. The relationship between slope indicated steeper slopes had lower productivities on average (Figure 6). However both the effect of age and slope on GYC were not significant. The relationship between GYC and distance to the sea was then examined and indicated higher productivities associated with inland locations (Figure 7). The plots used in the study ranged from 1 km to 45 km from the sea. The relationship between distance from the sea and GYC (r^2 values of 14%) was significant at the 0.01 level. This indicated that the GYC of plots increased by $1.7 \text{ m}^3 \text{ha}^{-1} \text{annum}^{-1}$ for every 10 km increase away from the coast for the plots used in the study.

Figure 6: The relationship between slope classes and GYC in Co. Mayo

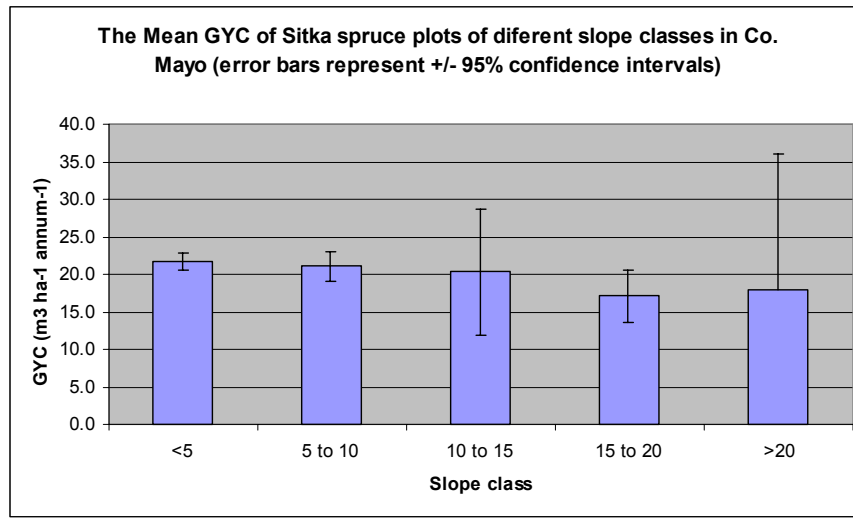
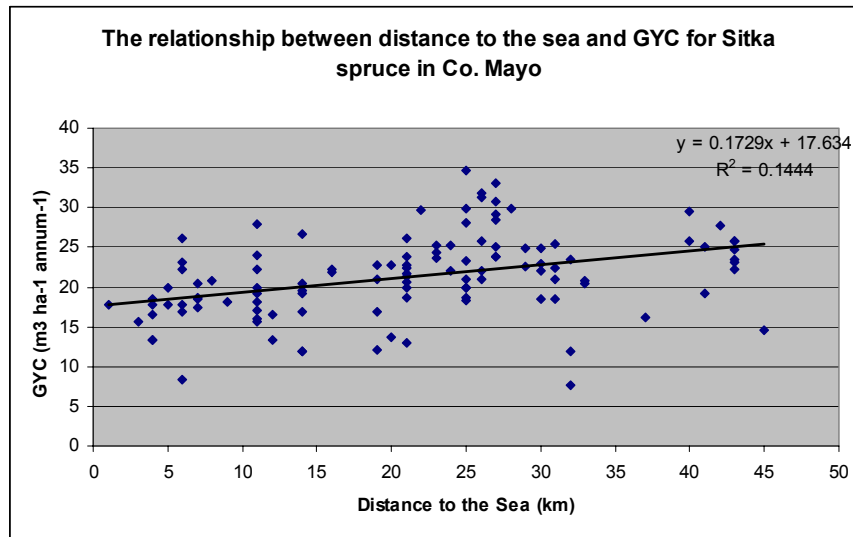


Figure 7: The relationship between distance from the sea and GYC in Co. Mayo



Precipitation, Temperature and Global Solar Radiation

The effect of climatic variables also indicates a strong relationship with GYC. All the climatic variables examined in the study are significantly correlated with GYC at the 0.01 level. The relationship between annual precipitation and GYC (r^2 value of 33%) indicates that lower yields are associated with increased precipitation (Figure 8). Annual precipitation ranged from 1229 mm to 1983 mm over the range of sites studied. Cumulative precipitation values for May to October, and precipitation in January and July were all negatively correlated with GYC (r^2 values of 32-34%), indicating that lower yields were associated with increased precipitation, Figures 9 - 11. Precipitation values of the driest period, July range from 72 mm to 117 mm.

Figure 8: The relationship between annual precipitation and GYC in Co. Mayo

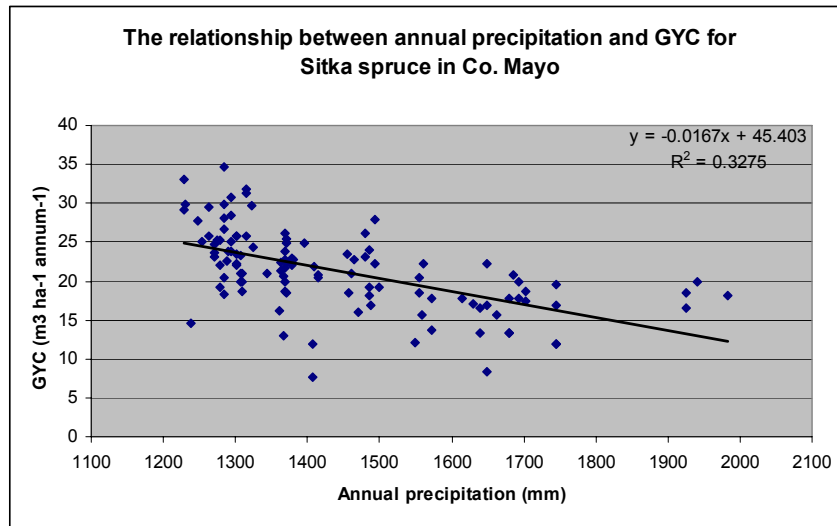


Figure 9: The relationship between cumulative precipitation (may to October) and GYC in Co. Mayo

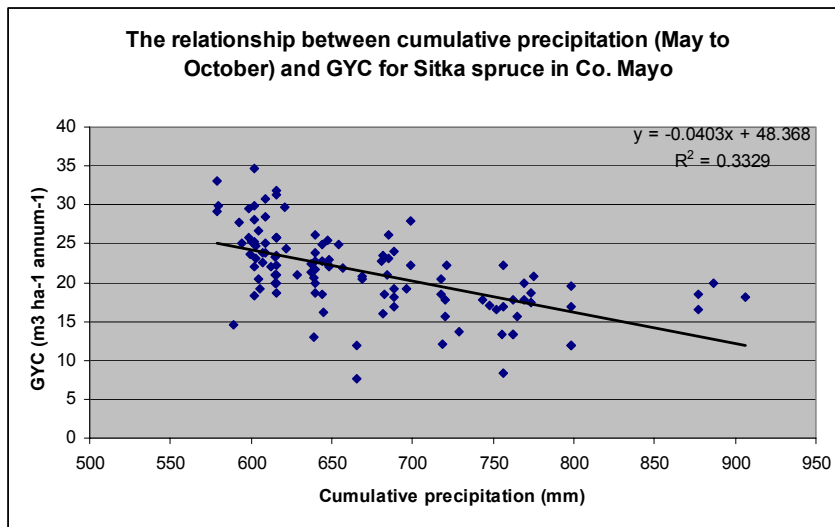


Figure 10: The relationship between January precipitation and GYC in Co. Mayo

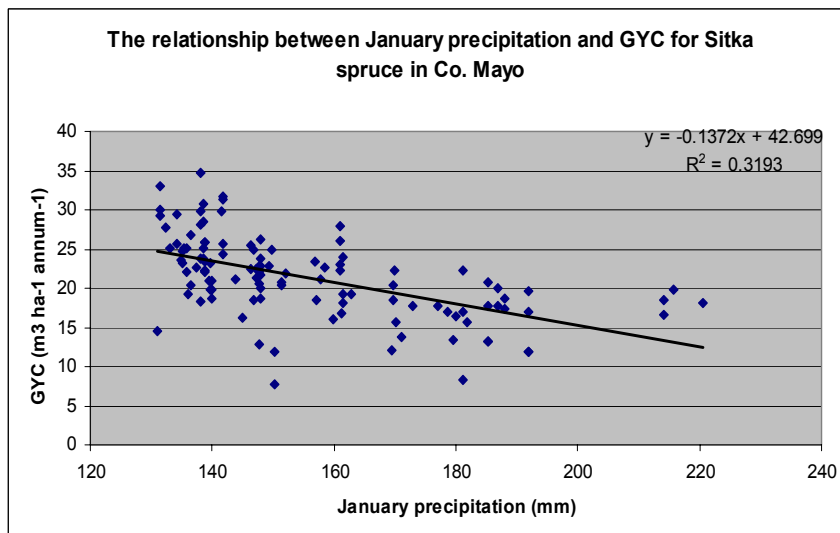
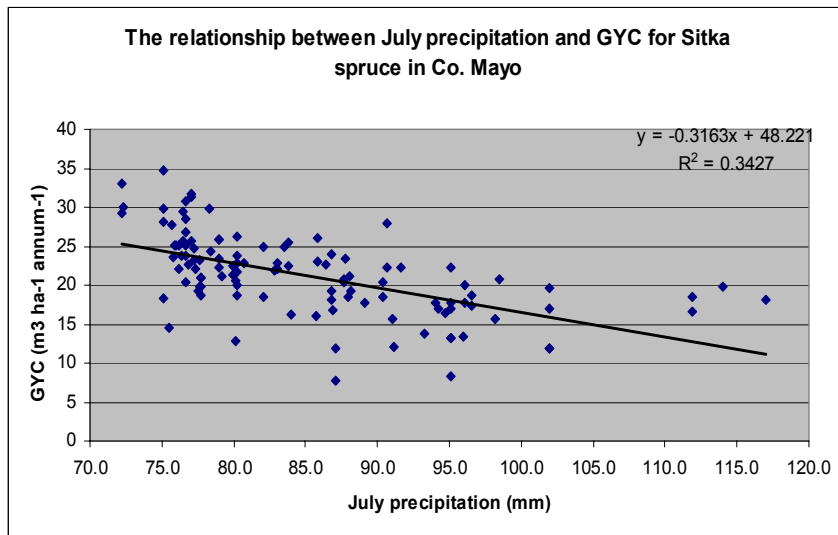


Figure 11: The relationship between July precipitation and GYC in Co. Mayo



The relationship between the temperature variables and GYC were all positively correlated with GYC indicating an increase in productivity for an increase in temperature. Mean annual temperature ranged from 7.2 degrees Celsius to 9.5 degrees Celsius. Both mean annual temperature and mean temperature of the coldest month were highly correlated with GYC (r^2 values of 22% and 20% respectively), (Figures 12 and 13). The mean temperature of the warmest month, which was July, had the best relationship with GYC (r^2 values of 35%) suggesting that high temperatures in July in the middle of the growing season were very beneficial in terms of stand growth (Figure 14). A strong relationship was found between annual global solar radiation and GYC (r^2 value of 32%), resulting in increases in productivity with higher levels of annual global solar radiation (Figure 15). Over the range of plots surveyed there was a difference of 170 Mega Joules/m²/annum between the highest and lowest level of annual global solar radiation in the county.

Figure 12: The relationship between mean annual temperature and GYC in Co. Mayo

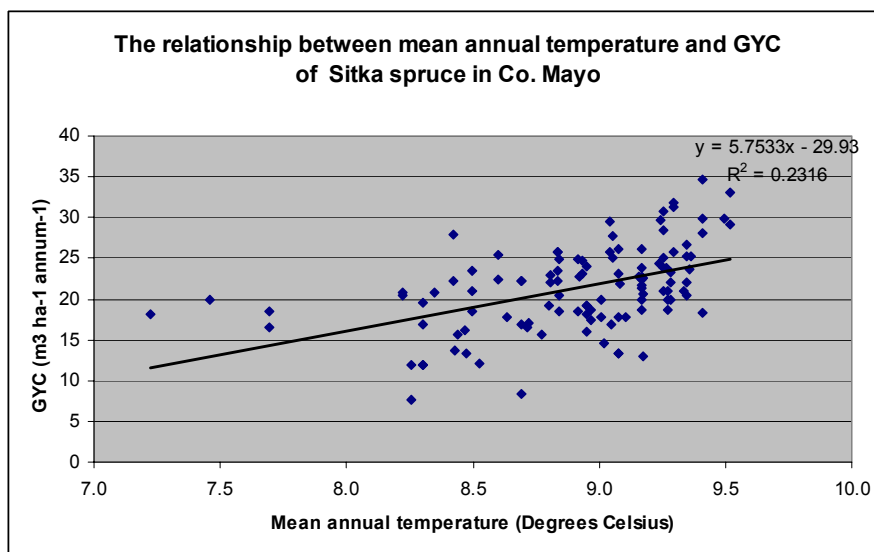


Figure 13: The relationship between mean temperature of the coldest month and GYC in Co. Mayo

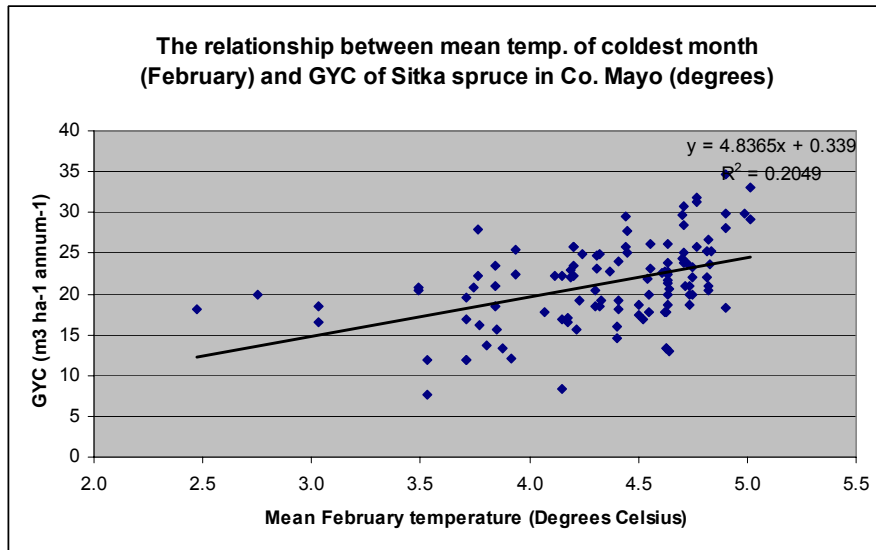


Figure 14: The relationship between mean July temperature and GYC in Co. Mayo

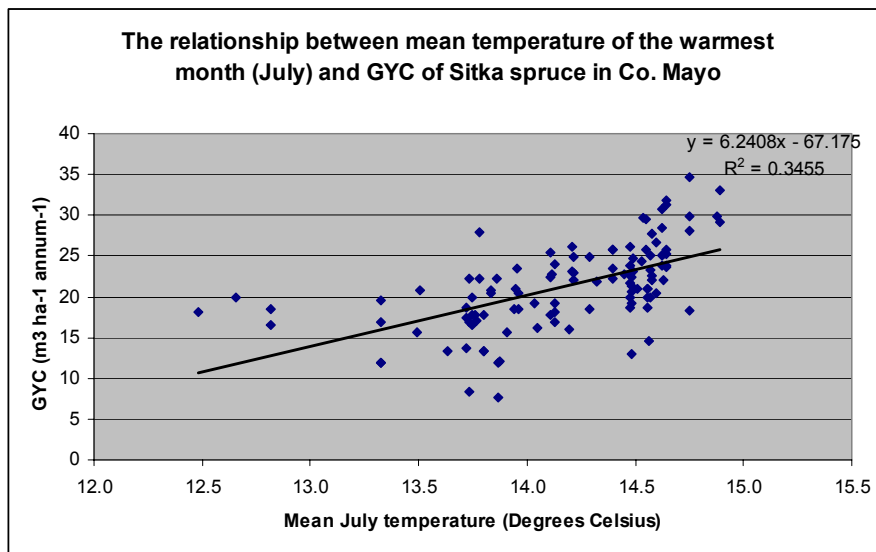
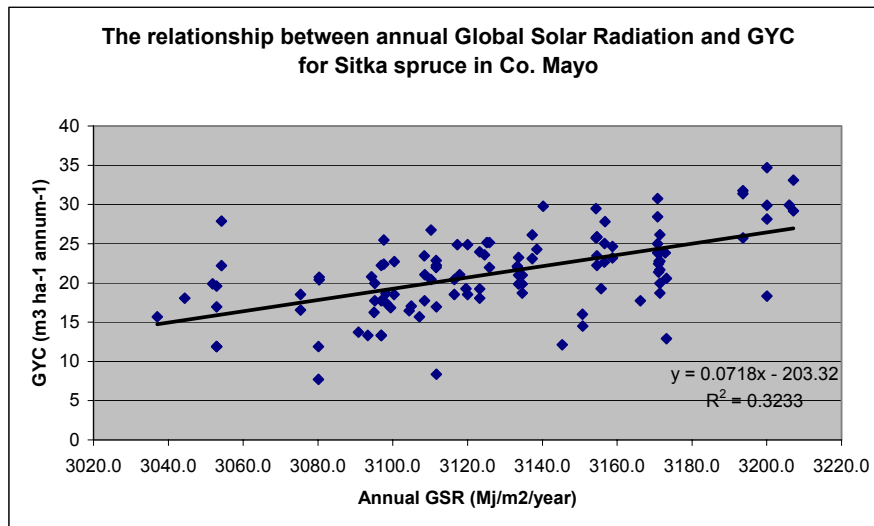


Figure 15: The relationship between annual global solar radiation and GYC in Co. Mayo



Regression Analysis of Continuous Variables

Analysis using multiple regression was used to estimate the combined effect of these site and climatic variables on GYC and indicated that 16 of the variables in Table 1, accounted for 58% of the variation in GYC. Analysis using stepwise regression techniques was undertaken in order to find out what combinations of variables best explained the variation in GYC among the sites studied. A model relating plot location and altitude to GYC was constructed and accounted for 43.5 % of the variation in GYC in the county. The equation is as follows:

$$\text{GYC} = 42.53 - 0.0373 (\text{altitude}) + 0.062 (\text{X coordinate in km}) - 0.088 (\text{Y coordinate in km})$$

($r^2 = 43.5\%$).

DISCUSSION

Factors Affecting Productivity

Soils. Well drained soils had on average the highest productivity, with well drained soils derived from basic parent material such as grey brown podzolic soils having the highest yields on average encountered in the survey at $29.6 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$. Brown earth soils derived from limestone and from acid soil parent materials were similar in productive capacity with mean yields in excess of $26 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$. Poorly drained mineral soils also showed good overall production figures, these soils such as gleys and peaty gley had production levels in excess of $22 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$ and $20 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$, making them very suitable for Sitka spruce growth. Production on modified peat soils was also quite impressive with yields on cutaway Raised peats and blanket peats at $19 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$ and $23 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$. Lowest production figures were found on virgin blanket peat soils and peaty podzols making them less suitable soils for productive forestry.

Aspect and Exposure: The effect of aspect was not significant, however sites facing in an easterly, south easterly and south westerly had lower yields than the average. Plots located on flat sites had on average the highest yields. These plots were located in lowland situations. There was a drop in yield associated with an increase in the exposure level of study plots. Yields on very exposed sites were at $16 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$, while sites classed as exposed sites had slightly better yields on average at $18.6 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$. The yields on moderately exposed sites indicated that the species grows quite well even when some degree of exposure is encountered. The optimum growing conditions for Sitka spruce are in sheltered conditions.

Age: Productivity was negatively correlated with age in the survey but was not significant. As the calculation of GYC uses age, and relationships presuppose that older sites tend to have a senescence phase, a drop off in height growth with age is expected. Other reasons can be speculated at, including the planting of better quality land, better planting stock, and management practices.

Elevation. The relationship between elevation and GYC represents 22% of the variation in yield of all the plots examined. The effect of altitude on yield over the range of sites sampled in the study (19 m to over 250 m) indicates that GYC is negatively correlated with increasing altitude. An increase in altitude of 100 m represents a decrease in productivity of over $4.5 \text{ m}^3 \text{ ha}^{-1} \text{ annum}^{-1}$. There is reason to believe that at increased elevations altitude may have a more significant effect.

Plot location, Slope and Aspect: The location of plots accounted for 30% of the variation in GYC found in the study. Plot location (Y coordinate) was negatively correlated with general yield class, indicating that plots in a northerly location have on average a lower productivity than southerly located plots. The X coordinate of the plot was positively correlated with GYC indicating that moving eastwards in the county had a positive increased impact on GYC. A similar effect was encountered in that the distance from the sea of plots was positively correlated with GYC indicating that location close to the coast had a decreasing effect on productivity in the county. The marked effect of plot location is related to the position of Co. Mayo itself on the exposed North West Coast of Ireland. Although slope lead to a decrease in GYC the effect was not significant. Both sin and cosine of aspect were positively correlated with GYC but not significant.

Precipitation: The effect of precipitation on yield indicated that the effect of increasing precipitation was negatively correlated with productivity. Annual precipitation ranged from over 1200 mm to over 1980 mm per annum in the county. At these high rates of precipitation the effect of water shortages is unlikely to be a problem at any point during the year. Because precipitation is inter related to other variables, it is likely that the effect of an increase in precipitation also represent an increase in elevation and the more westerly location of plots.

Temperature and Global Solar Radiation: Mean July temperature accounted for 35% of the variation in GYC of the plots measured. An increase in the mean July temperature lead to a corresponding increase in GYC. Although only 2.4 degrees separated the highest from the lowest mean July temperature, the effect of increasing July temperatures and yield is none the less dramatic. Although temperature is affected by location and altitude, it's effect was more pronounced when these variables were omitted from the analysis. All the variables for temperature were positively correlated with GYC indicating the effect of increased temperature lead to an increase in the growth of Sitka spruce in the county. As mean annual daily global solar radiation was positively correlated with GYC, but related to temperature the relationship between temperature and GYC seems to explain this variation in growth.

Regression analysis: In order to identify interactions between other site variables regression analysis was preformed and indicated that the continuous variables measured in the study accounted for 57 % of all the variation in GYC in the plots measured. Stepwise regression was performed in order to identify which variables best identified this variation and to reduce the variables to a more manageable number. A model for the growth of Sitka spruces in the county was produced that accounted for 43.5 % of the variation in GYC and is based on location and altitude. The model indicates that yield declines with altitude and northerly and westerly locations in the county.

CONCLUSIONS:

Strong and meaningful relationships were obtained when on-site field data was combined with site data obtained from geographical information systems in order to quantify the effect of site and climatic variables on GYC of Sitka spruce in Co. Mayo. The use of continuous and categorical measures of variables provides a means for analysis and comparison of effects on site productivity. Estimates of productivity on sites stratified by categorical variables provided mean GYC values and 95% confidence intervals (where available) and give indications of potential productivity in similar unplanted areas. Continuous measures of site and climatic variables accounted for 57% of the

variation in GYC in the study, and enabled a model to be created from regression methods. This model provides indications of potential productivity in the county from plot location and altitude.

ACKNOWLEDGEMENTS

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**PROTOTYPE CARBON FUND: AFFORESTATION OF DEGRADED AGRICULTURAL
LAND IN ROMANIA**

**Messrs. I. Abrudan, V. Blujdea, V. Kostyushin, C. Pahtontu, H. Phillips, Ms. S. Brown,
Ms. M. Voicu, Romania**

SUMMARY

The area to be afforested (6,728 ha) over a four year period forms the first afforestation project under the World Bank Prototype Carbon Fund (PCF) mechanism. The PCF will purchase the net carbon sequestered by the newly established plantations. Through excessive working and lack of investment in irrigation infrastructure and maintenance, the lands have become degraded and subject to erosion and are now uneconomic for crop production and are either used mainly for pasture or abandoned. Afforestation represents an alternative land use.

During the baseline study conducted in 2002, the method for estimating and predicting future carbon sequestered by the established plantations was developed together with the methodology for estimating carbon stocks (above and below ground) under current land use options. An economic analysis shows that afforestation is the preferred future land use. However, without the sale of carbon to the Prototype Carbon Fund, the afforestation is not economically viable and would not be undertaken by the National Forest Administration. Risks due to leakage are identified together with mitigation measures. The baseline study set out the plan for measuring and monitoring carbon sequestration and also the monitoring of social and biodiversity impacts throughout the project life.

Fonds prototype pour le carbone: le boisement des terres agricoles dégradées en Roumanie

Exposé de M. Ioan Abrudan, M. Viorel Blujdea, M^{me} Sandra Brown, M. Vasilij Kostyushin,
M. Ciprian Pahontu, M. Henry Phillips et M^{me} Malina Voicu

Résumé

Le document traite du boisement des terres agricoles dégradées du sud-ouest et du sud-est de la plaine de Roumanie ainsi que du rétablissement écologique d'une partie de la plaine alluviale du Danube inférieur (départements de Braila et d'Olt) par la plantation d'essences autochtones. Les terres dégradées ont été exploitées de façon intensive à des fins agricoles depuis le début des années 70, ce qui a coïncidé avec l'extension du drainage du Danube. Initialement, ces terres ont produit diverses cultures, dont des céréales, des légumes, des fruits et de la vigne. Du fait, cependant, de leur exploitation excessive et de l'absence d'investissement dans l'infrastructure d'irrigation et de maintenance, ces terres se sont dégradées, s'exposant à l'érosion. Aujourd'hui trop peu rentables, elles sont soit converties en prairies, soit abandonnées. Le boisement représente, en matière d'utilisation des sols, une solution de rechange.

Le boisement d'une superficie de 6 728 hectares sur une période de quatre ans représente le premier projet de boisement mis en œuvre dans le cadre du Fonds prototype pour le carbone (FPC) géré par la Banque mondiale. Le FPC achètera le carbone net piégé par les plantations nouvellement établies. Pendant l'étude de référence menée en 2002, on a mis au point la méthode d'estimation et de prévision du carbone qui sera piégé par les plantations créées, ainsi que la méthode d'estimation des stocks de carbone (aériens et souterrains) obtenus dans le cadre des méthodes actuelles d'utilisation des sols. L'analyse économique montre que le boisement sera, à l'avenir, la méthode privilégiée d'utilisation des terres. Sans la vente de carbone au FPC, cependant, le boisement n'est pas viable économiquement et ne serait pas entrepris par l'Administration nationale des forêts. Les auteurs analysent les risques de

ruissellement et énoncent des mesures d'atténuation. Dans le cadre de l'étude de référence, il est établi un plan de mesure et de surveillance du piégeage du carbone ainsi que de surveillance des incidences que le projet pourrait avoir, pendant son existence, sur la vie sociale et la diversité biologique.

Фонд для разработки прототипов углерода: Облесение пришедших в упадок (деградированных) сельскохозяйственных земель в Румынии

Основной документ, подготовленный г-ном Иоаном Абруданом, г-ном Виорелом Блуйдеа, г-жой Сандрой Браун, г-ном Василием Костышиным, г-ном Киприаном Пахонту, г-ном Генри Филипсом и г-жой Малиной Войчу

Резюме

В настоящем документе идет речь об облесении деградированных сельскохозяйственных земель на юго-западе и юго-востоке румынской равнины и экологической реконструкции части займищ в нижней части Дуная (округа Брайла и Олт) посредством посадки местных пород деревьев. Деградированные земли интенсивно эксплуатировались с начала 70-х годов одновременно с расширением дренажных работ на реке Дунай. Первоначально на этих землях выращивались зерновые культуры, овощи, фрукты и виноград. В результате чрезмерной эксплуатации и отсутствия средств на развитие ирригационной инфраструктуры и содержание земель в порядке они пришли в упадок и стали подвергаться эрозии. В настоящее время на них нерентабельно выращивать сельскохозяйственные культуры и они используются в основном как пастбища или брошены. Облесение является альтернативным видом использования земель.

Площадь, которую предстоит засадить лесом за 4 года, составляет 6 728 га, и это - первый проект облесения в рамках программы Фонда для разработки прототипов углерода (ФРПУ), находящегося в ведении Всемирного банка. ФРПУ будет выкупать за чистый углерод, секвестрируемый вновь заложеными лесонасаждениями. Во время базового исследования, проведенного в 2002 году, был разработан метод оценки и прогнозирования объемов секвестрируемого созданными лесонасаждениями углерода и методология оценки запасов углерода (над и под землей) при нынешних альтернативных вариантах землепользования. Экономический анализ показывает, что облесение является наиболее предпочтительным видом использования земель в будущем. Однако, если ФРПУ не будет приобретать секвестрируемый углерод, облесение будет экономически нецелесообразным и Национальная лесная администрация (НЛА) откажется от нее. В настоящее время ведется работа по идентификации рисков несанкционированного вывоза леса и одновременно рассматриваются меры по смягчению последствий такого вывоза. В базовом исследовании планируется проводить измерения и осуществлять мониторинг секвестрации углерода, социальных последствий проекта и его воздействия на биоразнообразие на протяжении всего периода его осуществления.

BACKGROUND

One of the difficult challenges facing the global community is how to cost-effectively reduce greenhouse gas emissions to avert the worst impacts of climate change. Under the Kyoto Protocol, which was adopted under the UNFCCC, industrialized countries must reduce their carbon emissions by an average of 5.2 percent below their 1990 levels by the end of 2012.

To meet these commitments in the most cost-effective manner, the Protocol contains provisions allowing industrialized countries some flexibility to meet their obligations through projects generating emission reductions in developing countries and transition economies. Two provisions are particularly important: Article 6 which allows for the “Joint Implementation” (JI) of projects by industrialized countries, including those with economies in transition and Article 12 which provides for a similar project-based mechanism, the so-called “Clean Development Mechanism” (CDM). Under both of these, purchase of emission reductions (ERs) is possible.

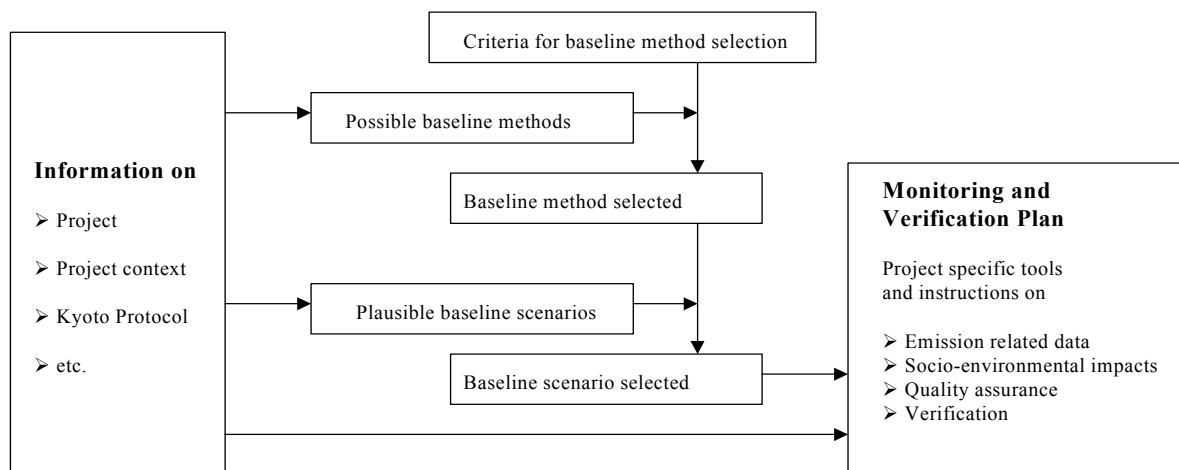
The Prototype Carbon Fund (PCF) was established in 2000 in response to these opportunities. It is a public and private partnership to mitigate climate change. Its aim is to pioneer the market for project based greenhouse gas emissions reductions within the framework of the Kyoto Protocol and to contribute to sustainable development. Six countries and seventeen private sector entities set up the PCF and committed \$180 million to the fund for the purchase of emissions reductions (Anon, 2002).

In 2001, the PCF entered preliminary discussions with Romania and the National Forest Administration¹² (NFA) regarding the possibility of an afforestation project. In accordance with PCF guidelines and procedures, a Project Concept Note (PCN) outlining summary project design and provisional estimates of carbon sequestration was drafted.

In keeping with the Kyoto Protocol, the PCF defines additionality as the positive difference between emissions that would have occurred without the project activity (baseline emissions) and the actual emissions of the project over its lifetime. Baselines are the lynchpin of JI and CDM and are required to demonstrate project eligibility and calculate certifiable emission reductions.

Figure 1 depicts the process the PCF typically applies in baseline studies.

Figure 1: PCF Baseline Study Process



¹² The National Forest Administration (NFA) was established in 1996 as a legal state-owned entity with an essentially commercial mandate. It is responsible for managing state forest lands.

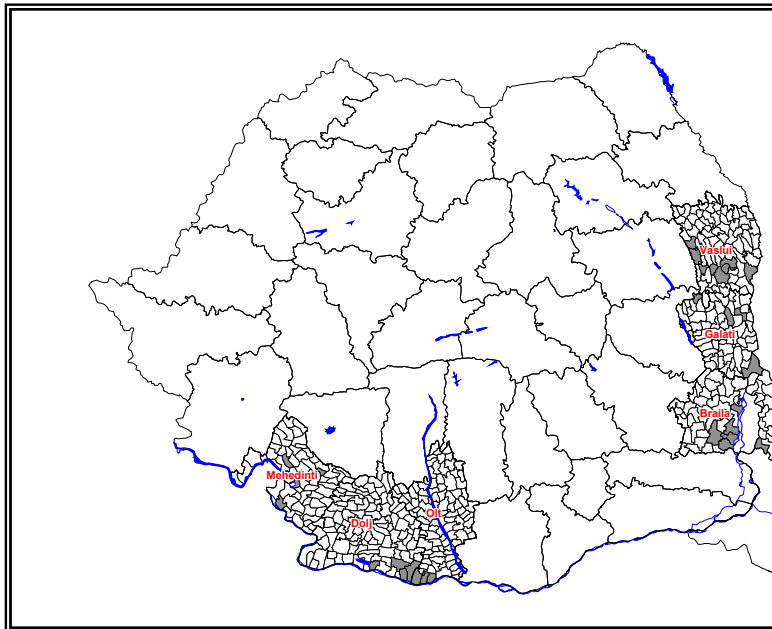
The baseline study for the Romanian afforestation project which was undertaken in 2002, had four components:

1. Carbon projections and financial analyses;
2. Baseline measurement and monitoring of carbon;
3. Baseline and monitoring of social issues;
4. Baseline and monitoring of biodiversity.

This paper focuses on the carbon projections and financial analysis.

PROJECT DESCRIPTION

The project concerns the afforestation of degraded agricultural lands in the south-west and south-east of the Romanian Plain and the ecological reconstruction of part of the Lower Danube floodplain (Braila and Olt Counties) through the planting of native species. Species selection was based on local site conditions and management objectives (fertility, soil stabilization, ecological reconstruction). The main species for degraded lands is Robinia (*Robinia pseudoaccacia*), a naturalized species which has been planted extensively in Romania over the past century. Where site conditions permit, oak and other broadleaf tree and shrub species will be planted. On the Lower Danube Floodplain native Poplars (*Populus alba* and *Populus nigra*) will be planted with some native Willow (*Salix spp*).



Map of Romania showing planned afforestation locations



Example of degraded land – former rice field



Example of current land use – sheen grazing

The total afforestation area included in the project is 6,728 hectares (net of roads and buildings etc.) and is spread across seven counties (**Table 1**).

Table 1: Planned Afforestation by County and Tree Species (ha)

County	Species			Total Area
	Robinia	Poplar / Willow	Oak + Other Broadleaves	
Braila	195	2,011	42	2,248
Dolj	2,100	0	0	2,100
Galati	192	0	0	192
Mehedinti	40	10	100	150
Olt	330	700	0	1,030
Tulcea	338	0	400	738
Vaslui	234	6	30	270
Totals	3,429	2,727	572	6,728

All lands are under the stewardship of the NFA, with some 5,000 ha being transferred from the State Domain Agency (SDA) in June of this year. The planned afforestation conforms with overall state forest policy and strategy which identifies degraded agricultural lands for afforestation. There is an estimated 2 million hectares of degraded agricultural lands in Romania.

The degraded lands have been worked intensively for agriculture since the early seventies, co-inciding with the extension of the drainage of the river Danube. Initially these lands produced a range of crops including cereals, vegetables, fruits and grapes. Through excessive working and lack of investment in irrigation infrastructure and maintenance, the lands have become degraded and subject to erosion and are now uneconomic for crop production and are either used mainly for pasture or abandoned (Tab.2).

Table 2: Current Land Use and Soil Type (ha)

County	Land Use				Soil Type		
	Pasture	Arable	Orchard/ Vines	Unused / Other	Sandy	Alluvial	Cernozem
Vaslui	270	0	0	0	154	0	116
Mehedenti	118	7	0	25	35	0	115
Galati	0	0	0	192	192	0	0
Tulcea	270	0	0	468	304	0	434
Olt	434	596	0	0	513	517	0
Dolj	236	1,592	240	32	2,100	0	0
Braila	0	237	0	2,011	180	2,011	57
Totals	1,328	2,432	240	2,728	3,478	2,528	722

The afforestation is planned to take place over a four-year period (2002-2005) and the species and potential productivity class reflect the inherent low fertility status of the soils (Table 3). There are five site productivity classes in Romania (I-V) with the higher figure representing lower volume production. Site index for afforestation areas was determined based on the site index of existing forests in the locality and on soil type

Table 3: Planned Afforestation by Year and Site Productivity Class (ha)

Species / Productivity Class	Year				Total
	2002	2003	2004	2005	
Poplar/Willow - Class III	800	700	700	527	2,727
Robinia - Class III	732	1000	179	0	1,911
- Class IV	368	0	354	0	722
- Class V	100	0	467	229	796
Oak / OB - Class IV	0	0	0	142	142
- Class V	0	0	0	430	430
Totals	2,000	1,700	1,700	1,328	6,728

PROJECTED CARBON BENEFITS

General

Carbon sequestration was modeled using CO2FIX V2.0, a computer simulation program. The CO2FIX V 2.0 software was developed by the CASFOR project by G.J. Nabuurs, J.F. Garza-Caligaris, M. Kanninen, T. Karjalainen, T. Lapvetelainen, J. Liski, O. Masera, G.M.J. Mohren, A. Pussinen, and M.J. Schelhaas of ALTERNIA, UNAM, CATIE and EFI.

CO2FIX V 2.0 is a carbon bookkeeping model that simulates stocks and fluxes of carbon in (the trees of) a forest ecosystem, the soil, and (in case of a managed forest), the wood products. It simulates these stocks and fluxes on a hectare scale with time intervals of one year.

The model consists of five modules, all of which apart from the Output module require input of initial parameters:

- General Parameters;
- Biomass;
- Soil;
- Wood Products; and
- Output.

CO2FIX Parameterisation

Six species models (Robinia III, Robinia IV, Robinia V, Poplar III, Oak IV and Oak V) were developed to represent the six species strata. Other broadleaved species were assumed to equivalent to Oak of similar production class. Willow was assumed to be equivalent to Poplar as it has a similar volume growth pattern and current annual increment curve. Parameters were input for each of the six species strata based on a combination of (a) planned future crop management (harvesting, rotation etc.), (b) Romanian data (yield tables, wood density, volume assortments) and (c) comparison with parameters used by other users of CO2FIX V 2.0.

Wood Density: Wood density samples for Robinia aged 4 and 12 were taken and analyzed by the National Wood Institute (NWI), Bucharest. The results indicated a density of 0.710 at age 4 and a density of 0.730 (heartwood) and 0.800 (sapwood) at age 12. The value of 0.800 was unusual, but possibly due to a high percentage of silicates in the sapwood. Based on these samples, the standard value (Mos, 1985) for Romania of 0.727 was used. Wood density samples were also analyzed by the NWI, for Oak (*Quercus pedunculiflora* – 0.696), Poplar and minor species (*Tilia cordata* – 0.427, *Pyrus pyraeaster* – 0.749) and confirmed the values used in the PCN analysis.

Thinning – Harvesting: Percentage volume removal values based on normal management practice were used. The apportionment between logwood, pulpwood, branches and slash was based on a combination of (a) yield table diameters and (b) product assortments under Romanian conditions.

Stems + Branches: Stem current volume annual increment (CAI) values and the apportionment between stem and branch volume were based on Romanian yield tables (Giurgiu, 1973).

Roots + Foliage: Biomass growth relative to stem volume was used to estimate roots and foliage growth. Values for relative growth were based on a combination of (a) Romanian data and (b) comparison with other species models provided by CO2FIX V2.0.

Production Line: The apportionment between sawnwood, boards and pulp/paper was based on current practice and experience in Romania.

End Products: Product allocation and “End of Life” values used were based on best estimates for Romanian conditions and practice. Relatively low values for product recycling were input, reflecting Romanian conditions. However, product carbon was not included in total carbon sequestered in the financial analysis. This is in line with preliminary recommendations from the Intergovernmental Panel on Climate Change (IPCC). Furthermore, to include carbon in products would require would

require an estimate of leakage due to replacement of old products by new products and such information was not available. The values for product carbon are included for illustrative purposes only.

Results of Simulations with CO2Fix

The CO2Fix model was run for a period of 100 years, to co-incide with the rotation age for the Oak. The end of project (year 30) carbon values are shown in **Tables 4 -5**. The values are gross and are not corrected for identified risk.

Table 4: Total Carbon at Year 30 (Tonnes)

	Robinia			Poplar	Oak + OB		Total
	III	IV	V	III	IV	V	
Stems	78,163	13,186	11,580	121,824	2,008	3,135	229,896
Foliage	6,630	1,253	1,250	2,295	71	125	11,624
Branches	14,118	3,377	2,923	8,789	960	1,509	31,676
Roots	18,326	3,204	2,780	29,970	829	1,312	56,421
Litter	32,855	8,981	2,256	29,838	413	641	74,984
Soil	22,668	5,241	2,430	34,444	605	933	66,321
Totals	172,760	35,242	23,219	227,160	4,886	7,655	470,922
Products	58,750	18,071	2,420	0	4	4	79,249

Note: Products carbon values are not included in total

The exclusion of carbon in products, while significant over the project life, has only a minor impact over the proposed purchase period (2002-2017).

Table 5: Average Carbon per Hectare at Year 30 (Tonnes)

	Robinia			Poplar	Oak + OB		Mean
	III	IV	V	III	IV	V	
Stems	40.9	18.3	14.5	44.7	14.1	7.3	34.2
Foliage	3.5	1.7	1.6	0.8	0.5	0.3	1.7
Branches	7.4	4.7	3.7	3.2	6.8	3.5	4.7
Roots	9.6	4.4	3.5	11.0	5.8	3.1	8.4
Litter	17.2	12.4	2.8	10.9	2.9	1.5	11.1
Soil	11.9	7.3	3.1	12.6	4.3	2.2	9.9
Total	90.5	48.8	29.2	83.2	34.4	17.9	70.0
Products	30.7	25.0	3.0	0.0	0.0	0.0	11.8

Note: Products carbon values are not included in total

The Robinia, due to its more extensive planting and significantly higher wood density, is the major contributor to total carbon sequestered. The Poplar, even though it is not harvested, contributes less due to its lower average wood density. Oak, due to a combination of the relatively small area planted, low site productivity and slow early growth is only a minor contributor to total carbon.

Figure 2: Total carbon sequestered over project life. Mg/C = tonnes of carbon.

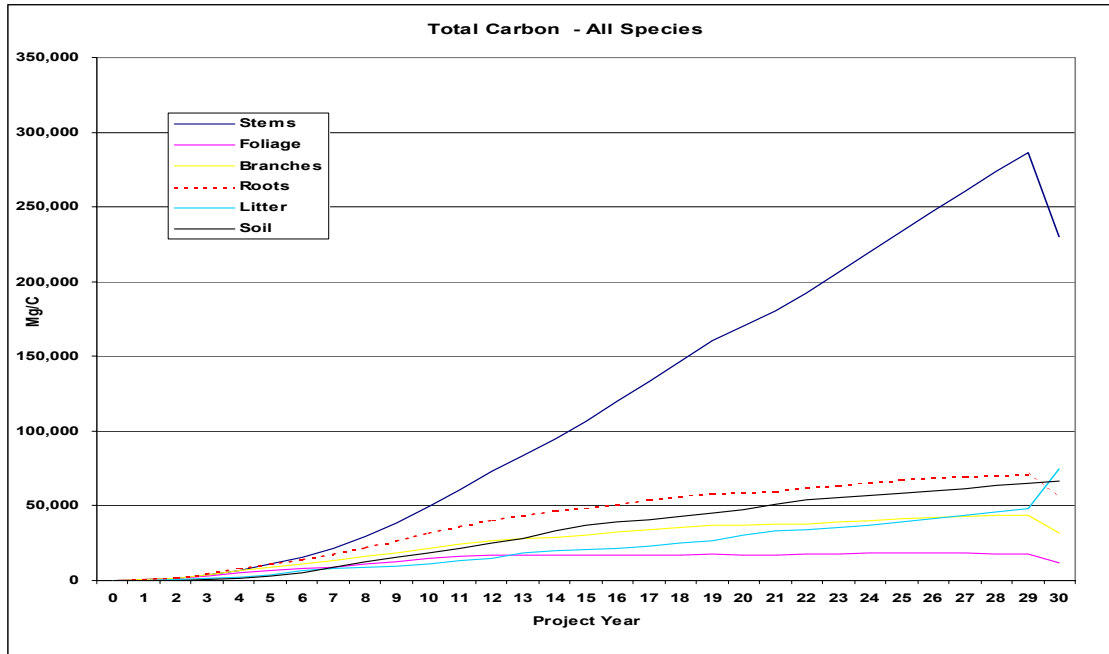


Figure 3a: Robinia Site Class III- total carbon sequestered over project life (t/C)

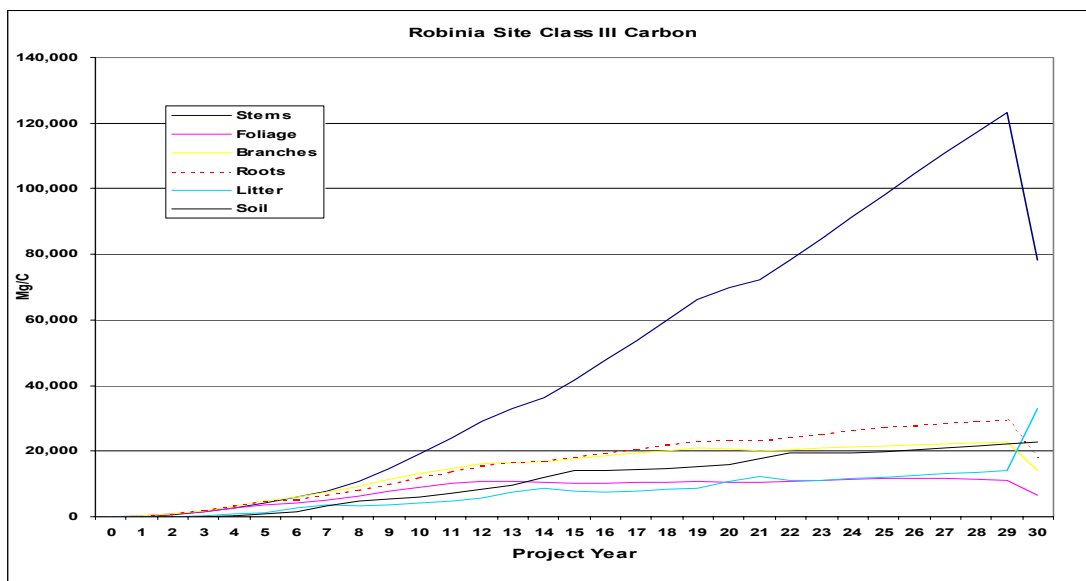
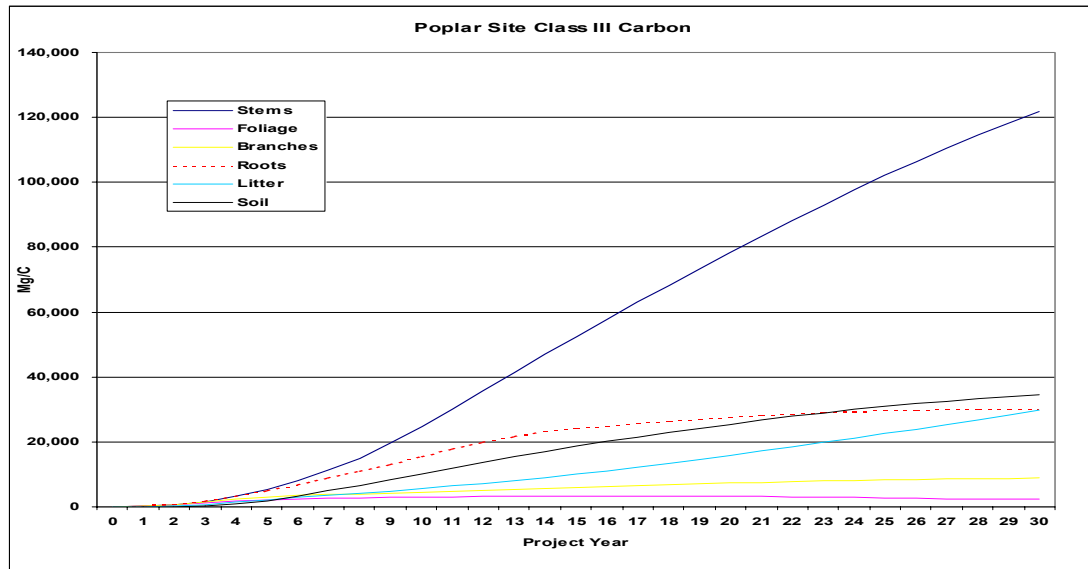


Figure 3b: Poplar Site Class III- total carbon sequestered over project life (t/C)



FIELD DATA COLLECTION FOR BASELINE ANALYSIS

Table 6 lists the number of plots and/or samples collected from the corresponding strata. In all cases except one, a fixed area radius plot of 5 m; the one exception was Q15 where a fixed radius plot of 3 m (planting density was highest in this site) was used. Diameter at breast height (dbh) was measured for all trees that exceeded 1.3 m in height. In addition, the dbh and height of a selection of the tallest trees was measured to confirm their site class designation.

Biomass and thus carbon (carbon = 50% of biomass) for the forests was based on estimating volume per ha and multiplying this by the wood density values. A two-step approach was used to estimate volume. Regression equations for each of the four species and site class combinations between dbh and height based on data in the Romanian biometrics handbook (Giurgiu et al. 1973) were calculated. From these regressions it was possible to estimate the height of each measured tree based on its dbh. Volumes were estimated using the regression equations for Romanian trees reported in Giurgiu (1990). The volume was then multiplied by the corresponding wood density and summed for each tree to give an estimate of the aboveground carbon in each plot.

Table 6: List of Field Sample Plots and Measurements Taken

Stratum	Stratum Number	Number of Plot Samples		
		Vegetation	Soil	Litter
Forest Sites				
Robinia Age 6, site class III— F6	3	6	6	6
Robinia Age 12, site class IV— F12	2	10	10	10
Robinia Age 28, site class IV— R28	2	7	6	0
Poplar Age 12, site class III— P12	4	8	8	8
Mixed oak Age 15, site class V— Q15	5	6	6	6
TOTAL-Forests		37	36	30
Non-forest Sites				
Abandoned vineyards-- VR	2-3	16 plants	8	-
Abandoned orchard-- OM	2-3	3 plants	6	-
Abandoned land near F6 — AF6	3	-	6	-
Bare land near F12 — BF12	2	-	5	-
Bare land –previously a vineyard at Research Station— RSA	2	-	6	-
Bare land –never cultivated at Research Station RS-Mz	2	-	6	-
Grazing land near Q15 – PQ15	5	-	5	-
Mixed bare and grazing land on brown soil— BQ	5	-	8	-
Amorpha area on alluvial soil on Small Island of Braila- PAF	4	5	5	-
Grazing land Small Island of Braila- G	4		8	-
TOTAL –Non-forest		5	63	-

All soil samples were collected to a depth of 30 cm using a standard soil corer (inside diameter of 2 cm). One sample for soil carbon analysis and one for bulk density analysis was collected from each plot. Samples for bulk density were oven dried to 105C and weighed. The soil bulk density was then calculated as the dry mass divided by the volume of the core to 30 cm depth. Soils for carbon analysis were air dried, sieved through a 2 mm mesh sieve, and a well mixed ground sample analyzed. Soil carbon was determined by the Walkley-Black method and expressed on an oven dry weight basis (dried to 105C).

In forest plots, litter was collected from a 0.5 m x 0.5 m quadrat. All litter, down to the top of the mineral soils was collected, including all dead plant material (including small woody material—no large wood [>10 cm diameter] was found in any of the plots). All litter samples were oven dried and weighed. The litter was separated into three components: current year leaf and fruit litter, previous [old] litter, and woody material.

Results of Carbon Measurements and Analyses

Despite the fact that these forests are plantations, estimates of aboveground biomass carbon (t C/ha) for the forest sites are highly variable, with coefficients of variation (CV) ranging from 18 to 88% (Table 7). The poplar site class III forest (P12) and the Robinia site class III (F6) have almost identical amount of carbon in aboveground biomass, despite their six year difference.

Table 7: Results of Carbon Field Measurement (t/C/ha)

Stratum	Robina Age 6	Robinia Age 12	Robinia Age 28	Poplar Age 12	Oak/mixed spp. Age 15
Aboveground Biomass					
Number	6	10	7	8	6
Mean	36.6	28.6	81.8	36.5	12.8
Standard error	2.6	3.3	24.1	6.0	5.0
CV (%)	17.5	36.8	78.0	46.4	87.7
Total Litter					
Number	6	10		8	5
Mean	4.9	4.2		2.4	2.5
Standard error	0.5	0.6		0.3	0.3
CV (%)*	23.8	43.6		31.9	31.0
Soil (30 cm depth)					
Number	6	10	6	8	6
Mean	18.7	24.9	28.5	62.9	81.4
Standard error	1.4	2.0	2.4	3.1	5.0
CV (%)*	18.8	24.7	20.2	13.9	15

CV=coefficient of variation; no litter was collected for the R28 site as none was present (heavily grazed site)

The Robinia age 6 site was the least variable and the Oak-mixed species the most variable. The Robinia age 6 site had previously been used for water melon production that was irrigated and fertilized and it is possible that the site retained some of this former production potential accounting for the high rate of carbon accumulation over the first 6 years. The Robinia (age 12) had less carbon than the Robinia age 6 demonstrating the effect of site class. The high variability of the Robinia age 28 is due to the amount of illegal logging or thinning that had taken place on this site as evidenced by the large number of stumps and an average number of stems per ha of 580 versus the 5,000 originally planted.

Total litter in the two Robinia sites was almost twice that of the other two forest sites. The “fresh” litter was separated from the old. In the Robinia sites, the fresh represented less than 40% of the total compared to more than 60% in the other two forest sites. This implies that Robinia litter, despite its generally higher nitrogen content (as expected from a leguminous tree), decomposes slower than the other two sites. This could be due to lack of moisture during the warmer months.

Soil carbon content to 30 cm depth shows a gradual increase with age in Robinia forest, but the difference between each age class is not significant. Compared to the alluvial soils in the poplar site and the zonal brown soils of the Oak site, the soil carbon in the Robinia forests is very low. Coefficients of variation for the soil carbon are in the 19-25% range, and considerably lower on average than the carbon in the vegetation. Generally it is expected that soil carbon is more variable than tree carbon. However, in the case of these sandy soils, this is not the case most likely due to their low carbon content as is typical of sandy soils (carbon is readily leached from sandy soils due to the lack of clay particles to bind the carbon), and the long use by agriculture.

COMPARISON OF CO₂FIX MODEL RESULTS WITH THE FIELD DATA

The model significantly underestimates the carbon stocks in aboveground biomass and litter for all comparable sites (**Table 8**). In all cases the field measurements indicate that the carbon content in aboveground biomass is about 1.5 to 4 times higher than the model projects, and litter is about 1 to 3 times higher. This demonstrates the value of field measurements versus model simulations/projections. Although the model simulates expected management and growth based on a vast data base for these forest species, part of the difference in results from the two approaches could be explained by the actual management of the stands measured versus the modeled management. Also, there could be some uncertainties introduced in the analysis of field measurements caused by the several steps used to estimate carbon contents, although these steps are likely to introduce only small errors. Further, the sites measured, although assigned a given site class, could actually be in a higher site class. Lastly, the site with the highest carbon in trees (the 6 year-old Robinia-F6 site) was established on a previous water melon site where residual fertilizer likely increased growth in the initial stages.

The soil carbon field results tend to give similar trends as CO₂Fix: the model projects an increase in soil carbon in all cases, and up to almost 6 t C/ha in the poplar site III. The largest increase in soil carbon projected by the model is in the poplar site class III, the only site that produced a significant difference in the field data. It is possible to conclude from this comparison, that the model outputs likely underestimate the amount of carbon that will be sequestered by this afforestation project.

If all the abandoned degraded sandy soil sites are combined, the mean carbon content is 17.3 t C/ha with a standard error of 0.7 t C/ha and a CV of 22.7%. If these values are compared with the Robinia forest sites, the carbon stocks in age 12 and 28 are then significantly different from the abandoned sites, and are more in line with the results of the CO₂Fix model.

Table 8: Comparison of Field Measurements with Output from CO2Fix. (t C/ha)

Site and Parameter	Field Measurements	CO2Fix Model
Robinia Age 6-class III:		
Aboveground biomass	36.6	9.4
Fine litter	4.9	2.0
Change in soil carbon	No change	1.2
Robinia Age 12-class IV		
Aboveground biomass	28.6	18.9
Fine litter	4.2	1.4
Change in soil carbon	Increase but not significant	2.9
Poplar Age 12-class III		
Aboveground biomass	36.5	19.1
Fine litter	2.4	2.0
Change in soil carbon	Significant increase	5.9
Oak/mixed spp. Age 15-class V		
Aboveground biomass	12.8	3.2
Fine litter	2.5	0.7
Change in soil carbon	No significant increase	0.9

FINANCIAL ANALYSES FOR CARBON SEQUESTRATION

The terms of reference for the baseline study foresaw two alternatives for the financial analysis. The first was a full economic analysis to determine the IRR and to rank alternative land use options. Such an analysis requires valuing project externalities such as (a) avoided soil carbon losses on afforested lands, (b) positive impact on agricultural yields on adjoining lands. The second alternative was for a financial analysis, excluding project externalities. As (i) it was not possible to value project externalities and (ii) the NFA is operating as a private (commercial) investor within the context of the project, a standard forest financial analysis was used. Notwithstanding the above, a detailed financial appraisal was undertaken for the project. The basic underlying assumptions used included:-

Project Period: Thirty years.

Costs: Costs were based on the average planned NFA costs as outlined in the Project Concept Note (PCN). These costs were validated and an annual maintenance cost after establishment included. No real increase in costs over the project period was assumed.

Timber Revenues: Timber prices were based on those provided in the PCN. Prices for Robinia and Oak were validated by comparing with NFA reference prices. A price size curve (PSC¹³) was developed for Robinia and Oak. Sensitivity analysis showed that there was only minimal differences in net present value (NPV) and IRR values between the original PCN prices and the PSC. The

¹³ A Price Size Curve shows the relationship between mean tree diameter or volume and price.

original PCN prices were used with some small changes but the overall impact was less than 0.1% in IRR.

A salvage value for Poplar and Oak was input for year 30. The use of a salvage value for Poplar and especially for Oak underestimates their full financial return. This is especially the case for Oak, which is “felled” at age 30 when its value increment is still increasing.

No real increase in timber prices is assumed. This may be conservative, as Romanian prices have not as yet reached parity with European prices.

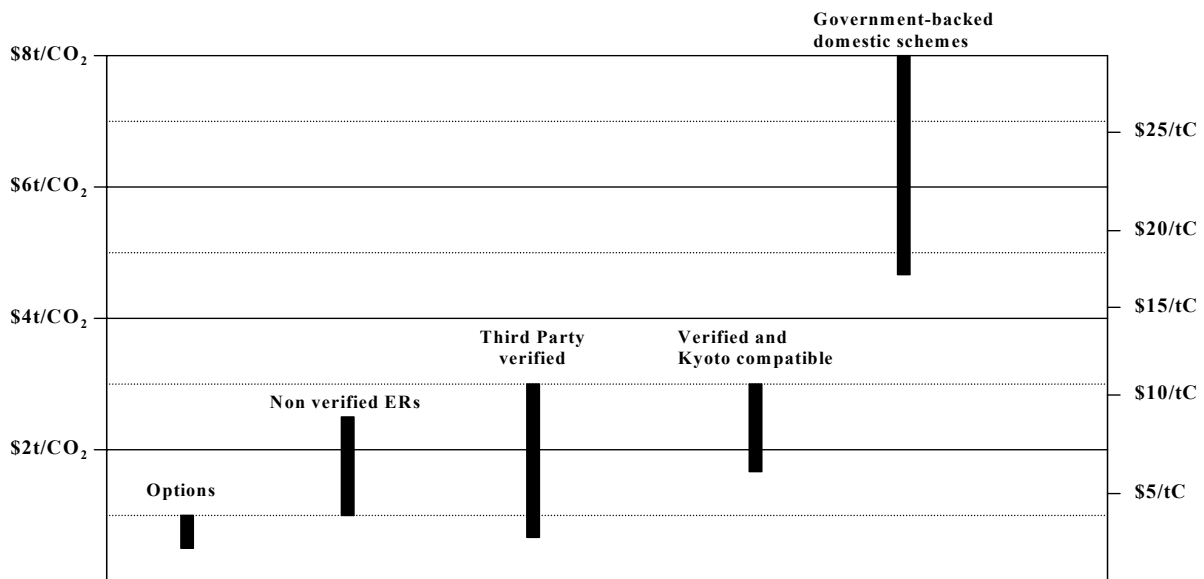
Timber Volumes: Romanian yield table data was used for all species and productivity classes. Total crop standing volumes were adjusted to take account of thinning volumes removed.

Volume Correction Factor: A 10% volume correction factor was used to allow for unstocked areas, tracks / roads, power lines, mortality etc. The project areas included in Tables 1-3 are net of any existing roads.

Carbon Price: A carbon price of \$12.83/tonne of carbon, as provisionally agreed between the PCF and the NFA, for the first twelve years and thereafter \$14 per tonne of carbon.

The PCF monitors the emerging carbon market to ensure that the price it pays for ERs is broadly in line with prices paid by other buyers under comparable transactions. To date, ERs have been valued across a wide price range – from about \$1 per tonne of carbon dioxide equivalent for non-verified ERs, to over \$8 for permits that are recognized by governments under existing domestic schemes. (Figure 4)

Figure 4: Historic Prices for CO₂ - Equivalent Emission Reductions



CASHFLOW

The cashflow for the basic scenario is shown in **Table 9**. The project is like any other afforestation project, front loaded in terms of costs.

Table 9: Project Cashflow and Net Discounted Revenues (NDR) @ 5% (US\$)

Project Year	Timber Costs	Timber Revenues	Cashflow	NDR	Carbon Revenues	Adjusted Cashflow	Adjusted NDR
1	-	2,440,000	-	2,440,000	22,743	2,417,257	2,417,257
2	-	2,400,000	-	2,400,000	62,225	2,337,775	2,226,452
3	-	2,430,600	-	2,430,600	108,239	2,322,361	2,106,450
4	-	1,951,710	-	1,951,710	150,189	1,801,521	1,556,221
5	-	358,808	-	358,808	174,597	184,211	151,551
6	-	197,072	16,270	182,429	186,738	4,309	3,376
7	-	123,077	17,529	107,300	210,937	103,637	77,335
8	-	81,602	7,059	75,248	235,394	160,146	113,813
9	-	5,046	379	4,705	261,923	257,218	174,095
10	-	5,046	-	5,046	282,749	277,703	179,010
11	-	5,046	-	5,046	292,115	287,069	176,236
12	-	5,046	-	5,046	289,518	284,472	166,325
13	-	5,046	71,593	59,388	275,726	335,113	186,604
14	-	5,046	78,380	65,496	262,187	327,683	173,777
15	-	5,046	32,799	24,473	256,660	281,134	141,992
16	-	5,046	3,144	2,216	260,134	257,918	124,063
17	-	5,046	-	5,046	263,496	258,450	118,399
18	-	5,046	8,971	3,028	267,061	270,088	117,839
19	-	5,046	-	5,046	274,854	269,808	112,111
20	-	5,046	202,296	177,020	218,046	395,066	156,341
21	-	5,046	215,780	189,156	217,786	406,942	153,372
22	-	5,046	95,911	81,274	234,165	315,439	113,225
23	-	5,046	9,035	3,085	253,007	256,092	87,545
24	-	5,046	-	5,046	253,800	248,754	80,987
25	-	5,046	-	5,046	252,939	247,893	76,864
26	-	5,046	-	5,046	246,595	241,549	71,330
27	-	5,046	-	5,046	236,917	231,871	65,212
28	-	5,046	-	5,046	225,438	220,392	59,032
29	-	5,046	-	5,046	213,871	208,825	53,270
30	-	5,046	18,455,086	16,604,532	764,093	15,840,439	3,848,376
Totals	-	10,093,880	19,214,233	7,198,929	5,725,956	12,924,885	1,827,405

IRR 2.04%

3.86%

Net discounted revenue (NDR) represents the surplus of discounted revenues over discounted costs. It is negative when costs outweigh revenues. NDR represents profit or return from an investment, at a given discount rate and is a measure of a project's desirability. Projects with equal time horizons (project life) can be compared and ranked on the basis of their respective NDR values.

Timber revenues from thinnings occur relatively early in the Robinia crops but only become significant in terms of economic impact at age 20. The greatest proportion of timber revenues occur at year 30 when all crops are felled. Carbon revenues show a steady increase for the first thirteen years and then decline as volumes are removed and current annual increment (CAI) values begin to fall in the Robinia and Poplar crops.

The project yields a without-carbon IRR of 2.04% equivalent to an NPV of -\$732/ha at 5% discount rate and a with-carbon IRR of 3.86% equivalent to an NPV of -\$272 /ha. Estimated IRR values without carbon for pure Robinia stands are 6.1%, 4.3% and 1.5% for site classes II-IV respectively. Site Class V does not yield an IRR as costs are greater than potential revenues.

Despite the relatively unattractive IRR values for the with-carbon scenario, it is worth noting that Douglas Fir (*Pseudotsuga menziesii*) in Scotland generates an IRR of 2.82% (Bell Ingram Rural, 1998) and that plantations in Japan have an estimated IRR of 0.9% (Eastin et al, 2001). In an

extensive world review of plantation and managed forests, Neilson and Manners (1997) show an IRR of 3.22% for Birch (*Betula spp*) in Finland, 3.18% for Sitka spruce (*Picea sitchensis*) in Scotland, 2.99% for Scots pine (*Pinus sylvestris*) in Sweden and 3.88% for Douglas Fir in Canada (British Columbia). Notwithstanding this, private investment e.g. pension funds, would require a minimum IRR of 6% before investment in commercial plantations (Phillips 2002). Further, in countries with economies in transition where risks are perceived to be higher, private investments generally require a higher IRR to invest in plantations (P. Moura Costa, EcoSecurities Ltd., 2002, pers. comm.).

Non-Timber Benefits

In addition to timber and carbon revenues, the project will contribute significantly to non-timber forest products (NTFP) in terms of soil stabilization and potential honey production. Robinia is a prolific flowering species and highly prized for honey production. Even though reported yields in Hungary and Georgia are as high as 100kg per hectare, yields of 20-25 kg per hectare after age 6 would be more realistic and prudent. The NFA does not charge beekeepers for placing hives under crops.

The project will also contribute significantly to local employment during the first four years and sporadically thereafter in line with planned harvesting. The impact on local employment is elaborated in detail in the social assessment in the baseline study (Brown et al, 2002).

Based on field visits to the project sites, erosion will continue at an increased pace in the absence of forest crops. It was not possible to estimate the economic impact of this soil stabilization on either the project area or the adjoining agricultural lands.

Sensitivity Analysis

Costs and Timber Prices

The project is sensitive to any change in the cost assumptions. This is due to the front loading of costs, so typical in afforestation projects. Any real cost saving will impact positively on the IRR for both with and without carbon scenarios. The risk associated with any cost increase is borne fully by the NFA and not by the project.

Table 10: Impact of Cost on IRR (%)

Increase / Decrease	Costs		Timber Prices	
	Without-Carbon	With - Carbon	Without - Carbon	With - Carbon
-10%	2.45	4.40	1.64	3.57
-5%	2.23	4.12	1.84	3.69
+10%	1.65	3.38	2.41	4.16
+5%	1.85	3.61	2.22	4.01
Base Scenario	2.04	3.86	2.04	3.86

While the project is sensitive to timber price, the impact is less important than for costs. This is due to the timing of timber revenues which occur later during the project life, with the greatest proportion of timber revenue occurring in the final year of the project.

Carbon price and Volume Correction Factor

The project is less sensitive to changes in carbon price than to equivalent changes in timber revenues. This is due to the greater proportion of overall revenues attributable to timber and the fact that carbon in products is excluded.

Table 11: Impact of Carbon Price for First 12 Years on IRR

Carbon Price (\$/Tonne)	IRR (%)	
	Without - Carbon	With - Carbon
10	2.04	3.70
11	2.04	3.78
12	2.04	3.85
13	2.04	3.92
14	2.04	4.00
15	2.04	4.07
16	2.04	4.15

FINANCIAL ANALYSES FOR ALTERNATIVE LAND USES

Current use of the lands identified for the project include pasture, grain and fruit crops and abandonment (Table 2) and is based on site visits to all of the project areas. A series of alternative land use options were developed for the degraded arable lands together with costs and revenues over the project period. The alternative land uses selected represent the standard range of crops grown on the sites prior to the transfer of the lands to the NFA. They were chosen based on discussions with the Romanian Central Research Station for Agricultural Crops on Sands, Dabuleni. The alternative land use options identified were:

- Maize;
- Winter Wheat;
- Water Melon;
- Vines;
- Orchard (Peach); and
- Pasture.

The more demanding crops are cultivated on the less degraded soils with working irrigation facilities. The uses chosen represent a continuation of the “status quo”, although it is likely that in the absence of the project, due to poor yields and high input costs, more and more of the lands will be either abandoned or used for rough grazing over time. Current and anticipated future yields and resource inputs for crops on the project lands were provided by the Central Research Station for Agricultural Crops on Sands. Pasture use is not equivalent to sporadic grazing but represents organized grazing on selected areas with animal flocks shepherded and moved from site to site. A summary of the results is shown in **Table 12**.

Table 12: NPV (\$/ha) @ 5% for Range of Land Uses

Land Use	Assumption		NPV
	Yield Decrease	Inputs Increase	
Maize	Yes	Yes	-3,157
Winter Wheat	Yes	Yes	-4,578
Melon	Yes	Yes	-4,994
Vines	Yes	Yes	-12,400
Orchard	Yes	Yes	-12,944
Pasture	Yes	No	-319
Project – Carbon	No	No	-732
Project + Carbon	No	No	-287

Due to the negative cash balance from year 1-30 inclusive, it is not possible to calculate equivalent IRR values for the alternative land uses.

The best land use is the project with carbon, followed by pasture (sheep) and the project without carbon. However, there is an added risk with pasture use, namely continued erosion, especially with sheep grazing. It was not possible to quantify the impact of pasture on erosion over the project life but the likelihood is that erosion would accelerate and impact on adjoining lands used for agriculture through windblown shifting sands.

Sensitivity Analysis

The impact of changes in yield, input costs and price for a range of scenarios was tested. The NPV of all land use alternatives is less than the project with carbon and only better than the project without carbon for water melon production under the most optimistic and unlikely scenario (**Table 13**).

Table 13: Sensitivity Analysis for Land Use Alternatives

Alternative Use	Land	Cost of Inputs Increase	Decrease in Crop Yields	Price Increase 10%	NPV @ 5% (US\$/ha)	NPV @ 7% (US\$/ha)	NPV @ 3% (US\$/ha)
Vineyard	No	No	No	No	-7,243	-5,958	-9,059
	Yes	No	No	No	-9,999	-8,031	-12,822
	No	Yes	No	No	-9,644	-7,676	-12,493
	No	No	Yes	Yes	-6,074	-4,997	-7,597
	Yes	Yes	No	No	-12,400	-9,749	-16,256
	Yes	No	Yes	Yes	-8,831	-7,070	-11,360
	No	Yes	Yes	Yes	-8,715	-6,886	-11,375
	Yes	Yes	Yes	Yes	-11,472	-8,959	-15,138
Winter Wheat	No	No	No	No	-3,822	-3,144	-4,781
	Yes	No	No	No	-4,285	-3,493	-5,411
	No	Yes	No	No	-4,115	-3,363	-5,182
	No	No	Yes	Yes	-3,550	-2,920	-4,440
	Yes	Yes	No	No	-4,578	-3,712	-5,813
	Yes	No	Yes	Yes	-4,012	-3,268	-5,070
	No	Yes	Yes	Yes	-3,872	-3,161	-4,882
	Yes	Yes	Yes	Yes	-4,334	-3,509	-5,512
Melon	No	No	No	No	-1,948	-1,602	-2,436
	Yes	No	No	No	-3,814	-3,005	-4,985
	No	Yes	No	No	-3,127	-2,488	-4,048
	No	No	Yes	Yes	-487	-401	-609
	Yes	Yes	No	No	-4,994	-3,891	-6,597
	Yes	No	Yes	Yes	-2,354	-1,804	-3,158
	No	Yes	Yes	Yes	-1,784	-1,375	-2,382
	Yes	Yes	Yes	Yes	-3,651	-2,778	-4,931
Peach Orchard	No	No	No	No	-5,023	-4,132	-6,283
	Yes	No	No	No	-8,115	-6,449	-10,513
	No	Yes	No	No	-9,853	-7,684	-13,020
	No	No	Yes	Yes	-2,978	-2,450	-3,725
	Yes	Yes	No	No	-12,944	-10,001	-17,250
	Yes	No	Yes	Yes	-6,070	-4,767	-7,955
	No	Yes	Yes	Yes	-8,291	-6,357	-11,136
	Yes	Yes	Yes	Yes	-11,382	-8,674	-15,365
Maize	No	No	No	No	-1,972	-1,622	-2,466
	Yes	No	No	No	-2,457	-1,987	-3,128
	No	Yes	No	No	-2,672	-2,152	-3,414
	No	No	Yes	Yes	-1,495	-1,230	-1,870
	Yes	Yes	No	No	-3,157	-2,518	-4,075
	Yes	No	Yes	Yes	-1,980	-1,595	-2,531
	No	Yes	Yes	Yes	-2,264	-1,813	-2,912
	Yes	Yes	Yes	Yes	-2,749	-2,178	-3,573

Note: Exchange rate = 33,150 Lei / US\$
Crops grown for project life - 30 years
Most likely scenario

ADDITIONALITY

The NFA has afforested 345 hectares annually over the past ten years (**Table 14**). Project eligibility requirements for Joint Implementation (Article 6 Kyoto Protocol) includes that projects show additionality. Thus the eligible area for afforestation projects is that area over and above what has normally been afforested during the period 1991 to date.

Table 14: NFA Afforestation and Reforestation (ha)

Year	Reforestation	Afforestation
1991	15,163	400
1992	12,243	127
1993	10,170	128
1994	13,563	302
1995	12,315	334
1996	11,541	389
1997	10,209	144
1998	10,416	154
1999	11,446	708
2000	12,382	766
Mean	11,945	345

Two issues arise. Firstly, would the NFA afforest the project areas as part of their “normal” afforestation and, if so, should the average area afforested be deducted from the total project area? Secondly, does the project area represent the total area planned for afforestation by the NFA?

The project area can be divided into two quite separate components – (i) degraded agricultural lands and (ii) the Lower Danube Floodplain. The degraded lands have very poor site productivity (Table 3) and in the absence of carbon credits are incapable of yielding anything like an economic return. The overall internal rate of return (IRR) in the absence of carbon credits is 2.04%. With carbon credits, the IRR increases to 3.86% for the overall project (components (i) and (ii)).

Hurdle discount rates have been developed for use in forestry investment decision making and represent the minimum IRR (%) required to undertake the investment. The rates vary depending on ownership category (state, private), perceived risk and alternative opportunities for investment but are within the range of 2.5 to 7% for state forestry (Phillips 2002).

The project IRR without carbon is lower than minimum hurdle rates and thus would not normally be considered for investment. The with-carbon IRR shows a return which some other state forestry organizations might consider worthwhile but even so the return is low. Thus it is reasonable to conclude that the project areas would not be afforested in the absence of carbon credits.

The afforestation of the Lower Danube Floodplain represents a special case—ecological restoration. No harvesting will take place and consequently no timber revenues will ensue. This area could not be considered as part of the normal NFA afforestation. It is only possible to afforest these areas under the project and with the inclusion of carbon credits.

Thus considering the economics of the project, the area would not normally be planted under commercial criteria.

The NFA will take over in addition to the project area, some 1,700 hectares in the counties of Arad, Sibiu and Botosani. Site productivity in these areas is significantly higher, especially in Arad and Sibiu which total 1,500 hectares. The NFA plans to afforest these areas over the coming years but the immediate priority is the afforestation of the project areas.

The total project area can be considered as eligible under the additionality criterion both from an economic and technical viewpoint.

RISKS DUE TO LEAKAGE

The planned project afforestation of 6,728 hectares is in addition to the normal reforestation carried out by the NFA. The project will not impact on the rate of reforestation after harvesting as the NFA is legally obliged under the Forest Code (Law No. 26/24, April 1996) to reforest areas which have been felled and through the operation of the Regeneration and Conservation Fund¹⁴ has the financial capacity to fulfill its reforestation obligations. It also has the technical resource capacity (seed, nurseries, labor and equipment) to complete the required reforestation of recently felled lands.

As there is little or no private afforestation currently in Romania and the funding of this activity is separate to the Regeneration and Conservation Fund e.g. EU SAPARD, the project will not impact private afforestation.

The lands to be afforested under the project are degraded lands and many areas have been abandoned (Table 3). The adjoining lands of higher fertility will continue to be used for agriculture. The afforestation will not displace local communities or land owners or result in leakage through the deforestation of other lands for agriculture.

The project by virtue of its objectives (soil stabilization and ecological reconstruction) will not result in increased demand for timber and timber products thus leading to leakage from other forest areas through increased harvesting.

OTHER RISKS

There are a number of other identified risks both to the financial analysis and the total carbon sequestered:

- Grazing;
- Drought;
- Fire / Disease / Wind;
- Model Predictions;
- Yield Table Predictions;
- Site Productivity Class;
- Illegal Felling; and
- Financial and Technical Capacity.

¹⁴ Under Article 63 of the Forest Code (Law No. 26/24 April 1996), the NFA are obliged to maintain an interest bearing Forest Regeneration and Conservation Fund. The fund is financed mainly through a 20% levy on timber sales (standing and secondary products). The Forest Code states that this fund is to be used solely for (a) afforestation, (b) reforestation, (c) special protection functions and (d) to cover the cost of natural calamities.

Grazing (mainly sheep) is widely practiced both on the identified project areas and on adjoining lands. Grazing is anticipated throughout the project life mainly under Robinia crops and has the potential to reduce the litter (foliage) and result in smaller gains in carbon in this component as well as soil, in the absence of any mitigating measures.

Drought, especially during the first five years of the project, represents the greatest risk, resulting in mortality and filling-in (replacement of dead or missing seedlings) with subsequent impact on the rate of carbon sequestration.

Fire is not considered a major risk, as few ignition sources exist. The major species being planted – Robinia – is relatively disease free. While Poplar and Oak may be subject to disease, major infestation is unlikely. Wind damage (snow break and windthrow) is unlikely given the afforestation location and species being planted.

The CO2FIX predictions are based on a general model for carbon sequestration. There is the likelihood that the model could either over- or underestimate the carbon sequestered. The results of the field sample plot analysis conducted during the baseline study suggest that CO2FIX underestimates above ground carbon for Robinia and Oak. The yield models assume full stocking and a set sequence of thinnings over the life of the crop. Total volume production, and by implication total carbon sequestration, is relatively independent of stocking within certain limits. There remains, however, the possibility of some plants dying resulting in gaps and less than full stocking.

There is a significant difference in total volume and revenues between the five site productivity classes. For example, Robinia shows a difference of about 100 m³ in total volume production between each site class over a 30-year rotation. Any overestimate in site class could result in significant overestimation of carbon and financial benefits. The corollary is also true.

Illegal felling, mainly for firewood, by locals is a real risk. The extent of illegal felling is difficult to predict but sporadic illegal felling is likely, especially in the Robinia areas. This will require careful monitoring and control.

MITIGATION MEASURES FOR REDUCING RISKS

Several actions at specific sites can be implemented to reduce some of the risk to the project. However, it is recommended that the project retain a proportion of the carbon benefits generated to self-insure. To some degree this has been taken care of in the simulations of the CO2FIX model—a general volume and carbon reduction factor of 10% has been built into the financial and carbon analysis to take account of possible losses through grazing, drought, illegal felling, disease and stocking. In terms of volume reduction, this is probably slightly high given that the afforestation areas are net of roads, etc. A figure of 7.5% is not unreasonable. The difference of 2.5% represents a safeguard against possible overestimation by CO2FIX.

Other mitigation measures include:

- Fencing on sites where there is an economic fence area ratio (less than 120 linear metres / hectare) could be worthwhile in reducing the impact of grazing and is recommended.
- In Dolj, some of the project areas will be watered from the existing irrigation pipelines during years one and possibly two. This will lessen the impact of drought.
- The NFA can, through the vigilance of its local staff and through building good relations with local communities, reduce the possible levels of illegal felling for firewood.
- The CO2FIX parameters can be reviewed in the light of project monitoring and independent third party validation and thus corrected over time to provide greater reliability of estimates.

- In assessing site productivity class, the NFA has erred on the side of caution. Thus where a site could be considered III or IV, the higher class was selected with significant reduction in total volume production.

OVERVIEW OF MONITORING DESIGN

Carbon

A carbon measuring and monitoring plan needs to monitor both for carbon and for project compliance (that is the project has planted and is maintaining the areas proposed). The carbon measuring and monitoring plan (M&M) was designed to treat the whole 6,728 ha, which means that if implemented as designed, the project cannot be subdivided into smaller parcels for trading.

The first step was to determine the number of plots needed in each stratum to reach desired precision levels. There is no policy in place that provides guidance as to the desired precision level or at what level of confidence should be used in carbon projects in the forestry sector. The data from the forest plots for aboveground biomass carbon were entered into Winrock’s Plot Calculator© software to estimate the number of plots that will be required to achieve a level of precision between 5% and 10% for the carbon content of aboveground biomass (Table 15). The number of plots is based on sampling error only, but there are other sources of error when estimating carbon namely regression error and measurement error. In general, the sampling error is the largest source of error and can account for up to 80% of the total error. We suggest an overall goal of a level of precision of +/- 10% so by targeting about 7% for sampling error we can meet that target, allowing for the other sources of potential error in the estimates. .

Table 15: Number of Plots Required for Various Precision Levels in Aboveground Carbon

Soil Type and Stratum Number	Site Class	10%	7%	5%	Area (ha)
Degraded sandy soils: 1	<i>Robinia V</i>	3	7	14	796
2	<i>Robinia IV</i>	4	8	15	722
3	<i>Robinia III</i>	6	13	25	1,911
Alluvial soils 4	<i>Populus II & III</i>	24	49	96	2,727
Eroded zonal soil 5	<i>Quercus IV and V</i>	3	7	13	572
Total		40	83	164	6,728

To meet the 7% precision level for sampling error, the analysis shows that 83 plots are needed. It is recommend that additional plots be established to account for future damage, missing plots, etc. We recommend that an additional 10% of the total needed be established; this results in a total of 92 plots: 7, 9, 15, 54, and 7 in the order strata 1-5.

The requirement is to measure and monitor the quantity of carbon accruing on these planted sites over the length of the project and over separate time periods. This is accomplished by measuring the changes in stocks over time. For forest vegetation, this will be accomplished by monitoring the growth of individual trees in permanent sample plots at given time intervals (recommended to be 5 year intervals), keeping track of growth of survivors, mortality and ingrowth of trees. Changes in

carbon per tree will be estimated and summed per plot. Changes in carbon stocks in dead wood, and fine litter will also be measured and added to those for the trees. Statistical analyses will then be performed on net carbon accumulation per plot; rates of carbon accumulation will be estimated directly from these analyses rather than subtracting two pools from each other. It is expected that the targeted precision will be met by this approach.

In contrast to the procedure for vegetation where the original trees in the plots are monitored through time, the same soil sample cannot be monitored over time. Instead, at each sampling interval a new sample is “destructively” collected and the analyses will involve subtracting two large pools from each other. This can result in a larger error. To illustrate this concept, we assume that the soil carbon results from the replanted areas and the forest areas represent a time sequence of sampling. Of importance in determining the number of plots that need to be established is not the number of plots that makes a difference significant but rather what number of plots could produce a given change in carbon stocks to be significant, i.e. how many plots are needed for a significant difference of 1, 2, 3, etc. t C/ha change.

The afforestation of the 6,728 ha or so will occur over at least 3-4 years, thus it was recommended that two age-class cohorts be developed to reduce variability in carbon measurements. Sites planted in the first two years will be one population and sites planted in the second 2-year period will be another population. The implication of the two age-class cohorts is that there are two unique populations and thus two sets of plots are needed for each population.

Social

The monitoring of the social impact on local communities of the proposed afforestation represents an important aspect of the overall project design. During the baseline study, a detailed social assessment was undertaken and highlighted a number of issues of concern to communities. Based on this a monitoring plan, focusing on four aspects was developed (Table 16).

Table 16: Social Aspects and Monitoring Indicators

Aspect	Indicator
Social	Creation of new job opportunities Migration Law-breaking - forest legislation (illegal grazing, theft) Legal status of the agricultural land
Economic	Improvement of agricultural productivity Establishment of new industrial units in area
Quality of Life	Health of the villagers Quality and quantity of the water
Social support for the project among villagers	Attitude towards forest Attitude towards afforestation Project Attitude towards NFA and its employees

An initial educational and awareness campaign to inform local communities will be undertaken in year one. Following this a first round of monitoring is planned. Second monitoring will be at the end of year one and subsequently every five years.

Biodiversity

To monitor biodiversity, the most practical approach is to use one of the taxonomic groups which is an essential part of ecosystem biodiversity, quite well correlated with total species richness, for which past information is available, is easy to census, and readily understandable to non-experts. Birds are one of the best indicator taxonomic groups and were chosen as the preferred indicator.

Presence-absence information needs to be maintained, as well as census counts, particularly of migratory species, which should be compared with figures being produced by others in the overall migratory corridors (flyways). One can then see if changes noted are general for the species or are specific to the areas being measured (and thus plausibly attributable to the project).

While only part of the biodiversity story, birds seem to be the most practical and immediate indicator available, and in work on indicators in the CBD and the OECD as well as in Europe through the EEA, birds are being prominently featured in theoretical and practical discussions of biodiversity indicators.

Three main types of bird counting methods are usually used for non-colonial breeding birds – territory mapping, point counts, line transects. The majority of specialists agree that line transect methods are the most time and cost effective ways of achieving reliable figures. The transect method can be used year round, but during breeding season, when birds strictly found in their nesting areas, is the most important time for the monitoring biodiversity of concrete parcels of land such as found in the afforestation project.

To simplify field census and calculation of densities, the two-belt line transect method will be used. An additional method - counting of the nests of colonial birds – will be used on The Small Island Braila, in colonies located near afforested plots.

An initial inventory will be required to establish a baseline for monitoring. Summary details of the sampling for the initial inventory and subsequent monitoring are provided in Table 17.

Table 17: Summary Information on Spatial Planning for Inventory and Monitoring

Group	Location	Land Use		Number of transects (excluding counting control sites)	
				Inventory	Monitoring
I	Dolj Mehedinti Olt Galati Vaslui	Vineyard, Arable land, Pasture	Robinia Quercus	V15 A15 P15	R15
II	Braila	Arable land, Pasture	Robinia Populus	P15	Pop15
III	Tulcea	Pasture	Robinia Quercus	P15	O15

Legend : V- vineyard, A- arable land, P – pasture, R- Robinia forest, Pop – Poplar forest, O – Oak forest; V15 – fifteen transect in vineyards, R15 –fifteen transects in Robinia forests etc.

Besides the monitoring program there are several other sources of information on biodiversity in afforested areas that will assist in ensuring a positive (or at least benign) biodiversity effect of the project, and/or measuring those effects.

The first is the Romanian census of game species. According to the Law on Hunting Fund and Protection of Game (1998), hunting management units and the central public authority responsible for the forestry shall control and organize management of a hunting fund, including approval of annual harvesting quotas. So, annually, for each hunting management unit, hunting organizations conduct the field census of game species.

The second is information from the department for forest survey (including pest control), within the NFA. The Romanian forest survey system, through the national permanent plot network, is based on (Badea, O et al. 1998) :

The third possibility is information from Integrated Management Plan for the Small Island of Braila.

Finally, there are bird surveys conducted annually through organizations such as BirdLife International and Wetlands International which not only may have data (historical as well) for Romania, but may well sample similar sites to those of concern for this project. At least this information can be used to ascertain what is happening to observed species elsewhere in the flyway so as to filter out to some extent extraneous factors from those that may be related to the project activities.

Thus there are a good opportunities to obtain additional information on plants, some invertebrates and game species animals for some of the areas or generally, which is possible to be used to evaluate changes in biodiversity on the afforested plots.

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COILLTE FARM PARTNERSHIP SCHEME – A JOINT VENTURE IN COMMERCIAL AFFORESTATION IN IRELAND

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SUMMARY

The Coillte Farm Partnership Scheme is a unique afforestation product that is available to Farmers and Landowners from Coillte (the Irish Forestry Board). Under the Farm Partnership scheme Coillte leases the land from the farmer for the period of one rotation, usually 40 years. The farmer retains ownership of the land and receives a tax-free annual income for the life of the crop, including an advance payment at the start of the venture and the larger share of the clearfell profits. In addition, Coillte provides a professional management service over the full rotation, including establishment, maintenance, inventory, harvesting and marketing activities.

To date, Coillte manages over 10,000 ha of high-yielding commercial plantations under the Farm Partnership scheme. Recent customer surveys have indicated very high levels of satisfaction among Coillte Farm Partners. Most partners have opted for the Farm Partnership arrangement because of the availability of Coillte's management expertise over the full rotation and the facility of direct access to the company's timber marketing network. Partnership plantations enjoy Forest Stewardship Council certification status in line with the company-owned estate.

BACKGROUND TO THE COILLTE FARM PARTNERSHIP SCHEME

Throughout most of the 20th century afforestation activity in Ireland was largely in the hands of the state and land was purchased outright from farmers for planting. From the early 1980's, and with the support of EU funding, farmer forestry has continued to increase its share of the planting market. Coillte, The Irish Forestry Board, was established in 1989 to manage the state-owned forests on a commercial basis.

The availability of EU funded supports for afforestation, with particular emphasis in favour of farm forestry, has brought about substantial changes to the pattern of forestry ownership in Ireland. This has manifested itself in a significant increase in the volume of farmland converted to forestry and greater competition for afforestation business among forestry development companies and consultants. However, competing agricultural schemes and increasing environmental regulations are having a negative impact on the supply of land with forestry potential. The outcome from all of these factors is that the purchase price of bare land for afforestation has risen steadily over recent years. Coillte has taken the view that prices are now significantly above the point of economic return and the company has ceased the practice of outright purchase of bare land for afforestation.

In the 1990's, against the background of increasing competition and rising prices for forestry land, Coillte recognised an opportunity to continue its forestry development programme through a leasing and joint venture arrangement with farmers.

The Coillte Farm Partnership scheme is an afforestation product unique to Coillte, and is one of several new planting options offered to farmers by the company. The financial incentives are provided in the form of a planting grant and annual premiums, funded under the EU Common Agricultural Policy reform measures. Under the Farm Partnership scheme the farmer receives an advance payment from his/her share of the clearfell profits and an annual premium for 20 years after planting. Payments after year 20 are funded by future profits from thinnings and at maturity the farmer receives the larger share of the clearfell profits. The Coillte Farm Partnership Scheme also protects the farmer's succession rights in that the next of kin may continue with the agreement.

KEY FEATURES OF THE COILLTE FARM PARTNERSHIP SCHEME

Ownership of the Land: Under the scheme the farmer retains ownership of the lands. Coillte enters a legally binding lease arrangement with the farmer for the duration of the rotation which is usually 40 years. This arrangement ensures that the farm holding, while undergoing a substantial change in enterprise, continues to remain in the ownership of the family.

Advance Payment: The farmer will receive from Coillte an advance payment at the commencement of the partnership of up to €635 / ha. This payment is an advance from the partner's share of the clearfell profits and will be deducted from the realised clearfell profits at the end of the rotation. Regardless of the level of inflation over the period of the crop's life Coillte has placed a maximum limit on the repayment of 4% of the clearfell profits. Without this provision for the deduction of the advance at the realisation of profits, the advance payment could be deemed to be a "gift" and taxed as such.

Forest Premium: Following the establishment of the forest the farmer receives an annual direct payment, the Forest Premium from the Forest Service for twenty years. The level of payment will depend on the species proportions, and higher payments are received for broadleaves and larger scale plantations. Premium payments to non-farmer landowners are considerably less and are paid for fifteen years only.

Thinning Annuity: The farmer receives 80% of the thinnings profits in the form of an annuity paid from the time the forest premiums cease (year 21) until the year prior to clearfell. The annuity is calculated on the basis of the total net thinning profits divided by the residue of years then remaining prior to the year of clearfell.

Coillte can also offer additional flexibility in allowing the farmer to increase his annuity by bringing forward up to 20% of the clearfell revenue. Again, this enhanced payment is received by the farmer over the remaining years of the rotation.

Clearfell Profits: The farmer retains 55% of the clearfell profits. In cases where the annuity payments were enhanced by bringing forward a proportion of the clearfell profits, the farmer's share of the clearfell profit is amended by a similar amount.

Professional Management: As Ireland's largest and most experienced integrated forestry company we offer our partner customers a complete forest management package over the full term of the partnership arrangement. This covers all establishment and maintenance activities, and full access to Coillte's marketing and harvesting network. There is also the added benefit in that plantations managed by Coillte under the Partnership scheme have full Forest Stewardship Council certification status in line with the company-owned estate.

The Partner's Responsibilities: The day-to-day duties of the partner as a joint venture party include care-taking, security and ensuring that the Coillte manager is fully briefed on general maintenance activities that may require attention. A condition of the Partnership agreement is that a management meeting is held with the partner at least once a year for the purpose of discussing the on-going management of the venture and agreeing the work plan for the following period. The scheme also allows the partner to undertake some of the on-site work, such as planting and vegetation control, and payment is made at the normal rate for the job.

Tax-free Income: Under current Irish tax legislation, the profits accruing to an individual from the occupation of woodlands managed on a commercial basis and with a view to profit making are exempt from income tax.

Succession and Sale of Share:

Under the Partnership agreement the farmer is free to exercise his/her succession plans. The agreement and lease remains in place until expiry at clearfell stage.

The partner's share can be sold during the term of the agreement provided Coillte is given the first option to purchase the share. If the two parties fail to agree a sale the partner is free to negotiate a sale elsewhere.

Establishment Grant: Coillte receives the establishment grant under the terms of the joint venture agreement for the purpose of funding the establishment and maintenance activities.

CASE STUDY – COILLTE FARM PARTNERSHIP

Example: Landowner with 20 hectares who qualifies as a farmer under the Forest Service grant guidelines. The land is improved for agriculture and is of medium quality i.e. rough grazing. The landowner and Coillte enter into a partnership for 38 years. A typical species composition is Sitka spruce (*Picea sitchensis* (Bong. Carr.) 70%, Larch (*Larix* spp) 20% and broadleaves (10%).

The landowner will receive up to €635 / ha as an advance payment, forest premiums for 20 years. 80% of the thinning profits and 55% of clearfell profits. These payments are quantified as follows:

Advance Payment	20 ha x €635 =	€12,700
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Forest Premium

20% Diverse Category	18ha x €416.47 =	€7,496.46
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Broadleaves Category	2ha x €476.26 =	€934.52
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The total premium per annum payable from year 1 to year 20:		€8,430.98
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Thinning Annuity

In this example 80% of the total thinning profits is estimated at €356/ha. The thinning annuity payable to the farmer: 20 ha x €356

Each year from year 21 to year 37 the farmer receives:		€7,120
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Clearfell Profits

Assuming that the crop is clearfelled at year 38, the landowner's 55% share of the clearfell profits is estimated at €18,850/ha

The clearfell profit payable to the farmer: 20ha x €18,850 =		€377,000
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Special note on timber revenues: the revenues quoted are net of costs and are calculated on the basis of an average annual inflation rate of 3% over the period of the partnership and that increases in timber prices will match inflation. Timber prices fluctuate and may fall below inflation as well as rise above it. If inflation is less than assumed in the worked example or if timber prices do not increase in line with inflation, returns will be less than illustrated.

COILLTE FARM PARTNERSHIP – A SUCCESS STORY

The Coillte Farm Partnership Scheme was launched as a new afforestation product in Ireland less than 10 years ago. Understandably, the initial take-up was slow but the scheme has grown substantially in recent years. To-day, Coillte is managing over 10,000ha of high-yielding commercial plantations within the Farm Partnership Scheme. The interest in the scheme among the farming community remains very buoyant, particularly in view of the many uncertainties facing the agricultural sector at this time.

Customer surveys undertaken by Coillte clearly show a very high satisfaction rating from our partners. Farmers have given the following reasons for choosing the Coillte Farm Partnership Scheme:

- farming enterprise non-viable
- lack of forestry skills for the management of the forest
- Farm Partnership the best financial option
- The financial security of a long term agreement with a state-backed company
- Coillte body of knowledge and forestry expertise
- Coillte timber marketing facility and certification label

CONCLUSION

The Coillte Farm Partnership Scheme is now established as a valuable afforestation product in Ireland. In less than a decade over 10,000ha of high-yielding forestry plantations have been established by Coillte in partnership with farmers. This novel joint venture in Irish afforestation has delivered to our partners financial security and a substantial shareholding in a commercial forestry enterprise.

ACKNOWLEDGEMENTS

My thanks are due to Michael Davoran, Pat Sweeney, Coillte Forestry Services and Tom Kavanagh, District Manager, Coillte for their assistance in preparing this paper.

THE EFFECT OF FORMATIVE SHAPING ON THE STEM QUALITY AND EARLY GROWTH OF PLANTATION ASH

M. Bulfin, T. Radford and J. Brosnan

SUMMARY

From a commercial perspective, the most important part of any tree – whether broadleaf or conifer – is the lower section of the stem. This is the portion of the tree, particularly in the case of broadleaves, which yields the greatest financial return. The form and quality of this lower stem is laid down in the very early years of growth. At this time, significant form defects, should they occur, can quickly become intractable. Formative shaping can offer an efficient, cost-effective way of ensuring that the most valuable lower portion of future crop trees will be straight, clean and of sufficient quality to be marketable. Formative shaping is a silvicultural operation carried out before the stem reaches a height of four metres, to ensure that selected trees produce a straight defect-free stem with a single straight dominant leader.

This paper traces the effect of formative shaping on five species of broadleaves: ash (*Fraxinus excelsior*); sycamore (*Acer pseudoplatanus*); maple (*Acer platanoides*); beech (*Fagus sylvatica*); and pedunculate oak (*Quercus robur*). Two levels of shaping (light and heavy) plus a control were laid down in randomised blocks in young plantations. Over a 3-year period, measurements were taken of the effect of shaping on stem quality, diameter and height. Growth rates for cohort groups, within height growth categories, were compared over the same period. Results confirmed the beneficial effects of formative shaping.

L'effet de la taille sur la qualité du tronc et le développement initial des feuillus

Exposé de MM. Michael Bulfin, Todd Radford et John Brosnan

Résumé

Du point de vue commercial, la partie la plus importante d'un arbre – qu'il s'agisse d'un feuillu ou d'un résineux – est la partie inférieure de son tronc. C'est, en particulier dans le cas des feuillus, la partie de l'arbre qui a le meilleur rendement financier. La forme et la qualité de cette partie du tronc se déterminent dans les toutes premières années de croissance. À ce stade, d'éventuelles déformations importantes peuvent rapidement devenir incorrigibles. La taille peut être un moyen efficace et rentable d'obtenir que la partie inférieure – la plus précieuse – des futurs arbres de place soit droite, propre et de qualité suffisante pour être commercialisée. C'est une activité qui s'effectue avant que le tronc n'atteigne la hauteur de quatre mètres, pour que les arbres sélectionnés produisent un tronc droit exempt de défauts se terminant par une pousse apicale unique et droite.

Les auteurs étudient les effets de la taille de cinq essences de feuillus: frêne (*Fraxinus excelsior*); érable sycomore (*Acer pseudoplatanus*); érable plane (*Acer platanoides*); hêtre commun (*Fagus sylvatica*) et chêne pédonculé (*Quercus robur*). Deux degrés de taille (légère et lourde) ainsi qu'un témoin ont été établis en blocs randomisés au sein de jeunes plantations. Pendant trois ans, on a mesuré l'effet de la taille sur la qualité, le diamètre et la hauteur du tronc. Pendant la même période, on a comparé, au sein de catégories de hauteur, les taux de croissance de diverses cohortes. Les résultats ont confirmé les effets bénéfiques de la taille.

Влияние формирования структуры насаждений на качество ствола и развитие деревьев широколистных пород на начальном этапе

Основной документ, подготовленный г-ном Майклом Балфином, г-ном Тодом Рэдфордом и г-ном Джоном Бросаном

Резюме

Для целей торговли наиболее важной частью любого дерева, и широколистного и хвойного, является нижняя часть ствола. Именно эта часть дерева, особенно широколистного, приносит наибольший финансовый доход. Форма и качество нижней части ствола закладываются в самые первые годы роста. В этот период серьезные дефекты формы, в случае их возникновения, могут быстро стать неисправимыми. Действенный и эффективный с точки зрения затрат способ формирования структуры насаждений может обеспечить, чтобы наиболее ценная нижняя часть будущего урожая деревьев была прямой, чистой и достаточно качественной, чтобы продаваться на рынке. Формирование структуры насаждений - это лесоводческая операция, выполняемая до достижения стволом высоты четырех метров. Цель операции - добиться, чтобы у отобранных деревьев был прямой ствол, не имеющий дефектов, с одним прямым главным побегом.

В представленном документе прослеживается воздействие формирования структуры насаждений на пять пород широколистных деревьев: ясень (*Fraxinus excelsior*), явор (*Acer pseudoplatanus*); клен платановидный (*Acer platanoides*); бук лесной (*Fagus sylvatica*) и дуб черешчатый (*Quercus robur*). На выбранных наугад участках молодых лесопосадок было применено две схемы формирования структуры насаждений (малого воздействия и интенсивного воздействия), кроме того, за ними был установлен контроль. В течение трех лет брались пробы для определения воздействия формирования структуры насаждений на качество, диаметр и высоту ствола. Темпы роста когортных групп сравнивались по категориям высоты за одинаковый период времени. Результаты исследований подтвердили положительное воздействие процесса формирования структуры насаждений.

Ireland has been conducting a major state, planting programme over the last 50 years. For most of this time the species being planted were conifer. This was because much of the land being planted was of very poor quality. Since the early 1980s, with increasing help from the EU the emphasis has shifted to private farmer planting. This has resulted in somewhat better land being planted. In more recent years – for environmental reasons – there has been an increasing requirement as part of the grant support system to include a certain percentage of broadleaves in each new plantation (Anon, 1996). This percentage has now risen to 30 percent in most circumstances. To date over 20,000 hectares of broadleaves have been planted and more are being planted each year.

From a commercial point of view the most important part of any tree - whether broadleaf or conifer - is the lower section of the stem. This is the portion of the tree, particularly in the case of broadleaves, which yields the greatest financial return. Balandier (1997) quotes French timber prices for pruned, straight, sound and knot free boles as being four times that of unpruned ones. Such price differentials do not exist in Ireland - as yet.

The form and quality of this lower stem is laid down in the very first years of growth. At this time should significant form defects arise they can quickly become intractable (e.g. a fork at 1 meter above ground) and result in a total loss of lower stem quality. In the early growth stages, of a young stem,

tissues are soft and malleable and have not lignified. Lower stem defects, unless corrected at the time of such malleable growth, are almost impossible to redress at a later stage.

In order to realise the full potential of Ireland's newly planted broadleaf plantations it is essential to develop management systems to promote quality. Formative shaping can offer an efficient way of ensuring that the most valuable lower portion of the tree will be straight, clean and of sufficient quality to be marketable as a high value raw material for an expanding broadleaf industry.

In the early 1990s some 2,500 (2 metre spacing) to 3,300 (1.75 metre spacing) plants were planted. Currently ash and sycamore are planted at 3,300 per hectare while oak and beech are planted, with a nurse species, to a combined total density of some 5,500 plants. Even these spacings mean that each sapling is growing in its first few vital years in a totally artificial environment - far removed from that of a similar sapling in a natural regeneration situation. There is no competition from neighbouring saplings for 4-7 years. Each plant grows in a "free growth" environment with no lateral competition.

Formative shaping is a silvicultural operation carried out in the very early years of a young broadleaf tree's development. Its purpose is to ensure that (such widely planted) trees produce a straight defect-free stem with a single, straight, dominant leader. Formative shaping – often abbreviated to shaping - is concerned with assisting a single main shoot achieve dominance. Shaping also seeks to counteract the tendency of young broadleaved saplings to produce defects, such as forks and disproportionately large branches low down on their stems.

The objective of formative shaping in this study is, as outlined by both Hubert and Courraud (1987) and Bulfin and Radford (1998 a & b) to produce a straight cylindrical bole by (if necessary) removing forks, co-dominant leading shoots, side branches with an acute angle of insertion and disproportionately large side branches. The aim of this process is to produce a clean straight main stem to a height of at least three metres. With standard hand pruning tools (i.e. secateurs and loppers) shaping up to three metres is easy according to Barton (1993) but above this height more difficult procedures and equipment are required. This study conforms to the three-metre height convention employed by Bulfin and Radford (1998). The broad thrust of the available literature would suggest that the summer months of June and July are most suitable for this operation. Hubert and Courraud (1987) and Balandier (1997) from France and Bulfin and Radford (1998) from Ireland all recommend that formative shaping is ideally commenced only after the rigours of winter and particularly late spring frosts and possibly spring insect damage has passed. Early Spring shaping was found to result in much loss of sap – especially from sycamore. This time of shaping is endorsed by Barton (1993), from New Zealand, who advocates early summer formative shaping to assist what he terms stem remodelling. Branch removal at this time will result in rapid occlusion of pruning wounds. Formative shaping, carried out at this time of the year, also allows the full growing season's growth to express itself entirely through the stem singled out as the main growing focus.

METHODOLOGY

The impact of formative shaping on stem quality is the principle method of assessing the effectiveness of the formative shaping treatment. Formative shaping is directed towards two specific areas of the stem.

The first area is at the top of the stem where any shoot - which is likely to compete with the leader - is removed. These unwanted, competing shoots are most likely to be caused by an incipient fork in ash. Removal of these defects allows the stem to add additional clean stem of (at least) the length of that years leading shoot growth. In this way the defect height of the stem is increased by an extra years shoot growth.

The second area of the stem is the lower part where large branches - likely to cause future deformation of the stem - are removed. Such large branches could cause a bend or kink in the stem at their point of insertion into the main stem or become so large as to distort the main stem. Such large branches low down on the stem seriously reduce the timber value of the stem.

All the quality measurements in this study are based on a four-grade, visual quality categorisation of each individual tree. This grading system is a modification of the five-grade system originally employed by Bulfin and Radford (1998 a and b) and is based on assessing the dominance of the leading shoot; the straightness of the stem and the presence or absence of form defects along the main stem.

In this grading system a Quality Category 1 stem is a top quality well-formed sapling requiring no shaping. A Quality Category 4 stem has such a poor misshapen form that shaping is not worthwhile or would be too labour intensive to warrant the effort. Trees of intermediate Quality Categories are characterised by defects, which may be remedied by shaping or - more rarely - by natural processes over a period of time. Many but not all Quality Category 2 trees can be brought to Quality Category 1 by shaping. Quality Category 3 trees may also be moved up to Quality Category 2 but less frequently to Quality Category 1. These standard Quality Categories are depicted pictorially in Figure 1 and their salient characteristics listed in Table 1.

Figure 1: Standard Quality Categories for young broadleaved stems

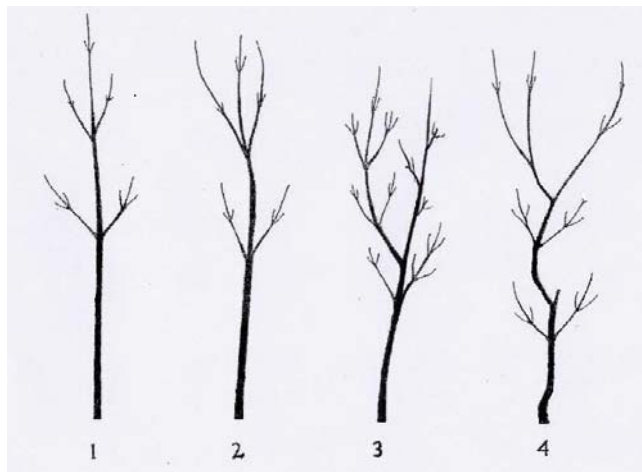


Table 1 Description of typical stem form for each Quality Category.

Quality Category	Description
1	Very good quality tree, straight stem, single dominant leader, no strong competing co-dominants, light branches
2	Good quality tree, not full apical dominance or stem can be slightly wavy, no strong co-dominants, moderate stem straightness, not more than one disproportionately large branch
3	Poor quality tree, poor apical dominance or poor stem straightness, One or more forks, whorls or strong co-dominants. One or more disproportionately large branches or a moderate kink could be present
4	Very poor tree, poor apical dominance and very poor or competing stems. Crooked stems. Multiple heavy branching or forking. Severe kinks or bayonet relays will also place stems in this category

Quality Categories 1 and 2 are regarded as good quality trees for the purposes of all experimental reporting in this study. Quality Category 1 trees by definition rarely require shaping while Quality Category 2 trees require very little shaping to be improved a category to the Grade 1 category.

The type of formative shaping practised by Bulfin and Radford (1998), Balandier (1997), and Nicol (1820) was an annual shaping – concentrated on those trees that were most likely to benefit from shaping. Whereas this approach of removing a little and often is very effective it may not be most cost effective or efficient in field practice.

In the study reported here a series of trials was devised, to examine how long and in what way the effects of a single formative shaping would last. By extension this was to assist with a decision on when and if a second shaping intervention would be appropriate.

Each trial consisted of a total of 900 trees with three blocks and three treatments per block. The treatments were control, light shaping and heavy shaping. There was no shaping in the control plots. In all the shaping plots only those trees which required shaping were shaped. In the heavy shaping plots a large percentage of foliage material associated with defects (measured as a visual estimate of the percent of total foliage) was removed. In the ash trial an average of 55% of total foliage was removed. The amount, on an individual tree basis, was generally in excess of 40% but in some cases as much as 80 % of the foliage was removed. In addition to shaping for obvious stem straightness defects, in some cases large branches, were removed or had their outer one third removed (tipped). In contrast the light shaping treatment resulted in an average of 25.5 percent of the foliage being removed.

Once the experiment was laid out - and in advance of any formative shaping work commencing - all trees were measured for height (to the top of the highest living part), diameter at 20 centimetres above ground level and Quality Category as illustrated in Figure 1 and detailed in Table 1. Where trees were shaped records were taken of the number and type of branch removed or tipped and of the percentage foliage removed.

In subsequent years measurements were carried out each year after leaf fall and before commencement of growth the following spring. Measurements taken were as already outlined for the first year. Measurements were again taken of individual tree top heights (again to the top of the highest living part) in centimetres and the diameter in millimetres at 20 centimetres above ground level. Trees were assigned a Quality Category each year based on an assessment of their current form. In addition in the final set of measurements, collected at the end of 1999, where the tree quality was categorised as Quality Category two, three or four, a height measure was taken from ground level to the point on the stem of the lowest defect affecting stem quality.

RESULTS FOR ASH

This paper reports on the results for ash at Mornington, County Westmeath. The ash was shaped early in the season and three years of results are available. The '97 assessment was carried out in the winter '97 period. The amount of foliage removed was 24.4 in the light treatment and 55.0 in the heavy treatment. The initial quality of the crop is given in Table 11. Most stems are concentrated in second and third Quality Categories.

INITIAL MEASUREMENTS

The overall quality of the ash stems in the trial is summarised in Table 2. This Table indicates that the ash at Mornington had overall good quality - with almost half of the stems in Quality Categories 1 and 2, before shaping. The "Brown ash" (*Fraxinus angustifolia*) at Crookedwood, nearby, had the poorest form of all the species in the experiment.

Table 2: Percent of stems before shaping of each species in each Quality Category

	Ash Mornington	Ash Crookedwood
Quality Category	Year treatment applied	
	1996	1997
1	12.2	2.5
2	34.0	7.4
3	40.8	33.9
4	13.0	56.2

The difference in the amount of foliage removed, for the light and heavy treatments, is summarised for all species in Table 3. In this experiment each species was treated individually and the definition of “light” or “heavy” was a matter of judgement as to what was sufficient to bring the stems of each individual species to the required level of quality. In comparison with most other species ash required less foliage removal to achieve a “Light” or “Heavy” treatment.

Table 3: Percent of Foliage removed by treatment from each species during shaping

Site and species	Ash M/ton	Ash C/wood	Sycamore C/wood	Sycamore Clare	Maple	Beech	Oak
Year treatment applied							
Treatment	1996	1997	1996	1997	1997	1996	1997
L	24.4	32.9	37.3	26.0	27.8	26.0	33.6
H	55.0	60.9	63.7	50.3	63.9	50.3	75.0

EFFECT ON QUALITY, HEIGHT AND DIAMETER

The effect of shaping on stem quality is detailed in Table 4. Table 4 shows that both the Heavy and Light shaping treatments had a statistically significant effect on mean Quality Category score in '97 after the shaping treatment had been applied in early summer. In '98 only the Light treatment was significant but both treatments were again significant at the winter '99 assessment.

Table 4: Effect of formative shaping on stem quality of ash at Mornington 1996 - 1999

Treatment	Year			
	96	97	98	99
Control	2.487	2.560	2.667	2.857
Light	2.573	2.377	2.540	2.640
Heavy	2.582	2.199	2.475	2.529
C v L	NS	*	*	*
C v H	NS	*	NS	*
H v L	NS	NS	NS	NS

* Significant at 95% level; NS Not Significant

Note: The higher the mean score the poorer the average quality of the stems.

Figure 2 gives a graphic representation of the progress of the mean Quality Category score for the three treatments. As a Quality Category 1 tree is the best the lower the mean Quality Category score the better the quality of the stems in any particular treatment. The mean Quality Category score for the control treatment increases steadily - indicating a decline in overall quality of the stems - from a mean of 2.49 in '96 to 2.86 in '99. The effect of the shaping treatment is shown by the improvement caused to mean score (indicated by the reduction in the mean score) by shaping. The heavy treatment has a greater effect. In '98 and '99 the quality of the stems in the shaped treatments begins to decline - indicated by the increase in the mean scores. However, the shaped treatments still retain their improved status in relation to the unshaped treatment.

Figure 2: Progress in subsequent years of mean Quality Category score by treatment - ash Mornington 1996 - 1999

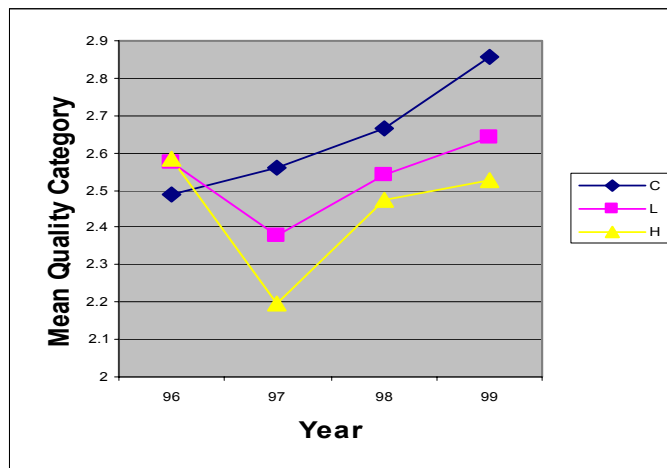


Table 5: indicates that formative shaping had no significant influence on height growth in the first two years after shaping. In the third year the control treatment was significantly different being some 17-18 centimeters taller on average.

Table 5: Effect of formative shaping on height growth - ash Mornington 1996 - 1999

Treatment	Year			
	'96	'97	'98	'99
Control	112.0	165.7	236.0	301.2
Light	118.0	163.3	226.3	283.0
Heavy	112.3	165.7	228.4	282.7
C v H	NS	NS	NS	*
C v L	NS	NS	NS	*
H v L	NS	NS	NS	NS

The progress of height growth is shown in Figure 3 indicating a steady height increment of 50-55cm each year. The height growth of the two shaped treatments is almost identical.

Figure 3: Effect of formative shaping on mean height growth - ash Mornington 1996 – 1999

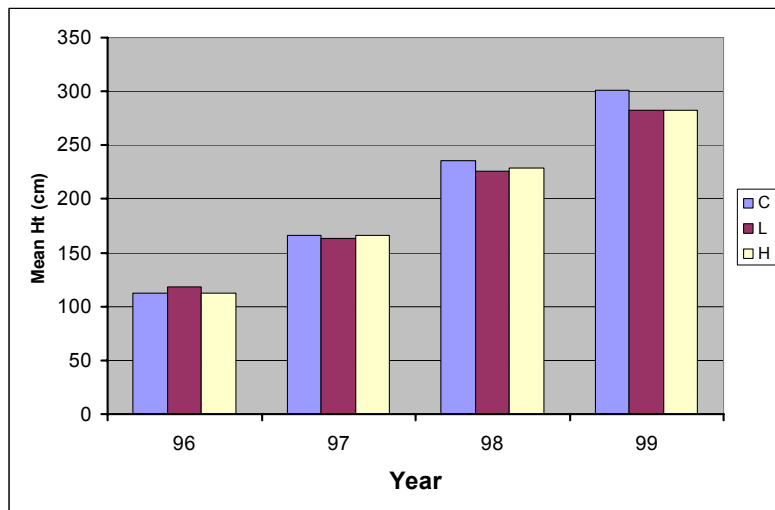


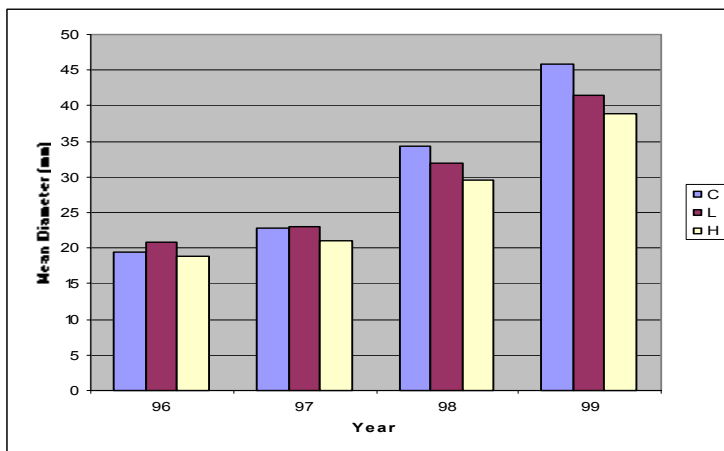
Table 6 details the effect of formative shaping on diameter growth.

Table 6: Effect of formative shaping on diameter growth of ash at Mornington, 1996 - 1999

Treatment	Year			
	'96	'97	'98	'99
Control	19.503	22.857	34.260	45.763
Light	20.863	23.097	31.853	41.493
Heavy	18.805	20.970	29.576	38.976
C v L	*	NS	*	*
C v H	NS	*	*	*
H v L	*	*	*	NS

Table 6 indicates that the average diameters of the light plot differed significantly from the control and heavy before the experiment started. This means that no statement of statistical significance can be attributed to the results for the light treatment. However, the very definite trends, which emerge in subsequent years, as shown in Figure 4 would indicate that the trends are indicative at least. The average diameter of the control plot increases faster than both the other two treatments. Because diameter is influenced by foliage removal, the control plot diameters, which have no foliage removal, gradually surpass the growth of the heavy and light treatment plots. This is shown in Figure 4 indicating an increase in mean annual diameter growth in succeeding years.

Figure 4: Effect of formative shaping on diameter growth - ash Mornington 1996 – '99



HEIGHT CATEGORY

To facilitate further analyses the stems in the three treatments have been divided into Height Categories based on their height just before the first treatments were applied. The stems were divided into Height Categories with 25-centimeter intervals, with the exception of the smallest category, which contains stems in the 0 to 50 centimetre range (almost all stems in this category were over 30 centimetres). The height intervals chosen are purely arbitrary and were designed solely to be flexible

enough to facilitate analysis – equally, 30, 40, or 50-centimeter intervals could also have been chosen. The division into Height Categories allows a more detailed analysis of the progress of height growth among the population of stems. It also provides a mechanism whereby the effect of other analyses – such as the height to the first defect - can be examined in more detail.

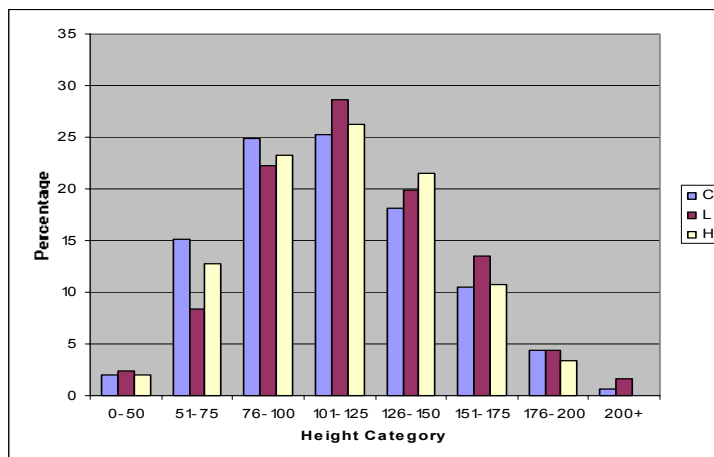
Dividing stems according to their original height allows an insight into the dynamics of growth in such a variable population of unimproved seed origin. A population of seedlings planted at wide spacing presents a broadleaved species with a considerably different challenge than it faces in a natural regeneration situation. Natural competition, from other seedlings spaced as close as a few centimetres away, is not present to force a seedling (or the whole population) to grow upwards (straight) in order to compete for light.

It was possible to divide the ash stems into eight Height Categories based on their height in 1996. Heights ranged from a category of below 50 centimetres to one of over 200 centimetres. The most important Height Categories in these analyses will be those in the middle of the range where most of the stems are concentrated

The first area, which can be examined in Height Category analysis, is the distribution of the initial population of stems into Height Categories. The number of Height Categories will vary depending on the species and the number of years after planting. Slower growing species will have fewer categories for any given age than faster growing species. The ash at Mornington was divided into 8 Height Categories after its third year from planting.

The distribution of stems by Height Category, expressed as the percentage of stems in each Height Category in 1996 by treatment, is shown in Figure 5. The Figure shows that most of the stems are located in the middle Height Categories and that the distribution of stems follows a basically normal distribution pattern with a slight skew towards the taller stems. The pattern is more-or-less similar for all treatments.

Figure 5: Distribution of stems by Height Category (percentage of stems in each Height Category in 1996 by treatment) – ash Mornington



The progress of height growth by Height Category for the control and shaped treatments is shown in Figures 6 and 7. The most vital information to be gained from the two charts of Figures 6 (unshaped) and 7 (shaped) is that the growth pattern is the same for each height category. The slope of the line of growth for each Height Category tends to run parallel to all other Height Categories. The stems, which are smaller at the start, do not tend to catch up on the larger stems nor do the larger stems tend to ‘fall off’ or to ‘pull away’. Thus small stems tend to stay small in comparison to the taller stems and seem to have little chance to enter or compete in the upper canopy.

These two figures would tend to indicate that stems, which start at one particular growth rate, continue to grow at the same rate. However, it would seem that the very smallest cohort of stems in the 0 – 50 Height Category are already beginning to fall behind the taller Height Categories.

Figure 6: Progress of height growth in unshaped treatment by Height Category– ash Mornington 1996 - 1999

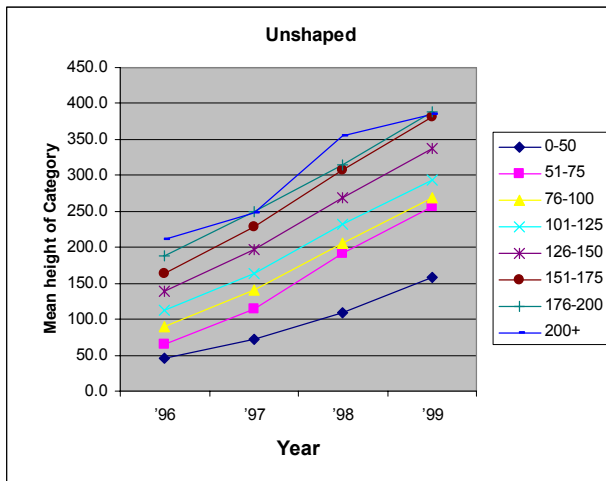
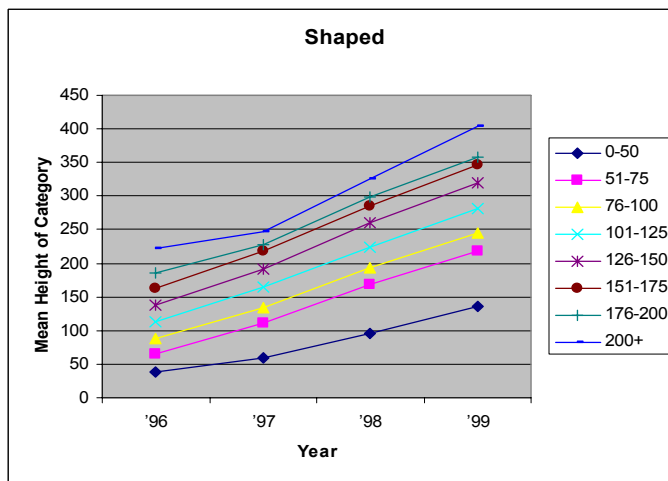


Figure 7: Progress of height growth in shaped treatment by Height Category– ash Mornington 1996 - 99



DEFECT HEIGHT

As pointed out earlier shaping affects two major areas of the stem –firstly promoting and giving protection to the growing point of the leading shoot and secondly improving the quality of the lower stem. In this section the effect of formative shaping on the lower stem is examined by assessing the height to the first stem defect. This gives a very valuable insight into the effectiveness of shaping as a method of improving stem quality. Both the light and heavy treatments add an additional length of

defect free stem in comparison to the control treatment. Table 7 indicates that both shaping treatments have a significant improving effect on the length of clean stem.

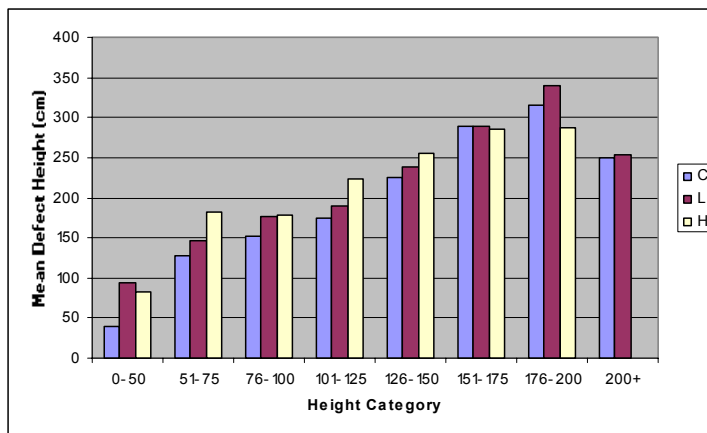
Table 7: Mean height to first defect by treatment – ash Mornington 1999

Treatment	Height
Control	186.5
L	211.3
H	221.0
C v L	*
C v H	*
H v L	NS

* Indicates the treatment is significant at the 95% level

Defect height is examined by Height Category in Figure 8, which shows the mean defect height by Height Category and treatment. The Figure clearly shows that the height to the first defect is greater in the taller Height Categories (with the exception of the 200+ Height Category). For instance the stems, which were in the 76 – 100 centimeter Height Category in 1996, had defect heights of around 150 centimeters in 1999 while stems, which started in the 176 – 200 Height Category, had defect heights of around 300 centimeters in 1999. In most Height Categories the defect height in the control treatments were lower than in the treatments which had received shaping.

Figure 8: Mean Defect Height by Height Category and treatment - ash Mornington 1999¹

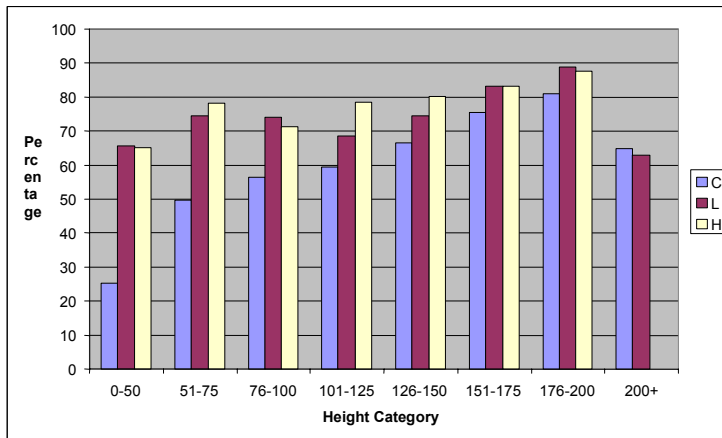


¹ Note there were no stems in the Heavy plot in the over 200 centimetres Height Category.

Defect height can also be expressed as a percentage of total height thus allowing another – and more detailed - method of comparison between treatments. Figure 9 shows the height to the first defect as a

percentage of the total height reached at the end of the 1999 growing season for each treatment. The stems are also divided into their 25-centimeter Height Categories. Figure 9 shows that the defect height as a percentage of the mean height in each individual Height Category in the control plots is less than the defect height in either of the treated plots, with the single exception of the light treatment in the 200+ Height Category. The defect height percentage also increases with increasing Height Category for each treatment – again with the exception of the over 200cm Height Category. Defect height, as a percentage of total height, is also much less in the control plots in the smaller Height Categories than in the taller Height Categories.

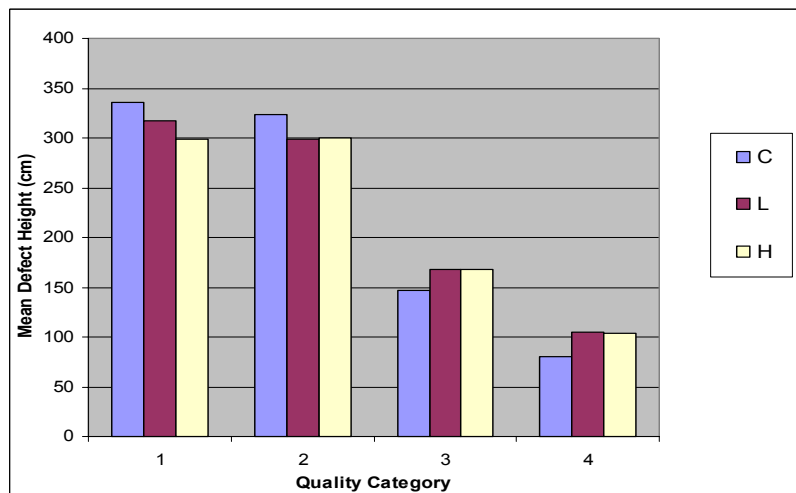
Figure 9 Defect Height as a percentage of total height in 1999 – ash Mornington



The mean defect height for each treatment is also examined by Quality Category. Such an analysis gives an indication (and confirmation) of the effect of defect height on quality ranking. The results for the ash at Mornington are given in Figure 10.

In the top two Quality Categories the control plots have the greater defect height. A partial explanation for this is that the mean heights of the stems in the QC 1 and 2 categories are taller than the stems in the treated plots. There are also fewer stems in the control plots in the top two Quality Categories and these stems tend to be defect free. There is a decline in mean defect height in each quality category. There is a marked fall in mean defect height between QC 2 and 3 where mean height is almost halved from around 300 centimetres for each treatment to around 150 centimetres. Quality Category 4 has the lowest mean defect height.

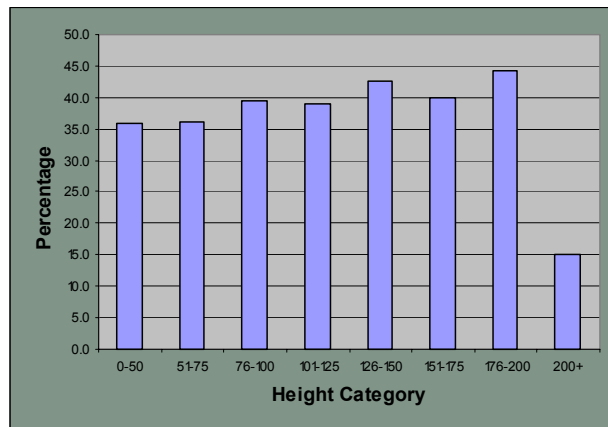
Figure 10: Mean Defect height by Quality Category and treatment – ash Mornington 1999



FOLIAGE REMOVAL

The next series of Figures look at aspects of stem and population development in relation to the amount of foliage removed. A visual estimate was made of the amount of foliage removed compared with the amount of foliage remaining on the stem after shaping. The percentage of foliage removed in each Height Category is shown in Figure 11. There is a small increase in the amount of foliage removed the taller the original Height Category with the clear exception of the tallest category (there are only 5 stems in this category). The range of foliage removal for all Height Categories except the tallest is from 35 – 45 percent.

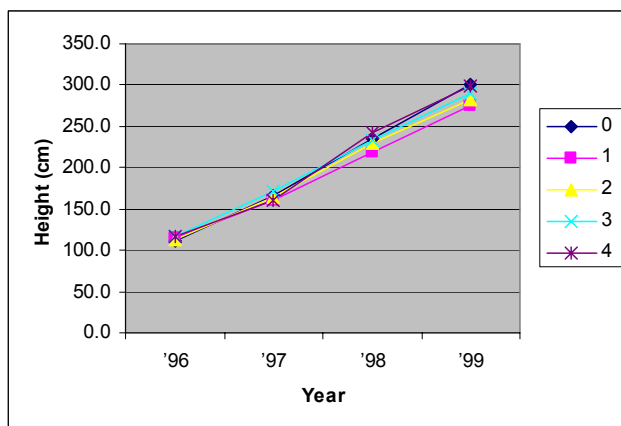
Figure 11: Percentage of foliage removed from each Height Category - ash Mornington 1996



In the next three figures each stem is assigned to a Foliage Removed category based on the amount of foliage removed from it. The Foliage Removed Categories were divided into four: 0 to 25, 26 – 50, 51 – 75 and 76+ percent based on the amount of foliage removed.

The effect of foliage removed by Foliage Removed Category on height is shown in Figure 12. There is little difference between any of the categories and the control. Foliage removal has little effect on height growth.

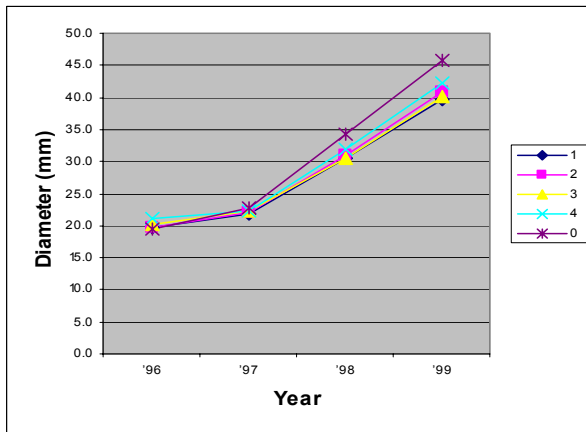
Figure 12: Progress of height growth within each foliage category – ash, Mornington 1996 - 99



The effect of foliage removed on diameter growth is shown in Figure 13. Diameter growth, in the experiment is good and, as shown in Table 6, the effect of shaping is significant. The control treatment has the largest diameter while the other treatments have a somewhat smaller diameter. There is very

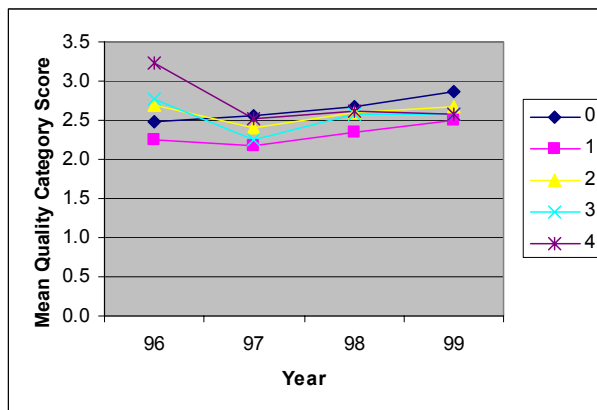
little difference between the other Foliage Removed Categories, despite having had increasing amounts of foliage removed.

Figure 13: Progress of diameter growth within each Foliage Category – ash, Mornington 1996 - 1999



The effect of different levels of foliage removal on stem quality is shown in Figure 14. The control treatment shows a steady decline in quality (shown by the slow increase in mean Quality Category score). Where foliage has been removed there is an improvement in mean Quality Category score for all levels of foliage removal with the greatest effect showing in Foliage Removed Category 4, which is the category with the greatest amount of foliage removed.

Figure 14: Progress of mean Quality Category score within each foliage category and the control treatment – ash, Mornington 1996 -1999



DISCUSSION

There were three years of annual measurements for ash following shaping in early '97. The height of each stem for '96 was also measured in early '97. This gives sufficient time for an assessment of the short-term (3 years) effects of formative shaping. Over this period the stems in the experiment grew an average of 2 metres. Formative shaping improved quality relative to the control treatment for all shaping treatments and for most years. However, even in the shaped treatments quality declines each

year after shaping as damage - subsequent to shaping - occurs to good trees. By the end of 1999 only the heavy treatment has held the mean Quality Category score below the level it held immediately after shaping. There is a clear indication that ash would need at least two sessions of formative shaping to produce sufficient stems (for long-term crop development) with clean boles over 3 metres.

Height growth was regarded as reasonably good, with an average height growth per annum for all treatments of 58 centimeters. The stems in the control treatment have gradually outgrown those in the shaping treatments and the difference is significant in the third year. This may be because the extra foliage on the control trees gives them added vigour in the shorter term. However, over a longer period - if sufficient stems maintain one single leader - then the height growth of the shaped trees may be better. This is what was found by Bulfin and Radford (1998 a & b) in earlier work.

Diameter growth was affected by formative shaping with the heavy treatment causing the greatest decrease in diameter. This effect is attributed to the extra foliage on the unshaped trees allowing them to develop thicker stems. The differential in diameter growth is more likely to last, as the unshaped stems become very bushy, which contributes to diameter but not to quality. It should be taken into account that all diameter measurements were taken at 20 cm above ground level. Many unshaped stems had already forked or developed large whorls below 1.3 metres, which is the standard height at which forestry diameters are normally taken.

While the differences in defect height between control plots and the shaped plots are significant this analysis of the mean defect heights masks the other important information that can be obtained from the more detailed analysis of the data. The division of the stems into Height Categories allows analyses, which yield more detailed and more vital information.

When defect height is examined by Height Category a number of trends become obvious. The most important observation is that defect height increases with increasing Height Category. This is not obvious or deducible - and is actually masked - from the analyses of mean defect height by treatment. The reason for this trend is not difficult to see. If at the time of shaping all serious defects are removed from the lower stem then the taller that initial stem is, when it is shaped, the longer the length of defect free stem it will have after shaping.

Further valuable information can be obtained by examining the relationship between defect height and the total height of the stem. Figure 8 examines this relationship. There is a trend apparent in that defect height, as a percentage of total height, is higher in the taller Height Categories. Defect height, as a percentage of total height is also much less in the control plots in the smaller Height Categories than in the taller Height Categories. These facts would indicate that it may be more effective to concentrate shaping activity on the taller stems.

Figure 9 indicates that the better the quality of the stem the greater the defect height. There is an anomaly apparent in that the control treatment has the highest defect height. This is explained because, while plots were assigned at random, it happened that the control plots contained some very good tall QC 1 trees, which have always been defect free. These stems, therefore, brought up the average defect height in the control treatment.

The amount of foliage removed tends to increase with increasing Height Category. Experience shows that when a stem is being shaped that less foliage will be removed from a small poorly furnished stem than from a larger stem with considerable foliage.

Foliage removal has little effect on height growth but does affect diameter growth. The amount of foliage removed has little effect on mean Quality Category score except in the heaviest removal category where the score is improved perceptibly in the first year. Following shaping the quality tends to decline slowly as some stems sustain damage. Because foliage removal has little or no effect on stem growth this would indicate that a heavier shaping –lasting longer and removing all defects - is preferable to a lighter one.

The information contained in this paper has very obvious implications for the choice of stems to be shaped in a young ash plantation. Not all stems need to be shaped. The poorest stems should be ignored. There is a clear indication that where tall trees occur that most shaping attention should be

given to these valuable stems. Exceptions may need to be made, where such tall stems are not evenly distributed throughout the plantation. Finally, because the amount of foliage removed has little effect on vital aspects of stem growth that a heavy shaping removing all defects is preferable.

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CREATING NEW NATIVE WOODLANDS IN SCOTLAND

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SUMMARY

Over the past 80 years, commercial forests, predominantly of Sitka spruce, have been established on a large scale throughout the uplands of Scotland. The techniques used to achieve this have tended to be intensive, often with deep ploughing and drainage followed by herbicide and/or fertiliser input.

Government policy over the last 10-15 years has shifted away from the planting of new commercial forests, seeking instead to encourage the creation of new native woodlands, often on very wet, exposed and nutrient-poor sites in the Highlands. The intensive establishment methods used successfully with commercial species are not considered to be sustainable forest management for such new native woodlands, and hence 'low input' establishment regimes have been favoured. It has become apparent that many of these 'low input' schemes are having problems in becoming established, with broadleaf species in particular failing or dying back.

A survey, planned for the summer of 2002, will investigate 10 new native woodland sites (including both successful and failed schemes), in an attempt to identify the factors contributing to the failures. This paper will present the results, discussion and conclusions from this survey work. In addition to the recent survey, some research has been carried out into the establishment of native species. However, the vast majority of research has been directed at commercial forests. The most relevant results from these experiments will be presented, hopefully in support of the survey findings.

La création de nouvelles forêts d'essences autochtones en Écosse

Exposé de M. Stephen A. Smith

Résumé

Au cours des 80 dernières années, des forêts commerciales composées principalement d'épicéas de Sitka ont été établies à grande échelle dans l'ensemble des hautes terres d'Écosse. On a généralement utilisé à cette fin des techniques intensives: labour profond et drainage suivis de l'application d'herbicides et/ou d'engrais.

Ces 10 à 15 dernières années, le Gouvernement a délaissé peu à peu la plantation de nouvelles forêts commerciales pour encourager la création de nouvelles forêts d'essences autochtones, souvent sur des sites d'altitude très humides, exposés et pauvres en nutriments. Les méthodes intensives d'établissement utilisées avec bonheur pour les essences commerciales ne sont pas jugées être un moyen d'exploitation viable de ces nouvelles forêts d'essences autochtones; c'est pourquoi l'on a privilégié des régimes d'établissement «à faible consommation d'intrants». Or il apparaît que la réalisation de nombre de ces programmes «à faible consommation d'intrants» est difficile, les feuillus, en particulier, croissant faiblement ou dépérissant.

Dans le cadre d'une enquête prévue pour l'été 2002, on étudiera 10 nouvelles forêts d'essences autochtones (y compris des programmes marqués par la réussite et par l'échec) afin de déterminer les facteurs qui contribuent aux échecs. Le document présentera les résultats, les délibérations et les conclusions auxquels aura donné lieu l'enquête. Outre cette dernière, il a été effectué des recherches sur l'établissement d'essences autochtones. Dans leur immense majorité, cependant, les recherches ont

porté sur des forêts commerciales. Les résultats les plus pertinents de ces études seront présentées et viendront, nous l'espérons, étayer les observations faites lors de l'enquête.

Создание новых лесных площадей на основе местных пород в Шотландии

Основной документ, подготовленный г-ном Стивеном А.Смитом

Резюме

В течение последних 80 лет во всех нагорных районах Шотландии происходило крупномасштабное создание коммерческих лесов на основе ели ситхинской. Для лесонасаждений использовались, главным образом, интенсивные методы, зачастую с глубокой вспашкой и последующей обработкой гербицидами и/или удобрениями.

За последние 10–15 лет правительство постепенно отходило от политики создания новых коммерческих лесопосадок, вместо этого оно стремится поощрять закладку новых лесов на основе местных пород, зачастую в очень влажных, незащищенных и бедных на питательные вещества горных районах. Интенсивные методы, успешно применявшиеся для коммерческих пород, не считаются устойчивым лесопользованием для новых лесов, создаваемых на основе местных пород, и, соответственно, предпочтение отдается "низко интенсивным" методам. Со временем стало очевидным, что многие из этих "низко интенсивных" методов трудно применять, особенно в отношении широколистных пород, которые слабеют и отмирают.

В обзоре, проведение которого запланировано на лето 2002 года, будет исследоваться 10 новых лесных площадей, созданных на основе местных пород (включая успешные и неудачные) с целью выявления факторов, приведших к неудачам. В этом документе будут представлены результаты, обсуждения и выводы, сделанные в ходе подготовки обзора работы. В дополнение к недавнему обзору были проведены несколько исследований по вопросам, касающимся местных пород. В подавляющем же большинстве случаев исследования были ориентированы на коммерческие леса. Результаты этих исследований, которые являются наиболее релевантными, будут представлены и, возможно, подтвердят результаты обзора.

PLANTING NEW NATIVE WOODLAND IN SCOTLAND: SURVEY FINDINGS FROM 10 PROBLEM SITES

BACKGROUND

Government policy is to encourage the planting and regeneration of new native woodlands in Scotland. In practice, this is through Forestry Commission (FC) grant payments to private landowners who undertake appropriate afforestation work to achieve agreed targets.

It should be noted that the majority of schemes progress successfully, however there are a proportion which struggle to become established and it is 10 of these newly planted schemes which this report has focussed on.

During 2000 and 2001 various staff in Forest Research (FR) had undertaken site visits and advisory queries relating to failures in newly planted native woodland schemes. In addition, the annual report summarising WGS site inspections indicated that there were significant areas of unsatisfactory new planting, particularly native broadleaves. It was agreed that site surveys be undertaken in 2002 as an initial investigation into the problem.

10 schemes were agreed for survey during 2002, 4 in FC Highland Conservancy, 2 in Grampian Conservancy, 2 in Perth and 2 in Strathclyde. The survey team comprised of FR staff, Stephen Smith (Establishment, Silv(N)), Bill Rayner (Soil surveys), Sarah Green (Pathology) and Colin McEvoy (Silv(N)), assisted by local FC staff and the site owners/managers as appropriate.

METHOD

The local FC Conservancy or site manager provided background information for each scheme before surveying commenced.

Areas of trees within the scheme that were growing well or poorly were identified beforehand and then located on the ground. A 5.65m radius plot (0.01ha) was positioned within each area of interest and the following factors recorded:

1. GPS co-ordinates of plot centre (OS GB National Grid)
2. Tree health assessment with summary of symptoms for each tree in the plot
3. Tree height and root collar diameters for each tree in the plot
4. Vegetation assessment, to give ESC Soil Nutrient Regime (SNR) score for the plot (FC Bulletin 124)
5. Cultivation type
6. Soil pit to give ESC Soil Moisture Regime (SMR) class for the plot (FC Bulletin 124)
7. Aspect (cardinal points)
8. Foliar sampling from 5 typical trees for later nutrient analysis

Using the above information, the following data were calculated for each plot:

1. DAMS score (Detailed Aspect Measuring System)
2. Accumulated temp
3. Soil moisture deficit
4. Elevation
5. Suitability of main species and woodland type using ESC

SUMMARY OF SITE CHARACTERISTICS

In total 77 plots were assessed across 10 schemes. The results for each site are commercially confidential so the results have been presented without identifying individual sites.

Climate

The plots ranged from 3-6 in continentality score and altitude ranged from 25m up to 460m. Wind exposure (DAMS) reached 19 for the most exposed plot, but most plots were in the range 12 to 17.

Soil

Soil types were very varied between schemes and also within schemes. ESC Soil Moisture Regimes (SMR) of 'Moist', 'Very Moist' or 'Wet' predominate in the schemes surveyed. ESC Soil Nutrient Regimes (SNR) of 'Very Poor' is by far the most common category.

Soil types and their occurrence within a scheme is determined by climatic, lithological and topographic influences. Consequently, the more varied conditions of the schemes surveyed in the North, West and South of the survey area are reflected in the complexity of soil and site type which need to be considered within the planning of the schemes in these areas. This degree of complexity was not found in the schemes surveyed in the East.

Vegetation

From the vegetation assessment it is apparent that *Calluna vulgaris*, *Trichophorum cespitosum*, *Erica tetralix* and *Molinia caerulea* were the most prevalent species in the assessment plots. These dominant species, coupled with the range of other species observed, indicate that 'Very Poor' is the major Soil Nutrient Regime on 9 of the 10 schemes, with the other scheme lying between 'Poor' and 'Very Poor'.

ESC

In general, ESC indicated that the majority of plots had been planted with a species that was 'Suitable' for the site, with only 8 plots where the main species was judged to be 'Unsuitable' (there was no ESC rating for 11 plots containing minor species). Only 1 scheme contained any plots where a species was considered to be 'Very Suitable'.

These definitions for an individual species are taken from FC Bulletin 124 :

Species 'Unsuitable' = the species is expected to grow at less than 50% of its maximum yield in Britain

Species 'Suitable' = the species is expected to grow at between 50 and 75% of its maximum yield in Britain

Species 'Very Suitable' = the species is expected to grow at over 75% of its maximum yield in Britain.

NVC suitability according to ESC was a different matter, with 55 plots being classed as 'Unsuitable' for any NVC woodland type. The definition is again taken from FC Bulletin 124 :

NVC 'Unsuitable' = Conditions where either the tree species or some of the characteristic species of ground vegetation would not occur.

NVC 'Suitable' = Conditions where the wood can be expected to regenerate itself.

RESULTS AND DISCUSSION

Tree Health

In general, abiotic factors, rather than insects or disease, were the main cause of damage to trees assessed during this survey. The main abiotic factors causing damage appeared to be nutrient deficiency (potassium (K) deficiency in particular), browsing, which was particularly severe at 3 of the sites, and exposure and/or wet site conditions resulting in poor growth and desiccation. Most sites had some planted areas fitting the latter category. Damage caused by insects or disease did occur on most sites, but only to a minor extent. For example, sawfly attack occurred sporadically on pine at some sites, but severe outbreaks were not observed, and *Melampsorium betulinum* rust was quite common on downy birch but infection was not severe and unlikely to be causing significant damage.

The current survey consisted of a limited number of sites, the majority of which were less than five years old. Older native woodland schemes visited outwith this survey as part of the disease diagnostic advisory service have been damaged by fungal pathogens. For example, shoot fungi commonly found on young, planted birch are *Marssonina betulae* and *Anisogramma virgultorum*. These fungi may contribute significantly to dieback of birch in a number of native woodland schemes. Another fungus, *Lophodermium seditiosum*, can cause needle loss in Scots pine, and has been reported in native pinewood schemes in Scotland. Many fungal diseases are exacerbated by poor site conditions and may be more severe in trees which are growing poorly as a result of additional stress factors.

Site and species

Many of the sites we surveyed appeared to have been degraded (by repeated burning and/or continual grazing) over many years prior to tree planting. As a consequence of this the sites were often poorly drained, compacted in the 'O' and/or 'A' soil horizons and very nutrient poor. Hence requiring silvicultural management input, particularly cultivation and fertilisation, in order to establish trees successfully.

However, the long-term suitability of many of these sites for sustainable development of native woodland is questionable. Surveys of birch and Scots pine new natural regeneration identified a lower threshold for regeneration where the SMR was VM to W and Hill-Ellenburg soil nutrient values fell below 4.5. Of the sites sampled in this survey 59% of plots fall below this threshold. The same threshold cannot be identified here but this may be due to effects of cultivation and fertiliser application. Conditions may become more suitable for sustainable woodland development if trees establish successfully, modifying humus from mor to mull and reducing soil wetness. However, it is difficult to envisage such a large shift in conditions when starting with soil nutrient values as low as 3.28.

Microsite selection by the tree planter is vital as the sites are often so intricate that these microsite changes are not identified on the maps and rely upon the planters' discretion. Some basic guidance on species choice related to vegetation and/or soil wetness coupled with better supervision would be a realistic way of improving this crucial part of the establishment process.

The origin of planting stock, particularly broadleaves, is difficult to determine but potentially of great importance to achieving successful establishment. We came across only one scheme where there was obviously non-local, non-native birch planted but in many of the other schemes this could not be ascertained with any degree of confidence. The origin of planting stock is a difficult factor to police and a great deal of trust has to be put in the supplying nurseries.

Alder is seen as an 'easy' native broadleaf to establish and this does appear to be the case until after 10 years of age. However alder has a tendency to dieback after initially promising growth when the site is fundamentally not suitable.

Silviculture

The main silvicultural factors on these sites are cultivation, fertiliser application and browsing. Weed control is generally not a problem, particularly when the site has been mounded. However, a sward of pernicious grass can cause problems in localised areas of higher fertility, where SNR is 'Poor' or better.

Mounding is of benefit to the planted trees by reducing the wetness (anaerobic conditions) and increasing the temperature of the planting position as detailed in FC Bulletin 119. However, the machine can often simply turn over an intact mound of peat with no real soil cultivation. This in effect doubles the depth of peat which the roots have to penetrate before reaching the underlying mineral soil.

Ripping offers some benefits, particularly when there is a pan or compaction to be disrupted, however this technique does not provide a raised planting position.

Some form of soil mixing and mound creation would be ideal but machine evaluation work has yet to be undertaken on such sites in Britain.

Fertiliser application was generally undertaken but not always with the rates or elements as recommended in FC Bulletin 95. Phosphate (P) was often applied alone when it would have been beneficial to have potassium (K) at the same time. This would enable the trees to utilise the applied P effectively. K application is also recommended in commercial plantings when peat depth exceeds 30cm and there is no research to suggest that native woodlands requirements are different. A more rigorous approach to fertiliser application, with P and K at planting followed at year 6-8 with a possible repeat PK application could be a contractual obligation for these schemes, with each site being evaluated separately.

Reduction of the rates of application of these elements may be possible with no detriment to the tree's growth, but considerable research input would be required in order to evaluate this, over a period of at least 10 years.

Fencing to the appropriate specifications, combined with regular inspections and shooting of marauding deer had been very effective at minimising browsing damage on several of the sites. Where fences, or individual tree protection, are not appropriate then effective deer control by shooting is

essential, otherwise the establishment of broadleaves will not be successful as was the case on at least 3 of the schemes.

CONCLUSIONS

Site and species

- These large native woodland schemes tend to be on severely impoverished sites which need a high level of management and materials input in order to establish and grow trees.
- Small scale site differences (aerated knolls/nutrient rich flushes etc.) make significant differences to tree establishment and growth. It is important that the trees are handled and planted carefully, the species being matched to the microsite at time of planting.
- The origin of some of the planting stock, particularly broadleaves was not always known. Planting non-local origin trees is likely to be detrimental to survival and growth on these difficult sites.

Silviculture

Basic silvicultural best practice had not been followed in many of the sites that were surveyed.

Drainage was not appropriate or permitted for these schemes, although there could be potential benefits from sensitive remedial drainage work.

Without drainage, some form of soil cultivation is particularly important to reduce the wetness of the planting position. There is potential to investigate mechanised mixing of soil horizons combined with mounding on these site types.

Deer browsing and fraying caused problems in several schemes. It is preferable to fence sites but if this is not appropriate then it is essential to have a rigorous system for deer control, especially if it is intended to establish broadleaves.

A more rigorous approach to fertiliser application, with P and K at planting followed between years 6 - 8 with a possible repeat PK application could be a contractual obligation of these schemes, with each being evaluated separately according to FC Bulletin 95 guidelines.

Pathology

Abiotic factors, rather than insects or disease, were the main cause of damage to trees assessed during this survey. However most sites in this survey were quite recently planted and disease problems may increase once trees are established and have been growing for several years.

ACKNOWLEDGEMENTS

Thanks to all the local FC staff, landowners and site managers for their assistance and co-operation before, during and after the survey. Thanks also to numerous colleagues in FR for advice and opinions on this topic

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OPERATIONAL ASPECTS OF FAST GROWING SPECIES

Mr. Oscar Barreiro, Director, Union of Foresters of Southern Europe, Spain

In Europe the Southern countries are the ones which have the largest area of fast growing species, mostly pine (radiata and pinaster) and eucalyptus with growing rates more than 3 times higher than the forest species up in the North.

We have been as well those who have been more criticised and attacked regarding our plantations that have been accused of everything.

The subject of the fast growing species is one of the most utilized by the environmentalists to attack, classifying this species as harmful, invasive, etc. Not being that the case we are forced to defend this species stating in public its importance as wood producers for industrial use, we will defend therefore the conservation of the so called native species, those would suffer the pressure of wood demand if there were not fast growing species.

In the year 2000 the plantations, mainly formed by eucalyptus, pines and acacias were occupying 187 million hectares, the immense majority in Asia and South America. Forest stands for industrial purpose are the 48%, and stands for non industrial purpose are the 26% of the total.

The problems start with the lack of real agreement in the concept and the definition of the plantation that goes from the terms used in Europe to the ones used in other parts of the world. We will take the definition accepted by the FAO, in its study FRA 2000 “Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either:

- of introduced species (all planted stands), or
- intensively managed stands of indigenous species at plantation, even age class, regular spacing.”

WHY DO WE PLANT THIS SPECIES?

The objective varies in the different regions, from the use of wood for commercial purposes, for construction, wood panels, furniture, paper pulp, etc. to the non commercial purposes, for instance soil conservation, fuelwood, and many others.

Table 1: Objective and ownership of plantations per reported area in the ten countries with the largest plantations

Region	Total Area	Industrial end (000 ha)					Non industrial end (000 ha)					Non specified end
	(000 ha)	Public ownership	Private ownership	Others	Non specified	Subtotal	Public ownership	Private ownership	Others	Non specified	Subtotal	
China	45083	10182	-	26994	-	37176	102	-	7805	-	7907	-
India	32578	8258	3749	-	-	12007	11370	8641	560	-	20571	-
Russian Fed,	17340	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	17340
USA	16238	1185	15053	-	-	16238	-	-	-	-	-	-
Japan	10682	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-10682
Indonesia	9871	12453128	1228	-	-	5759	358	3754	-	-	4112	-
Brazil	4982	-	-	4802	-	4802	-	-	180	-	180	-
Thailand	4920	850	314	-	-	1164	1219	2537	-	-	3756	-
Ukraine	4425	n.a.	n.a.	n.a.	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	4425
Rep. Islámica de Irán	2284	241	-	-	-	241	1938	105	-	-	2043	-
Principals 10 total	148403	25247	20344	31796	-	77387	14987	15037	8545	-	38569	32447
10 % Ppal	79 %					87 %					80 %	66 %
WORLD TOTAL	187086	30226	25786	27202	5871	89175	19836	18161	9772	680	48449	49463

SOURCE: FRA 2000

Table 2: Net annual increment in selected species used in forest plantation for industrial purpose

Species	NAI
	m ³ /ha/year
Eucalyptus	
E. deglupta	14-50
E. globulus	10-40
E. grandis	15-50
E. saligna	10-55
E. camaldulensis	15-30
E. urophylla	20-60
E. robusta	10-40
Pinus	
P. caribea var. caribaea	10-28
P. caribea var. hondurensis	20-50
P. patula	8-40
P. radiata	12-35
P. oocarpa	10-40
Other species	
Araucaria angustifolia	8-24
Araucaria cunninghamii	10-18
Gmelina arborea	12-50
Swietenia macrophylla	7-11
Tectona grandis	6-18
Casuarina equisetifolia	6-20
Casuarina junghuhniana	7-11
Cupressus lusitanica	8-40
Cordia alliodora	10-20
Leucaena lucocephala	30-55
Acacia auriculiformis	6-20
Acacia marnsii	14-25
Terminalia superba	10-14
Terminalia ivorensis	8-17
Dalbergia sissoo	5-8

SOURCE: Webb et al. 1984; Wadsworth 1997

Table 3: Area of plantations in each region for purpose and ownership.

Region	Total area	Industrial end (000 ha)					Non industrial end (000 ha)					Non specified end
		Public ownership	Private ownership	Others	Non Specified	Subtotal	Public ownership	Private ownership	Others	Non Specified	Subtotal	
Africa	8036	1770	1161	51	410	3392	2035	297	611	330	3272	1371
Asia	115847	25798	5973	27032	-	58803	17177	17268	9145	72	43662	13381
Europe	32015	-	-	-	569	569	9	6	-	-	15	31431
North and Central America	17533	1446	15172	118	39	16775	362	58	16	35	471	287
Oceania	3201	151	14	-	24	189	2	3	-	19	24	2987
South America	10455	1061	3557		4827	9445	251	528	-	225	1004	6
WORLD TOTAL	187086	30226	25876	27202	5871	89175	19836	18161	9772	680	48449	49463

SOURCE:FRA 2000

Table 4: Trends in the use of plantations by region 1980- 2000

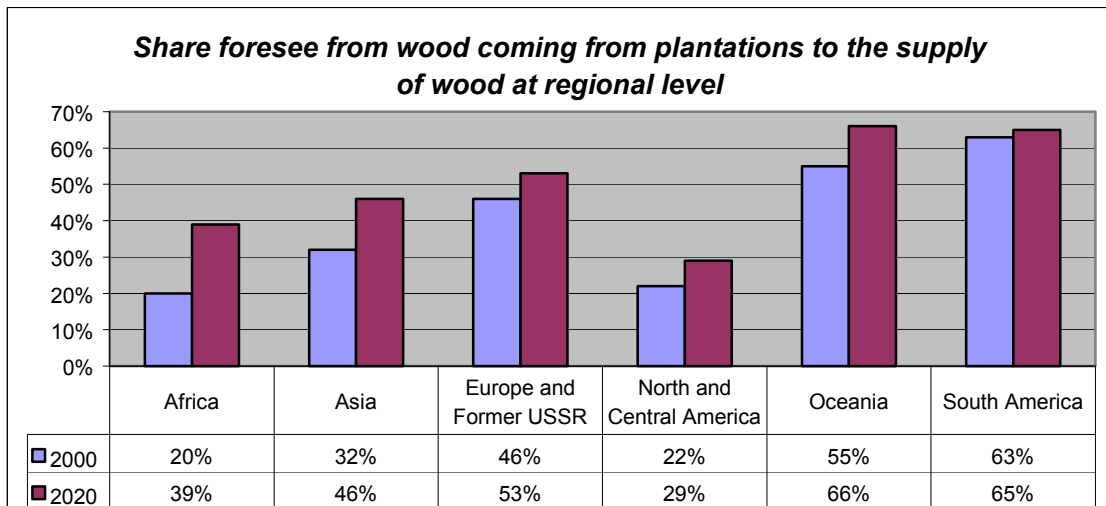
Region	Area of plantations according its use 000 ha			
	Total	Industrial	Non industrial	Non specified
2000				
Africa	8036	3392	3273	1371
Asia	115847	58803	43662	13381
Oceania	3201	189	24	2987
Europe	32015	569	15	31431
North and Central America	17533	16775	471	287
South America	10455	9446	1004	6
WORLD TOTAL	187087	89175	48449	49463
1990				
Africa	2990	1366	1623	
Asia	31775	8991	23119	
Oceania	189	167	22	
Europe				
North and Central America	691	457	234	
South America	7946	4645	3301	
WORLD TOTAL	43590	15625	28300	
1980				
Africa	1713	939	780	
Asia	11088	3487	7601	
Oceania	88	41	47	
Europe				
North and Central America	287	272	15	
South America	4604	2261	2348	
WORLD TOTAL	17779	7000	10791	

SOURCE: FAO 1981, 1995, 2000

The ten countries with the major area of plantations are China with 24,50 %, India 17 %, Russian Federation 9 %, Indonesia 5 %, Brazil 3 %, Thailand 3 %, Ukraine 2 %, Islamic Republic of Iran 1 %. Of this stand the main end is the industry 52 % while 26 % has other uses like fuelwood, soil protection, etc.

WHAT IS THE IMPACT OF THIS FORESTS STANDS IN THE DEMAND OF WOOD OF THIS COUNTRIES?

That is the main point, if we use the report FRA 2000, the world area of forest stands is only 5% of the forest area and only 3% is the area used for stands with industrial end, but, and here we see clearly its importance, they provide the 35.5% of the roundwood and accordingly the study of Jaakko Pöyry of 1999 in 2020 will be the 44.10%.



SOURCE: ABARE Y JAAKKO PÖYRY

In a country with a forest development of the importance of New Zealand the forest stands produced the 99% of the demand of roundwood. In Chile 84% and in Brazil 62%. If this forest stands would not have existed, the forest industry would have died or would have to import wood, if possible, or would have had to use native species.

We very often forget about this fact when we speak about this subject. The importance of the forest stands to safeguard the native species.

Which is the final purpose of this plantations? It is clear, to produce the largest amount of wood in the shorter space of time and for that we have the obligation to set up the ideal silviculture based on the principles of the Sustainable Forest Management very well defined at global scale and in the continental scale. In Europe the Criteria and Indicators of Helsinki and Lisbon and the work of the Ministerial Conference on the Protection of Forests in Europe (MCPFE) currently in the ongoing Vienna inter-ministerial process are quite well known.

This forest stands must have in the beginning a scientific work in genetic improvement, with nurseries adapted, and a correct preparation of the soil, all that respecting the environment.

Silviculture of this species is essential because of the right or wrong application will depend the future of the stand, we can not forget that it is necessary to know the destination of the wood since a plantation focused exclusively in pulp production does not have the same silviculture as other devoted to veneer or furniture.

That is why it is so important to know this end, as it influences the spacing of plants and the different works needed for each forest species.

This plantations or of fast growing species need of course help in the first stages because they will compete with bushes and other species, there are two possibilities: utilization of herbicide or mechanical bush cutting.

Both of them have problems, the herbicides need an adequate use with very much precaution, having to disappear in the long run and avoiding any environmental problem. The use of mechanical or manual bush-saws just depends on the ground, the manual ones have the problem that in the developed countries is a great problem to find workforce because it is a very tough work, much more than the work in an industry.

The same statement can be applied to the pruning, fully necessary for some uses of wood, and the clearings needed to get the best final felling.

We can not forget that the way we manage our plantations will affect the physical and chemical properties of the soil. That does not mean that we spoil the whole biodiversity, it is true that before a plantation the flora and fauna are different than afterwards, there will be a different one, instead of some insects or birds, or mushrooms, bushes; they will be substituted for other diversity. A has been change for B but carries on being biodiversity, of course the biodiversity differs from pine to eucalyptus, oak or beech.

The absorption of nutrients by plantations per year is greater than in others species. It is a crop and must be treated like that, with the use of fertilizers if necessary. The problems that can be produced by the plantations can be due to the burning of residues, compactation of soil due to a wrong use of machinery; and the unique solution is the correct silvicultural techniques adapted to the objective of the crop always regarding a Sustainable Forest Management.

It exists a black legend of our plantations that has been used to move away the attention of the society from important facts like the renewability and sustainability of plantations in an economical, social, environmental and cultural way. Always if it exists a correct management.

It is necessary that in the future the Public Administration define where and how we should do these new plantations, that will serve to maintain the native ones that are more and more devoted to protection; but never forgetting that the immense majority of the land in Southern Europe is a private property.

WHAT IS THE UNION OF FORESTERS OF SOUTHERN EUROPE (USSE)

By initiative of the organizations of private forest owners from Galicia, Vasque Country and Aquitania, the USSE was created in 1989 and it joins nowadays foresters from Portugal to Greece, including Asturias, Navarre, Catalonia, Poitou-charentes and Italy.

Together they decided to work:

- to unify 20 million hectares of forests.
- to conserve its forest patrimony
- to cultivate the forest to assure its sustainability
- to assure the balanced development of employment in rural areas

For further information <http://www.usse.es>

AFFORESTATION AND CONTINUOUS COVER FORESTRY

Mr. Arne Pommerening, School of Agricultural and Forest Sciences, University of Wales, United Kingdom

SUMMARY

For more than a decade continuous cover forestry (CCF) has been reconsidered a suitable forest management tool to meet the sustainability requirements which are part of the Rio Helsinki process. CCF may be said to include those silvicultural systems which involve continuous and uninterrupted maintenance of the forest. It endeavours to secure 'a continuous, harmonious cooperation of all factors of growth' (Troup, 1928). CCF systems can be introduced both at stand establishment and through transformation of existing plantations. Ireland and Britain, along with many other European countries, are currently transforming large blocks of even-aged coniferous plantations to some form of mixed uneven-aged woodland. But there is also the option of establishing such woodlands either at restocking or when afforesting former agricultural land. In the past nurse crops have found various applications in Ireland and Britain especially in the establishment of pure Sitka spruce stands. But these methods can also be used to create new mixed woodlands from scratch using nurse crops. Some tree species even require a canopy cover in order to develop desirable wood properties and to form stable forest stands. Although these methods are not new and have proven to be successful in the past, in particular in windy climates, they have not been widely used. This paper explores the potential of these methods with special attention to the establishment of mixed stands and suggests further scientific investigation.

Boisement et couverture forestière permanente

Exposé de Arne Pommerening

Résumé

Depuis une dizaine d'années, les systèmes à couvert forestier permanent sont devenus un outil de gestion forestière qui permet de satisfaire aux exigences en matière de durabilité fixées dans le cadre du processus de Rio et de celui d'Helsinki. On peut dire que les systèmes à couvert forestier permanent englobent l'ensemble des systèmes sylvicoles qui se caractérisent par un entretien permanent de la forêt. Ils visent à assurer une «interaction harmonieuse et constante entre tous les facteurs de croissance». Dans les forêts traitées de cette manière, le sol n'est jamais découvert et la couverture forestière est entretenue en permanence sur toute la superficie de l'espace forestier. Un système à couvert forestier permanent peut être créé par installation d'un peuplement, mais aussi par transformation de la forêt. La Grande-Bretagne et l'Irlande, comme nombre d'autres pays européens, transforment de vastes parcelles de plantations de conifères équiennes en surfaces boisées mixtes non équiennes. On peut également installer des surfaces boisées de ce type soit par replantation, soit par boisement d'anciennes terres agricoles. Il existe aussi des méthodes permettant de créer de toutes pièces des surfaces boisées mixtes en utilisant des plants issus de pépinières. Certaines essences exigent même un type donné de couverture pour que leur bois acquière les propriétés souhaitées. Bien que ces méthodes ne soient pas nouvelles et qu'elles aient démontré leur efficacité – en particulier dans les régions exposées au vent –, leur application était limitée jusqu'à présent. Le présent document explore les possibilités qu'elles offrent.

Облесение и система лесного хозяйства на основе непрерывного лесопользования

Основной докладчик: д-р Арне Поммеренинг

Краткое изложение

За последние приблизительно десять лет система лесного хозяйства на основе непрерывного лесопользования (НЛП) доказала свою надежность в качестве инструмента управления лесами, отвечающего требованиям устойчивости в рамках процесса Рио-Хельсинки. Можно сказать, что НЛП включает в себя все лесоводческие системы, которые основываются на непрерывном и постоянном уходе за лесами. Она стремится обеспечить "непрерывное гармоничное сочетание всех факторов роста". В лесах, где применяется такая система, почва никогда не оголена и лесной покров постоянно поддерживается на всей площади. Системы НЛП осуществляются как путем лесонасаждения, так и посредством трансформации. Великобритания и Ирландия вместе с другими европейскими странами в настоящее время преобразуют огромные площади одновозрастных хвойных плантаций в смешанные разновозрастные леса. Однако существует также вариант создания подобных лесов либо посредством лесовозобновления, либо облесения бывших сельскохозяйственных угодий. Используются также методы создания смешанных лесов практически с нуля с помощью покровных насаждений. Хотя эти методы известны с давних лет и уже доказали свою эффективность, в особенности в районах, подверженных сильным ветрам, их практическое применение пока не получило широкого распространения. В настоящем документе будут рассмотрены потенциальные возможности их использования.

1. INTRODUCTION

There is currently a new worldwide debate on continuous cover forestry (Gadow et al., 2002; O'Hara, 2002; Cairns, 2001; Turckheim, 1999; Guldin, 2002). The history of CCF or uneven-aged silviculture reveals that the popularity of these practices have waned and flourished in successive cycles (O'Hara, 2002). This conference is dealing with the two terms 'afforestation' and 'sustainable management'. The term sustainability, in the narrow sense of sustainable timber yield, is an old forestry maxim which goes back as far as to the 16th century (Hasel, 1985, p. 215). It has received a new quality since the United Nations Commission on Economic Development (UNCED) summit at Rio ten years ago. The new definition states that forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations (United Nations, 2001). The Rio conference and its subsequent process provided a major impetus for the acceptance of the continuous cover forestry idea. This paper investigates how this management idea can be directly realised through afforestation and thus looks at the link between afforestation and sustainable forest management.

1.2 Brief history of continuous cover forestry

The key to understanding and applying the concept of CCF is its history, as its past development still has impacts on present-day and future applications. Moreover it is useful to bear in mind past achievements and setbacks, in order to benefit from the former, avoid the latter and hopefully not "re-invent the wheel". Figure 1 gives a schematic overview of the history of CCF. For centuries long before an accepted term and corresponding definition were agreed selection systems ('jardinage' in the French and 'Plenterwald' in the German literature), which are a form of continuous cover, were practised as traditional forest management method in parts of Switzerland, France, Germany, Austria and Slovenia.

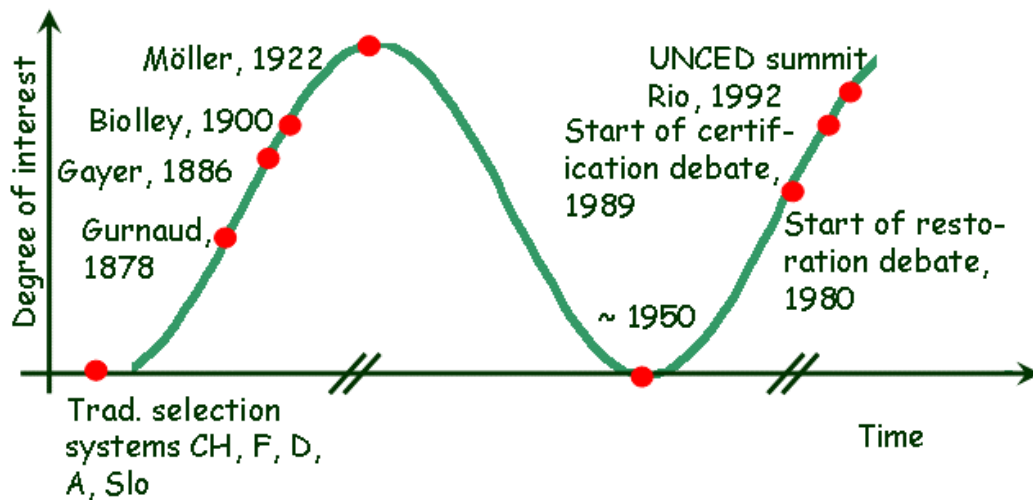


Figure 1. Schematic overview of the history of the continuous cover forestry idea in Europe.

Towards the end of the 19th century the French forester Adolphe Gurnaud and his Swiss colleague Henry Biolley began promoting the transformation of even-aged stands to selection systems and developed the so-called check method or *Méthode du Contrôle* for sustainable yield regulation. In his seminal book “Der gemischte Wald” (The Mixed Forest) the German professor Karl Gayer (1886) emphasised the advantages of uneven-aged mixed forests and in 1913 his colleague Alfred Möller coined the term Dauerwald (continuous forest). In 1922 Möller published his famous book “Der Dauerwaldgedanke: Sein Sinn und seine Bedeutung” (The Dauerwald idea: Its meaning and significance) which initiated a long running discussion. Möller found most of his ideas and principles realised in the Scots pine forests of the Bärenthoren Estate near Dessau in the modern German state of Sachsen-Anhalt. He used these forests as management demonstration sites for his Dauerwald idea which gave rise to a considerable number of ‘pilgrimages’ by forest managers as well as members of the academia. With only a few exceptions, such as the trials at Glentress in Scotland (Anderson, 1960), a period of decline began following Möller’s sudden death which lasted approximately until the 1980s when the discussions on acid rain, forest decline, restoration and certification gave rise to a revival of the continuous cover debate. This revival owed much to the United Nations Commission on Economic Development (UNCED) summit at Rio in 1992 when the terms and scope of sustainable forest management were re-defined and it was suggested they become an integral part of modern forestry practice worldwide.

1.2 Definitions

Just as there is an abundance of terms used to describe “continuous cover forestry” (such as close-to-nature forestry (Mlinšek, 1996), new forestry (Franklin, 1989), near-natural forest management (Benecke, 1996) etc.) there are also many different definitions. Three examples are quoted here which illustrate the original idea before the 1980s.

According to the IUFRO Multilingual Forest Terminology Database the term describes a highly structured forest ecosystem managed to maintain continuous tree cover over the total forest area (IUFRO, 2002).

The British silviculturist Professor R. S. Troup was very interested in the Dauerwald idea of the 1920s, even visited Bärenthoren and defined this form of silviculture in the following way (Troup, 1928): “The term Dauerwald may be translated briefly as ‘continuous forest’, that is, forest treated in such a manner that the soil is never exposed, the forest cover being continuously maintained over every part of the area.”

Möller applied the term Dauerwald in general not to any one particular method of treatment, but to any system not involving clear cut and the exposure of soil (Troup, 1928, p. 185).

These definitions very much stress the idea of the continuity of woodland conditions over time. In the past this was the main concern of the protagonists of CCF based on a sharp antagonism between themselves and the supporters of traditional forestry who used the concept of the normal forest which had strict rotation ages and clear cutting. However, looking at the recent European literature it is evident that clearcutting is only one of many issues being debated today (Kenk and Guehne, 2001; Nabuurs, 2001). Figure 2 illustrates the most important components of the current CCF debate and these are outlined in more detail below.

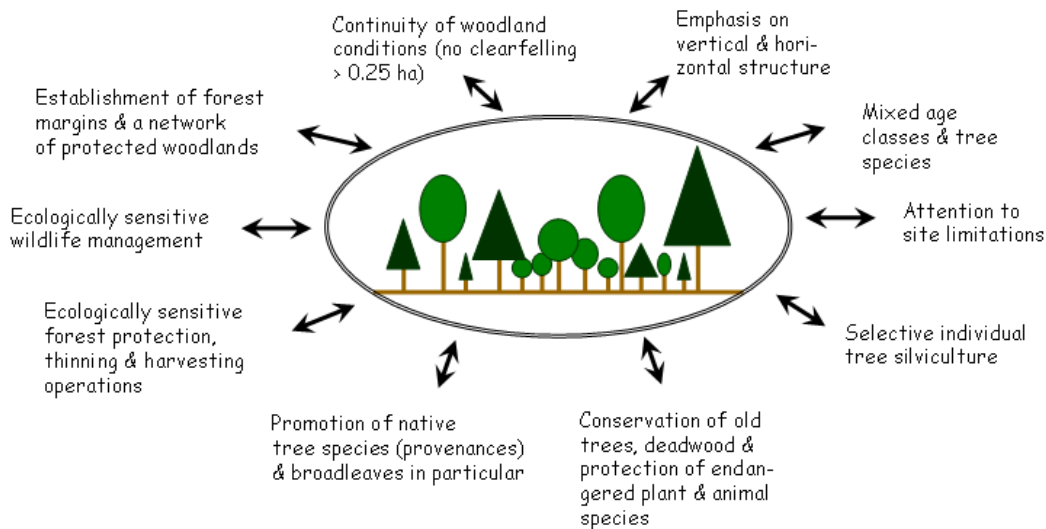


Figure 2. The main components of the contemporary international continuous cover forestry debate.

1.2.1 Continuity of woodland conditions

This is the oldest and most important part of the definition of CCF. The current understanding of continuous cover forestry may be said to include all those silvicultural systems which involve continuous and uninterrupted maintenance of the forest (Troup, 1928). There is, however, some debate on size of clearfell allowed. From a biodiversity/ ecological perspective some endangered tree species require the continuity of woodland conditions with only moderate changes of their habitats, imposed by forest management to ensure their survival. The same continuity is also an important feature of protection forests securing and stabilising watersheds, mountain slopes and amenity woodlands. Historically continuity of woodland conditions has always been an important factor in timber production in traditional selection forests on the small sized farm holdings of Slovenia, Switzerland, France, Germany and Austria.

1.2.2 Emphasis on vertical and horizontal structure

In CCF forest managers should aim to create a varied horizontal and vertical structure of individual trees and groups of trees in a stand. Such a goal-oriented management has several benefits. By allowing a varied amount of horizontal and vertical structural elements it is possible to save establishment and tending costs. Experience has shown that forest structures can be managed in such a way that natural processes such as natural regeneration, natural pruning, the development of good stem form and self thinning (natural stem number reduction) in the early growth stages are stimulated. This form of steered self-regulation is often referred to as biological automation. The individual and collective stability of woodlands can be enhanced and another positive side effect of this strategy is a

greater biodiversity. Well structured forests like those managed as selection systems are appealing to visitors and have therefore an important recreation and amenity value.

1.2.3 Mixed age classes and tree species

There is a range of benefits to be had by encouraging mixed coniferous/ broadleaved woodlands particularly in the reduction of biotic, abiotic and economic risk. Diseases and insect calamities cannot spread as easily as in pure stands. Recent research in pure and mixed stands of Norway spruce and beech showed that in such woodlands total volume production does not decrease with stand density approaching the maximum but remains constant. This contrasts with pure stands where total volume production decreases. Mixed spruce/ beech stands can be stabilised if labile spruces are replaced by stabile beeches. According to the study an important element of stabilisation in these mixed stands are sub-dominant and co-dominant trees which, therefore, should be retained. Mixed stands are much better able than pure stands to compensate for impacts on the stand density, such as windthrow or heavy thinnings, through an accelerated increment of the residual stand (Pretzsch, 2002). Mixed forests also provide a wider range of size classes and timber products allowing flexible and rapid response to market conditions. They contribute to greater biodiversity and therefore provide more habitats. Studies have shown that mixed woodlands are believed to be more appealing to visitors (Jensen, 2000). Mixtures may also help to reduce risk from global or regional climate change (Lindner and Cramer, 2002).

1.2.4 Attention to site limitations

As with all good forestry practice tree species/ provenance choice should be made dependent on site. This ensures that species/ provenances are used which are well adapted to the particular site conditions and therefore can resist biotic and abiotic damage and have high growth rates.

1.2.5 Selective individual tree silviculture

The trees of a stand are individually marked, thinned and harvested in a compromise between silvicultural, economical and conservation needs. Most CCF silvicultural systems aim at a combination of frame tree selection, crown thinnings and target diameter harvesting. Selective fellings may increase timber quality and is a pre-requisite for many other points in this list. As the economic benefits of tourism become better understood it is important to realise that unsightly clear-felling areas put potential tourists off (Jensen, 2000).

1.2.6 Conservation of old trees, deadwood and protection of rare and endangered plant and animal species

Many CCF guidelines suggest retaining a certain amount of lying and standing deadwood in each forest stand for biodiversity reasons. It is also recommended that a certain percentage of old trees are kept for their amenity value. Apart from that forest management should aim at promoting endangered plant and animal species along with other management objectives. This also includes the protection of special biotopes within forests such as wetlands, rocky outcrops and dunes.

1.2.7 Promotion of native tree species/ provenances and broadleaves

Species are considered native if they have not been introduced by humans, either recently or in the distant past. However, this definition presents some difficulties and the natural range of species cannot always be delimited. There will always be considerable debate over the 'nativeness' of one species vis a vis another and it is questionable whether species which have just been excluded from a certain region by the last ice age, but before that had a long co-evolution with other plant and animal species of the same area, should be termed non-native (Peterken, 2001). The 'site' to which a species is native can be defined at various scales, from a region through a discrete wood to each patch of contrasting soil within a wood. Provenance, too, must be considered (Peterken, 1996, p. 15f.). As there are many silvicultural problems with native tree species especially in upland forestry, this issue is traditionally very contentious in Britain, though it is a clear element of international definitions (Pro Silva Europe, 1999). The idea comes from the assumption that native tree species and provenances are better adapted to local site conditions and have co-evolved with other plant and animal species in a particular country or region. Numerous animal and plant species are directly connected to native trees in this co-

evolutionary development. The introduction of exotic species disrupts this symbiosis and results in a fall in biodiversity. Also to be considered here is the consequent removal of invasive non-native tree species. According to Pro Silva Europe (1999) exotic tree species should only be planted in situations where this is an economic necessity, and then only if the exotics can be mixed with the indigenous vegetation pattern in certain quantitative and qualitative limits.

1.2.8 Ecologically sensitive forest protection, thinning and harvesting operations

The idea behind this is to reduce the disturbance in the forest ecosystem to a minimum by carrying out only limited forest protection and promoting biological ways of protection. In the same way thinning and harvesting should be conducted in a way which affects the remaining trees and the ecosystem (especially the soils and the ground vegetation) very little. Artificial liming of forest soils is often conducted to compensate for soil degradation and branches, twigs, bark and tree tips should be left in the forest, as they contain most of a tree's stored nutrients.

1.2.9 Ecologically sensitive wildlife management

This applies especially to the density of the deer population which needs to be in balance with the carrying capacity of the site in order to make the use of natural regeneration feasible. This will also keep fencing costs low which could otherwise be quite high. In Britain this also applies to the grey squirrel, the control of which, is absolutely crucial to the success of continuous cover forestry.

1.2.10 The establishment of forest margins and a network of protected forests

Adopting a holistic approach to forest management by managing the ecosystem rather than just crops, is a very prominent feature of continuous cover forestry. One way to contribute to this objective is the establishment of forest margins as transition zones between the open landscape and woodlands. Here a certain stage of natural succession is artificially and permanently preserved (figure 3). Although there would be a strip of 25-30 m at the stand boundary with low or no timber production, this could significantly increase wind firmness.

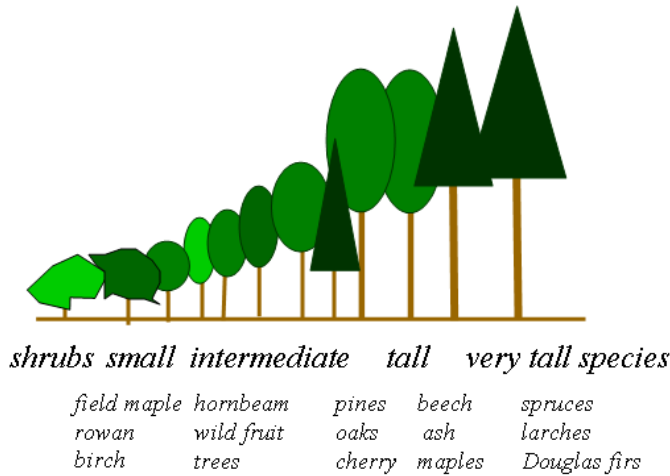


Figure 3. Forst margins as transition zones between open landscape and woodlands. They act as a reserve for rare plant and animal species and as a measure to improve wind firmness (modified from Burschl and Huss, 1997).

In a similar way CCF guidelines often demand that riparian forests and streamsides are restored by removing coniferous trees and promoting alder and willow species. This can contribute to decreasing catastrophic flooding events. Other authors additionally suggest the establishment of a network of protected woodlands, including some non-intervention areas, as 'stepping stones' in large areas of commercial forests which would provide areas of retreat and almost undisturbed development for flora and fauna.

1.3 Conclusions

Having reviewed these elements of the current debate on continuous cover forestry it is indeed difficult to produce a definition which sufficiently covers all of them. Among many stakeholders only parts of the above list would be regarded as desired properties in their concept of continuous cover forestry. Inevitably, the different terms and the vast variety of, sometimes contrary, definitions cause considerable confusion among politicians, practitioners and scientists. What we can learn from the history and the variety of definitions is that there must be a continuum of silvicultural systems and intervention sequences which together contribute to the establishment of continuous cover of woodland in space and time. Figure 4 gives an impression how wide is the silvicultural spectrum and different diameter distributions which can be included in the definition of CCF. However, no matter how we define CCF, it is most desirable to establish mixed stands in Ireland and Britain for the reasons described.

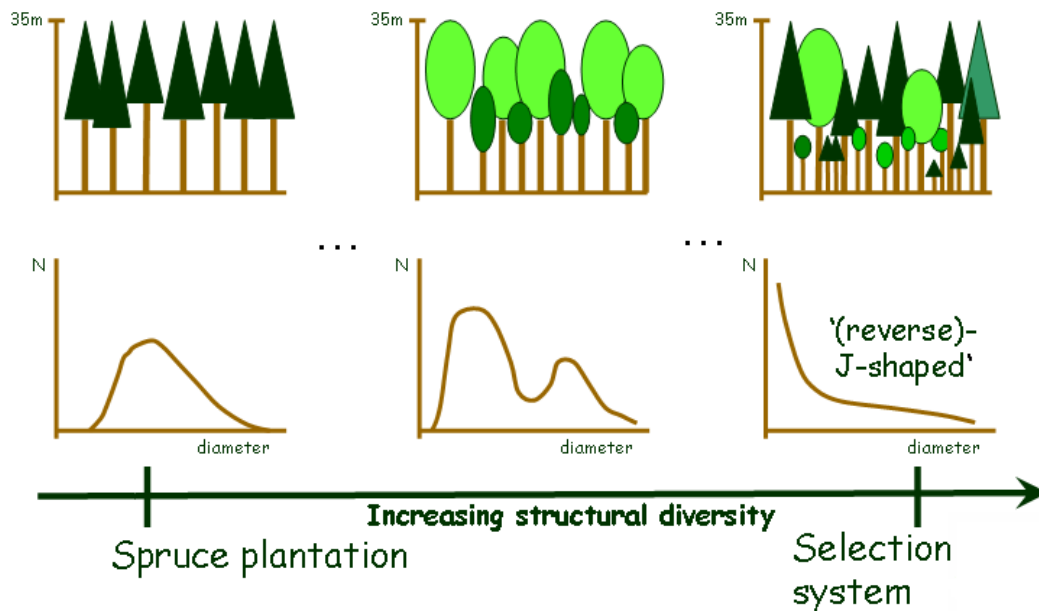


Figure 4. The continuum of continuous cover stretching from an even-aged coniferous woodland managed on a non-clearfelling basis to a selection forest.

3.1 Continuous cover and afforestation

According to Gadow (2001) there are three basic CCF situations: establishment on bare land, transformation and maintenance. Commonly most silvicultural interest focuses on the transformation or conversion of existing forests, such as monospecies even-aged coniferous plantations to diverse uneven-aged continuous woodlands. Having succeeded in transformation the uneven-aged forest needs to be maintained, i.e. managed in a way that sustainable and uninterrupted harvesting, regeneration and recruitment is possible. It is very often forgotten that there is also the silvicultural option of establishing mixed forests under CCF prescription directly from scratch on bare land. This method has been very successful especially where severe climatic conditions, such as strong winds and high precipitation, along the North Sea coast of Germany and Denmark made other methods impossible. Theoretically there are three main approaches to establishing diverse, mixed stands on bare land: direct planting, direct seeding and the indirect establishment of mixed stands under the shelter of a nurse crop. In this paper I will chiefly concentrate on the last option, which is the one to be preferred

where there are adverse climatic conditions. Anderson (1960), who applied the method to establish his trials in Glentress, used the term “advanced forest” while in the US this approach is sometimes called the “one-cut” shelterwood method (Smith et al., 1997). The procedure is to establish a nurse crop of a pioneer species such as common alder, birch or aspen by planting or seeding at a comparatively wide spacing. A little later, or sometimes even at the same time, the target species are introduced either by underplanting or from natural regeneration. Figure 5 illustrates the nature and the benefits of the nurse crop method. In a sense the nurse crop method mimics the classic shelterwood system. It provides an open canopy which protects the target species against extremes of the weather such as too much sunlight and increased evapotranspiration, high precipitation, frost and wind. On damp sites the nurse crop helps dry the soil through transpiration. It provides better soil conditions through litter recycling and suppresses competing ground vegetation. The temporary sheltering of the target species also results in an improvement of stem quality (stem straightness, branchiness). Another important benefit of the nurse crops is the retardation of growth of the target species. From afforestation trials with silver fir it is known, that the lack of shelter, especially, led to failure (Schmidt, 1951; Kramer, 1970).

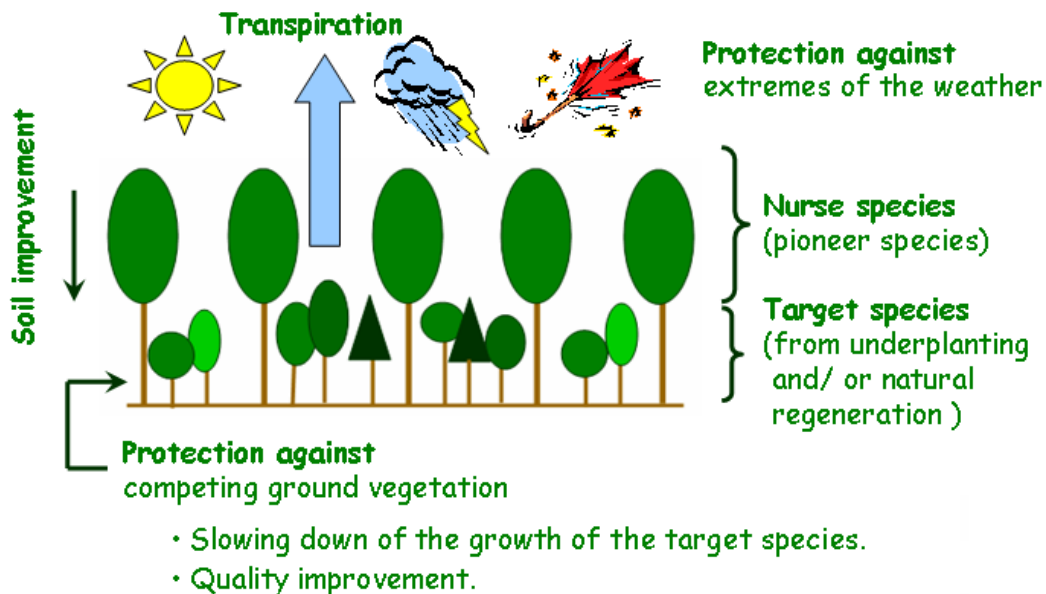


Figure 5. The nature and functions of a nurse crop used in afforestation.

Silver fir grown under canopy shows a slow but long-lasting growth with a late and slow culmination. In contrast to this silver fir planted on bare land without shelter has a rapid growth when young which is followed by an early culmination at a lower level than under canopy with quickly decreasing volume production thereafter (see figure 6). It is believed that in many cases the growth pattern of silver fir grown without canopy shelter is actually the reason for the increasing instability of silver fir stands around the age of 100 years (Kramer, 1970). Although not many studies have been done on this phenomenon with other tree species it is very likely that there is similar growth behaviour, with resulting greater instability in crops grown without canopy.

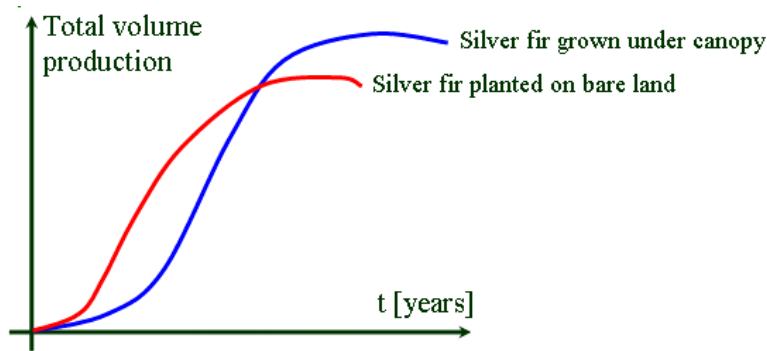


Figure 6. Growth patterns of silver fir.

The use of nurse crops can also be understood as a closer adherence to natural processes. In the sequence of natural succession from the initial herb and shrub stage to the climax stage the nurse crop approach resembles a stage where pioneer tree species are gradually replaced by climax species. The only difference is that other stages are omitted to accelerate the process of producing timber.

2.2 Brief review of regional experiences with nurse crops

There is a large number of references to be found in the relevant forestry literature concerning the use of nurse crops. The reviewed papers in this section are a selection of typical examples and reflect the current state of knowledge. In particular the species involved serve as examples, only, and are not necessarily being proposed as those which should be used for afforestation in Britain and Ireland.

Schmidt (1951) reviewed the growth of silver fir on poor sands in East Friesland near the North Sea coast of Germany, where afforestation with this species commenced in 1758, and presented a regional yield model. He stated that, after the first systematic trials, it became clear that the afforestation with silver fir would only be successful if a nurse crop of birch were used. A method was developed in which birch was planted first with an initial spacing of 2 X 2 m. When the birch reached a top height of 2m they were underplanted with silver firs. Schmidt suggested that, if available, plants should be taken from natural regeneration or other sheltered positions nearby. They should be about 30cm of height or 5-8 years old. Trials have shown that long-term mixtures of silver fir, Sitka spruce, grand fir and beech, especially, led to stable and productive forests along the North Sea coast. Silver fir proved to be very resistant against windthrow. Apart from birch the author suggested common alder as a nurse crop and mentioned that mountain pine (*Pinus mugo*) is used in Denmark. When Anderson (1960) started his trials at Glentworth in Scotland he used a similar method to introduce silver fir.

Taylor (1985) stated that during the British afforestation campaigns in the 1920s and the 1950s/ 1960s Sitka spruce plantations suffered chronic nitrogen (N), phosphorus (P) and potassium (K) deficiency on many upland sites particularly where *Calluna* predominated. It was then found that by using nursing mixtures of Sitka spruce (*Picea sitchensis*) with Scots pine (*Pinus sylvestris*), Japanese larch (*Larix kaempferi*) and lodgepole pine (*Pinus contorta*) this effect could be eased. In several experiments this was compared to pure plantations which were treated with repeated applications of fertilizers. The results of these experiments indicated that Sitka spruce planted in mixture with a suitable nurse achieved similar growth rates to pure Sitka spruce on a regular nitrogen regime on sites ranging from dry heathlands to unflushed deep peats. All three species proved to be suitable nurses, although Sitka spruce in mixture with lodgepole pine achieved slightly better results in Scotland. The findings of the experiment suggested that a 50% composition intimately mixed or in row mixtures is favourable. An initial spacing between 1.4 to 2.0m was recommended. Before that O'Carroll (1978) reported on an experiment which commenced in 1960 to test the effects on Sitka spruce of nursing by lodgepole pine and Japanese larch on podzolised gley. The species were mixed both intimately and in

rows. As a result of this experiment it was shown that growth of Sitka spruce in mixture with Japanese larch was superior. The results of the Scottish and Irish experiments were later updated by Carey et al. (1988). They suggested that maintaining the proportion of the nurse species at or around 33 per cent ensures a good stocking of spruce. Garforth (1979) also mentioned the use of mountain pine (*Pinus mugo*) as nurse species and reported on ratios of spruce to pine ranging from 1:10 to 10:1 in various spatial patterns. Yanai (1992) referred to a Norway spruce experiment at Gisburn Forest (NW England) where Scots pine was used as a nurse species. Records of failures can be found in Taylor (1985), Garforth (1979) and Yanai (1992). They suggest that greatest success with nursing Sitka spruce was obtained on N-deficient sites. An ecological study is presented by Pigott (1990) who looked into the influence of evergreen coniferous nurse crops on the field layer in two woodland communities. He reported from the Leith Hill Place Wood in Surrey where a clear-fell site was restocked with a mixture of sessile oak (*Quercus petraea*) and Norway spruce (*Picea abies*) or Douglas fir (*Pseudotsuga menziesii*). The nurse crop failed to stabilise the final oak crop, led to the accumulation of coniferous litter and reduced the diversity of ground vegetation significantly. Evans (1984, p. 27) mentioned that using conifer nurses to aid the establishment of broadleaves was by then almost universal in Britain, but suggested that the nurse species should not be allowed to overtop the target species. According to Garforth (1979) the increase in the popularity of mixtures in Britain during the 1950s was also due to Mark Anderson's ideas on the "Natural Forest", which is now called continuous cover forestry. Anderson (1956) encouraged the planting of mixed stands, adopting the view that foresters should attempt to imitate natural forest conditions in the interests of ecological stability. The long-term objective of all these trials, however, was primarily to produce a final pure crop of a desired target species such as Sitka spruce (Taylor, 1985).

Seitschek (1991) and Rittershofer (1999) summarise Bavarian examples on sites where not so much wind, but frost suggests the use of nurse crops would be beneficial. The initial spacing they quoted as a result of their experience is similar to the one stated by Schmidt: 2 X 2 – 3 X 3 m. They came up with the interesting observation that the target species should be introduced when the stand height exceeds the spacing of the plants. But in any case the authors emphasised the need for a rapid underplanting in order to keep the amount of competing ground vegetation low. In some situations it is even advisable to plant nurse crop and target species at the same time (Seitschek, 1991). The same author also stated that the establishment of forest margins can also contribute to the stability of the stand. Table 1 provides an overview of recommended tree species for both nurse crop and target trees according to Seitschek's (1991) experience.

Grey alder is only suggested for dry sites and should be used in rare instances because of its tendency to develop root suckers. Aspen and birch usually provide less shelter than alder. Perala and Alm (1990) reviewed the role of birch as a nurse crop worldwide.

Table 1: Tree species and initial spacings suitable for the nurse crop method according the Seitschek (1991). The suitability of the nurse crop species decreases from top to bottom of the first column.

	Nurse crop species	Target tree species
Species	Common alder <i>Alnus glutinosa</i>	Most species but particularly shade tolerant and intermediate species
	Birch <i>Betula spp.</i>	
	Aspen <i>Populus tremula</i>	
	Scots pine <i>Pinus silvestris</i>	
	Larches <i>Larix spp.</i>	
	Willows <i>Salix spp.</i>	
	Rowan <i>Sorbus aucuparia</i> (Grey alder <i>Alnus incana</i>)	
Initial spacing	2 X 2 - 3 X 3m = 2500, 1111 plants/ha	Norway spruce: 2 X 2 - 1.8 X 1.8m = 2500-3000 plants/ ha Scots pine, oak, beech: 1.3 X 1.3 - 1.1 X 1.1m = 6000-8000 plants per hectare Ash, sycamore: 1.8 X 1.8 - 1.4 X 1.4m = 3000-5000 plants/ha

Table 2 summarises the mixtures suggested by Seitschek as being advantageous. He obviously prefers alder as nurse crop species. This may be due to the fact that it forms a symbiotic relationship with the root fungus *Actinomyces alni* which assimilates atmospheric nitrogen and therefore contributes to soil fertility. Moreover common alder shows a monopodial branching system and has a monocormicly growing continuous crown which is very similar to that of coniferous trees (Bartels, 1993). These desirable properties make the author suggest that individual alders should be allowed to develop in the target stand.

Table 2: Recommended tree species mixtures according to Seitschek (1991).

Nurse crop species	Target tree species
Common alder	Ash with sycamore
Common alder/ birch	Oak with hornbeam and small-leaved lime
	Larch with Scots pine
	Norway spruce with common alder, sycamore and small-leaved lime
	Silver fir with beech and Norway spruce

Greger (1998) describes the afforestation of riparian zones along the river Elbe in the Stendal forest district. There the local forest authorities established a nurse crop to rapidly cover degraded soils and improve soil properties. Shrub species such as dog rose (*Rosa canina*), hawthorn (*Crataegus spp.*), blackthorn (*Prunus spinosa*) and pioneer tree species (elms, field maple, wild fruit trees) were used. The initial spacing for most nurse crop species was 2 X 2 m, though black poplar (*Populus nigra*), crack willow (*Salix fragilis*) and white willow (*Salix alba*) were planted at 4 X 5m. In contrast to Seitschek the author suggested a very late introduction of the two target species common or pendunculate oak (*Quercus robur*) and hornbeam (*Carpinus betulus*) after 15-20 years. Elsewhere Heuer (1996) reported his experience concerning the establishment of mixed broadleaved and coniferous species under a Scots pine canopy in the borough of Berlin. One result of his study was that oak tolerates a greater deficiency of light than commonly believed. He also noticed that the establishment of Scots pine under a Scots pine canopy is difficult.

2.3 Underplanting techniques

There is an abundance of approaches and techniques to underplanting mentioned in the literature. Two aspects, however, deserve special attention. It is clear that most authors prefer the establishment of mono-species groups of the target species or groups with only two different species rather than an intimate mixture of species over the whole afforestation area (Rittershofer, 1999; Burschel and Huss, 1997). This facilitates the organisation of plant cover according to small scale differences in site conditions and also makes tending of the young growth considerably easier. In any case a more intimate mixture of species will be achieved later through the reduction of stem numbers in each group as a consequence of thinnings and natural mortality. Figure 7 illustrates an underplanting plan for a 0.3 ha afforestation area. The south eastern corner is, for example, designed for a mixture of Sitka spruce and sycamore because of moister soils. Here a number of alders from the nurse crop could also be retained and absorbed into the target stand. On outcrops and ridges exposed to the wind preference is given to Japanese larch. On more calcareous soils pure ash or ash in mixture with sycamore is planted.

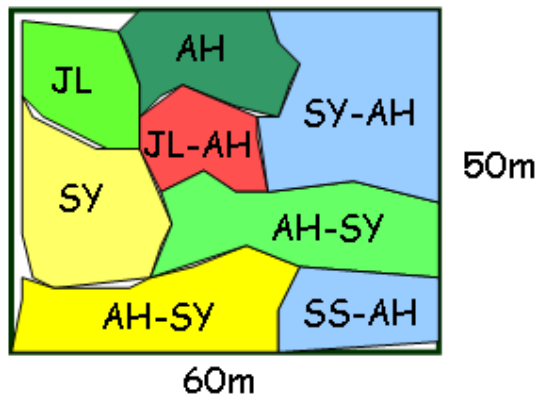


Figure 7. Underplanting plan in species groups according to small-scale changes in site conditions. Key to species codes: AH: ash, JL: Japanese larch, SS: Sitka spruce, SY: sycamore.

A quite sophisticated but efficient design, the so-called “oak-nest-planting” has been suggested by Burschel and Huss (1997). According to Röhrig and Gussone (1990) this is a method which originated in Russia and was successfully applied to the establishment of mixed oak forests in Poland. The design in figure 8 suggests 200 nests per hectare with 21 oaks and 16 hornbeams, respectively, in each nest. This results in 4200 oaks and 3200 hornbeams per hectare.

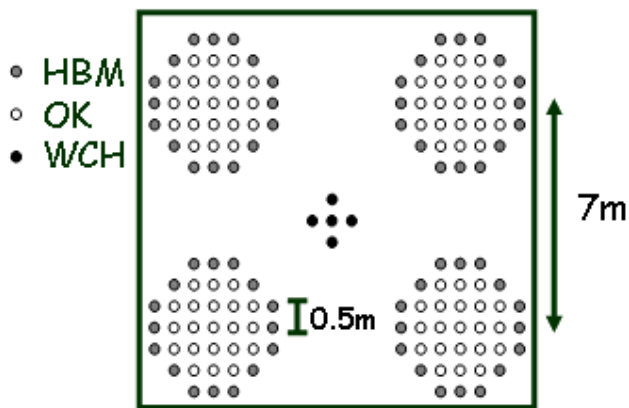


Figure 8. Design of a so-called “oak-nest-planting”. Key to species codes: HBM: hornbeam, OK: oak, WCH: wild cherry (gean).

Due to this design costs of establishment as well as of the tending of the young growth and subsequent thinnings have proved to be lower than those of conventional plantations. Browsing by deer was concentrated only on the boundary trees of the nests, so that the valuable oaks in the centre are scarcely affected. The space between the nests can be covered with trees with short rotation period such as wild cherry or gean (*Prunus avium*), but it is also possible to leave it to natural seeding from adjacent forest stands (Burschel and Huss, 1997).

3. CONCLUSIONS

Continuous cover forestry can be directly achieved through the establishment of mixed stands on former agricultural land. Most of the past British and Irish trials can be characterised as

- having their main focus on the establishment of monospecies plantations
- using only coniferous trees as nurse species
- comprising of nurse and target trees which were planted at the same time

This contrasts with most of the continental approaches reviewed in this paper which by and large prefer broadleaves as nurse species and aim at establishing mixed stands. Mixed forest stands have many advantages which far outweigh their disadvantages and may contribute to more stable and sustainable woodlands in Ireland and Britain. Given the severity of the climate in Ireland and Britain with respect to wind speed and frequency and the amount of precipitation it is advisable to make greater use of nurse crops when establishing mixed woodlands. Oak and ash dominated woodlands, especially, could benefit from this approach. The author suggests setting up experiments to gather data about the success rate of this approach under Irish conditions.

4. ACKNOWLEDGEMENTS

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THE MECHANISATION OF PLANTING ON RESTOCK SITES IN IRELAND

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SUMMARY

The mechanisation of forest operations has been erratic throughout the industry worldwide. In harvesting operations, mechanisation has become very important in many countries but this has not been the case in forest establishment. This is especially true on restock sites, where mechanisation has proven particularly difficult because of ground conditions after clearfelling.

At the moment, there are three main mechanical systems available for planting on restock sites in northern Europe. The **Silva Nova** is a very big, expensive piece of equipment based on a forwarder as the prime mover. Because of its size and cost, it is not considered suitable for Irish conditions at the moment. The **Bräcke planter** is an excavator-based machine, which mounds and plants in the one machine pass. This equipment has proven its worth in this country and a Bräcke planter has been working in the south east of the country (Wicklow/Wexford area) for three years now. The third piece of equipment, which is currently available for planting on restock sites, is the **EcoPlanter**. This equipment has been working in Ireland since January 2002. All three planters use container planting stock only.

Current costs for the Bräcke and the EcoPlanter units are approximately €100,000 and €250,000 respectively (including base units) with annual planting capacities of 140ha (Bräcke) and 200ha (EcoPlanter). In Irish conditions, the productivities (plants/hr) claimed by the manufacturers have not been reached. This has resulted in the current costs of mechanised planting being roughly similar to those of manual planting. It is envisaged, however, that, with reductions in overheads and increased competition, mechanised planting will play an increasingly large part in planting operations in Ireland.

La mécanisation de la plantation des sites de régénération en Irlande

Exposé de M. Michael Keane

Résumé

Dans le monde, les activités forestières sont mécanisées à des degrés divers. Dans le domaine de l'abattage, la mécanisation est maintenant très répandue dans de nombreux pays. Cela n'est en revanche pas le cas dans le domaine de l'établissement de plants, notamment sur les sites de régénération, où la mécanisation s'est révélée être particulièrement difficile du fait de la condition des sols après la coupe à blanc.

Il existe actuellement trois principaux systèmes mécaniques permettant de planter sur des sites de régénération en Europe septentrionale. Le Silva Nova est un équipement de grande taille, onéreux, qui repose sur une débardeuse faisant office de tracteur. En raison de sa taille et de son coût, ce système n'est pas jugé convenir aux conditions qui prévalent actuellement en Irlande. La planteuse Bräcke est une machine reposant sur une excavatrice, qui remblaie et plante en un seul passage de machine. Cet équipement s'est révélé être utile en Irlande, et une planteuse Bräcke est utilisée dans le sud-est du pays (région de Wicklow/Wexford) depuis trois ans. Le troisième équipement qui permet actuellement de planter sur des sites de régénération est l'EcoPlanter. Cette machine est utilisée en Irlande depuis janvier 2002. Les trois planteuses n'utilisent que du matériel végétal en conteneur.

La planteuse Bräcke et l'EcoPlanter coûtent actuellement environ 100 000 et 250 000 euros respectivement (y compris les unités de base), avec une capacité annuelle de plantation de 140 ha

(Bracke) et 200 ha (EcoPlanter). Dans les conditions qui prévalent en Irlande, la productivité (plantes/heure) avancée par les fabricants n'a pas été atteinte. De ce fait, le coût actuel de la plantation mécanique est globalement comparable à celui de la plantation manuelle. On prévoit cependant que, avec la réduction des frais généraux et l'accroissement de la compétitivité, la plantation mécanisée jouera un rôle de plus en plus important dans les activités de plantation menées en Irlande.

Bien qu'elle porte principalement sur des sites de régénération, l'expérience acquise dans le cadre de cette étude sera également extrêmement utile, en Irlande, à la mécanisation de la plantation des sites de boisement.

Механизация посадки деревьев на участках лесовозобновления в Ирландии

Основной документ, подготовленный Микаэлем Кином

Резюме

Во всех странах мира процесс механизации лесохозяйственных операций носит нерегулярный характер, в то время как механизации лесозаготовительных работ во многих странах уделяется очень важное значение. Особое положение сложилось в сфере закладки лесов, особенно на участках лесовозобновления, где использование механизмов чрезвычайно затруднено из-за состояния земли после сплошной рубки.

В настоящее время в северной части Европы используется три механические системы для посадки деревьев на лесовозобновляемых участках. "Силва Нова" - это крупное, дорогое оборудование, использующее форвардер в качестве тягача. Учитывая его размеры и стоимость, оно не пригодно к работе в ирландских условиях. Сажалка "Брэке" действует по принципу экскаватора, она одновременно делает насыпь и посадки за один проход. Эта машина успешно была опробована в Ирландии и вот уже три года работает на юго-востоке страны (район Виклоу/Вексфорд). Третьим, используемым в настоящее время на лесовозобновляемых участках механизмом, является "Экоплантэр". Эта машина эксплуатируется в Ирландии с января 2002 года. Все три сажалки используют только контейнерный посадочный материал.

Текущая стоимость "Брэке" и "Экоплантэр" составляет, соответственно, около 100 000 евро и 250 000 евро (включая базовые модели) при годовой мощности посадок 140 га ("Брэке") и 200 га ("Экоплантэр"). В условиях Ирландии заявленная производителями мощность (количество растений/час) достигнута не была. Это привело к тому, что стоимость одной механизированной посадки примерно равна стоимости ручной посадки. Вместе с тем ожидается, что при сокращении накладных расходов и росте конкуренции механизированная посадка будет играть все большую роль в операциях по закладке лесов в Ирландии.

Хотя исследование сконцентрировано в первую очередь на лесовозобновляемых участках, накопленный благодаря нему опыт может оказаться весьма полезным для механизации посадки деревьев на участках облесения в Ирландии.

INTRODUCTION

The level of mechanisation in forest operations has varied between countries and between operations worldwide. In harvesting, mechanisation has become very important in many countries and, currently in Ireland, accounts for over ninety five percent of all harvesting. This has not been the case in the establishment area and this is especially true on restock sites, where mechanisation has proven particularly difficult because of rough ground conditions after clearfelling.

Until relatively recently, all planting in this country was carried out manually. Costs were relatively low and there were no shortages of labour in rural areas - where most of the planting was taking place. With recent upsurges in the Irish economy, however, coupled with the increasing desire for young people to live in urban areas, it has become more difficult to recruit people to work in forest establishment. There have also been reductions in the numbers of foresters involved in the supervision of establishment operations. This has resulted in a greater need to streamline the whole establishment area and to examine ways to involve forest contractors to a greater degree in this phase of the forest cycle.

Coillte is currently spending approximately €15.3million/yr (direct costs only, not including overheads) on its restock programme. With restock rates set to remain at about 8,000ha/year, we will spend €77million on restocking at current prices over the next five years. A recent consultant's report indicated that, although direct establishment costs were comparable with international competitors, our overheads are still high and need to be reduced. Mechanisation of the establishment process is an area with potential for savings.

MECHANISATION OF ESTABLISHMENT

Several types of planting machines have been developed over the years in Europe, North America and elsewhere. Many of these are particularly suited to planting on afforestation sites as many of these sites are uniform, accessible and without obstructions. It was only towards the end of the twentieth century that machines were developed that could cope with the difficulties encountered on sites left after clearfelling. Many of these machines can now cope with stumps, drains and heavy brush loads.

At the moment, there are three main mechanical systems available for planting on typical restock sites in Europe. The **Silva Nova** is a very big, expensive piece of equipment, based on a forwarder as the prime mover. Because of its size and cost, it is not considered suitable for Irish conditions at the moment. The **Bräcke Planter** is an excavator-based machine, which mounds and plants in the one machine pass. This equipment has proven its worth in this country and a Bräcke Planter has been working in the east of the country for three years now. The third piece of equipment, which is currently available for planting on restock sites is the **EcoPlanter**. The EcoPlanter has been working in Ireland since January 2002. All three planters use container planting stock only.

DETAILS OF BRÄCKE PLANTER AND ECOPLANTER

Bräcke Planter

The Bräcke Planter was first introduced into the east of Ireland in April 1999 through a co-operative project between Coillte (Declan Egan) and Cashwood Ltd. (cultivation and harvesting contractors) (Figure 1). Another similar unit is about to begin work in the south of the country later this month.



Figure 1. Bräcke Planter at work on a restock site

The Bräcke Planter is manufactured by Robur Maskin AB in Sweden and there are currently approximately thirty units working worldwide – mainly in northern Europe and Canada. The planting head, which weighs about 1 tonne, attaches to the end of an excavator boom. The planting carousel takes only containerised plants but can accommodate most types currently available. The carousel needs to be refilled after every 60-90 plants (depending on size) are planted.

The planter works by firstly turning over a sod of earth (Figure 2). It then drives a ‘beak’ into this sod which opens to create the planting hole. A tree is dropped into this hole from the carousel. The tree is then firmed into position. A jet of air and water is applied to clean the beak before the next sod is turned. Insecticide can be incorporated into this water to protect seedlings against insect attack.

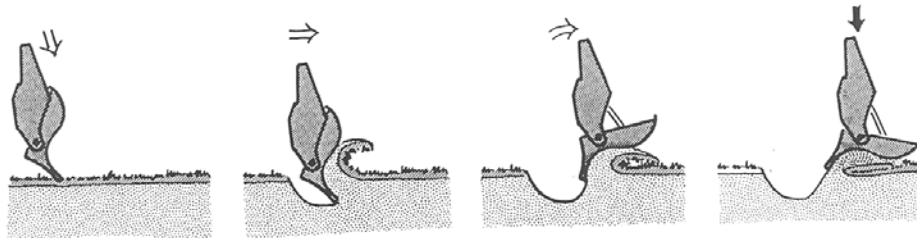


Figure 2. Cultivation by the Bräcke Planter (Illustration: SkogForsk)

The cost of the full unit is approximately €100,000. This includes the cost of a good second-hand excavator as a base unit. Although the optimum planting rate quoted by the manufacturers is

approximately 300 plants/hr, more realistic rates in this country are closer to 200 plants/hr when allowances are made for movement of our relatively heavy slash loads. The higher rate is possible on afforestation sites.

A Bräcke Planter has been working in Ireland for almost three years now and in that time, it has planted a total of over 250ha. It has worked mainly on restock sites but has also planted some afforestation sites.

The local Coillte Establishment Team is generally happy with the work of the Bräcke and is committed to holding on to the equipment for future work. The main benefits are:

Three operations are carried out in one pass (cultivation, planting and spraying against weevil). Using container stock, the planting season is extended to nine months (early September to early June, depending on weather conditions).

Quality of planting is good.

In relation to the last point on planting quality, formal trials have been established comparing manually and mechanically planted plants. These have found that, although manual planting scored higher than mechanised planting for planting quality, the quality of planting by the Bräcke was good and well within acceptable operational requirements.

EcoPlanter

Like the Bräcke Planter, the EcoPlanter is Swedish designed. It is manufactured by EcoFräsen in northern Sweden and the company is 40% owned by Valmet, the large harvesting equipment manufacturer. It is a relative newcomer to the international establishment scene and there are currently 11 units working in Europe, with an additional 7 on order (Figure 3).



Figure 3. The EcoPlanter

It is a designed very differently to the Bräcke and is based on a harvesting prime mover. The total cost of the planting head and prime mover is approximately €250,000.

The EcoPlanter also uses only containerised plants but it's carousel has a planting capacity which is four times that of the Bräcke, which means far less time spent reloading. The EcoPlanter prepares the soil using two individually operated rotors that spin and cultivate the soil into loose mounds (Figure

4). It then plants two plants simultaneously, approximately 2m apart. It also allows the operator to apply insecticide to each plant as it is planted. The manufacturers claim a performance of 400-500 plants/hr but levels of closer to 300 are more common under Irish conditions. This would give an annual planting capacity of approximately 200ha.



Figure 4. Cultivation by the EcoPlanter

An EcoPlanter has been working in this country since January of this year. It was initially leased in by Roland Forestry Ltd. (cultivation and harvesting contractors in the south east) in a co-operative project with Coillte for three months earlier this year. Since that time, the contractor has decided to buy the equipment and a longer-term contract has recently been signed with him.

Because of its relatively recent introduction, we do not have substantial information yet on the production capabilities of the EcoPlanter. In monitoring areas recently planted by this equipment, however, early indications are good and plants planted during this spring have been performing well over this summer.

Trials have also been established to assess the early performance of the EcoPlanter and first year results will be available later this autumn. The two benefits of multi-tasking (cultivation, planting and spraying) and extension of the planting season (as mentioned above for the Bräcke) also apply to the EcoPlanter.

PLANT SUPPLY

Containerised plants for the Bräcke Planter have been supplied by the Coillte Aughtim Nursery since it began planting in 1999. This nursery has also been supplying the EcoPlanter with plants since early this year. Although there have been problems with some plant batches (larch can be a problem for the EcoPlanter), the general supply has been good and both planters can plant most container types (Figure 5). It is especially important for mechanical planting that the plants have a compact, well filled root ball as the plants will not drop properly if they are not heavy enough. The EcoPlanter can also plant taller plants than the Bräcke and broadleaves present no problems to either planter. Up to now, plants have been delivered to the planters in co-extruded plastic bags. However, a recent move from bags to boxes for transportation has resulted in loading time of the carousel on the EcoPlanter being halved.



Figure 5. Plant quality is important for mechanical planting

QUALITY OF WORK

As mentioned above, we currently have more information on the Bräcke Planter than on the EcoPlanter. Results from both replicated field trials and operational planting show that planting quality of the Bräcke Planter to be well within operational requirements. We do not have such information on the EcoPlanter as yet but will be assessing trials later this autumn.

Both planters can also treat plants with insecticide as they plant. This was also tested with the Bräcke Planter (in Bunclody Forest) and the results are presented below (Figure 6). The Bräcke was as effective as manual spraying in this trial. Care must be taken in extrapolating this result, as weather will have a big influence on the efficacy of this type of spraying and questions remain as to whether the mechanical planters should continue to spray insecticide during wet weather.

Further trials will need to be carried out on this to assess effectiveness, chemical usage and effects of rainfall.

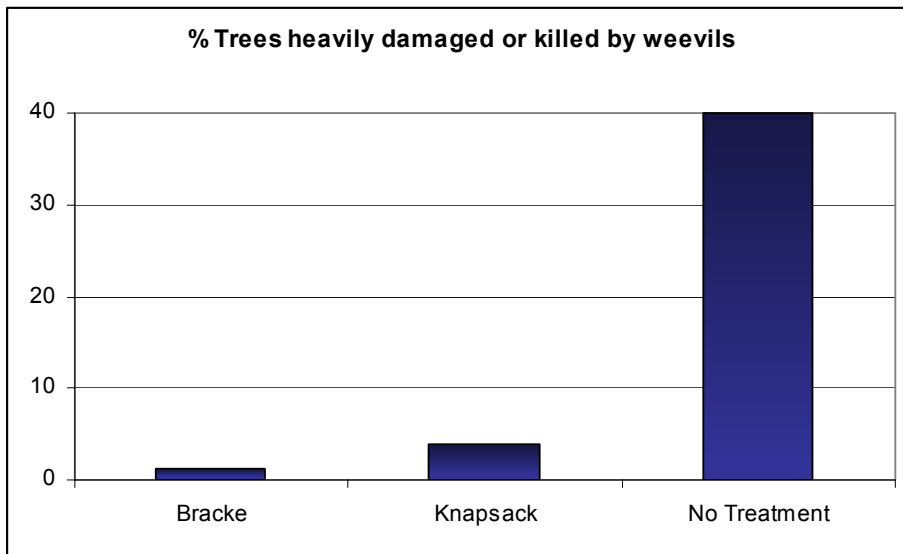


Figure 6. Effect of mechanical and manual (knapsack) spraying vs. no treatment after one growing season in Bunclody

COST

The difference in cost between both the Bräcke and EcoPlanter in comparison to manual planting is shown below (Figure 7). It must be noted that this is not simply a comparison between manual vs. mechanical planting. Manual planting figures are for transplants while the mechanical planters use container stock. This has further implications in relation to costs of plants, vegetation control and weevil control.

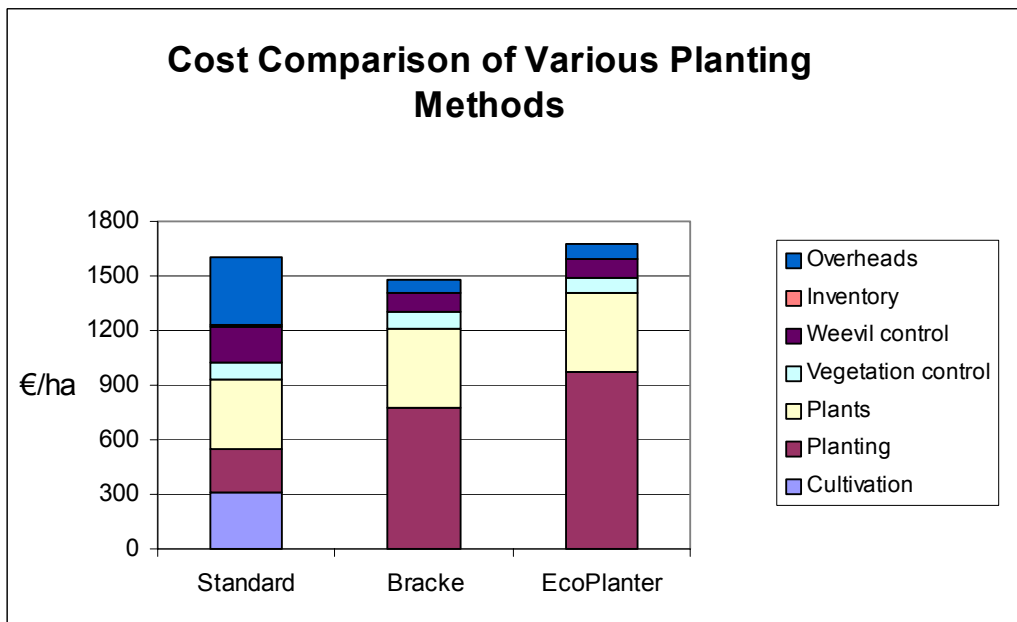


Figure 7. Comparison in costs between manual and two kinds of mechanical planting

Note

- Two sprays in total for each system. For the manual planting, two manual sprays are used. For the mechanical planting, the planting operation itself includes one mechanical spraying and there is one subsequent manual spraying
- Overheads from Establishment Production staff only

From the above, it can be seen that the cost of mechanical planting is approximately equal to manual planting, with the Bräcke Planter coming in at €126/ha less, and the EcoPlanter at €64/ha more than current establishment costs for similar sites. At the moment, the actual ‘mechanical cultivation and planting’ element of the operation is more expensive with either piece of equipment but there are potential savings in relation to management overheads.

Given the average annual planting programme of a member of the Coillte Establishment Team and the annual figures already quoted for either the Bräcke or the EcoPlanter, the introduction of planting machines on a phased basis could help in relation to current reductions in field foresters.

Given a measured approach and interested contractors, a small network of planting machines could be set-up in strategic locations to plant suitable sites. With new contracts for ‘planting plus supervision/management’, these machines could help relieve current workload/supervision problems in certain areas. Even in areas where there are currently forest workers available, the use of a mechanical planter could free up workers for other establishment work such as filling in or spraying. This could help relieve the pressure that comes on in e.g. springtime when labour for planting programmes often has to be used to protect existing plantations against insect attack.

For this to succeed, additional establishment operations must be taken on by contractors e.g. plant ordering, site logistics (water, plants, chemical distribution) and post-plant site inventory. We are currently exploring the possibility of a contractor using GPS technology to inventory site details after planting is completed.

This idea could be developed further by using a specific Coillte manager who would be responsible for a number of planting machines, in addition (if required) to additional conventional planting operations. This would also have major advantages for the planting contractor who would have only one contact person within the Establishment Process with whom to deal with. In the costings table above, it is suggested that the mechanical planting options would require only 20% of the overheads associated with the manual planting.

NURSERIES

Because all restock planting machines currently use only container planting stock, a move to planting machines would result in greater demands for this stock type from our Nurseries. This has been anticipated and the plant order from the Coillte Nurseries Division for container stock for the 2002/2003 planting season has been increased to two million plants, enough for three Bräckes and two EcoPlanters.

We must also strive to drive container plant prices down. Container stock is less expensive than bareroot stock for most of our competitors – it is the opposite here. Working with our Nurseries colleagues on up scaling the current set-up should help in this regard.

The Coillte Nurseries Division has also agreed to improve plant quality – average target height of Sitka spruce is to be increased to 35-40cm and all species are to have a compact, full rootball (this is crucial for mechanical planting). Other areas such as availability of minor species and plant quality in

larch also need to be addressed. Nurseries will also explore (in co-operation with Coillte R&E) the possibilities of pre-dispatch treatment of container stock with insecticide.

ISSUES

Mechanisation of restock planting has potential for savings within the establishment process. This potential will only be realised if the following issues can be resolved:

There is an inherent **risk** to using containerised planting stock on many of our site types. This stock type has been most successful in areas where summer planting is necessary (Canada, Scandinavia) or where high use of chemicals is used for vegetation control (southern USA). Container stock can be very vulnerable to weevil attack if not protected. We have quite good results, however, for three planting seasons now with the Bräcke Planter – once the plants were protected. We do not, as yet, know how the planting by the EcoPlanter will perform but early growth during the first growing season has been very encouraging.

The basic **price** of cultivation and planting by either machine is still high. We must work with our contractors on getting productivity up – this has an enormous effect on price and on efficiency. These machines are designed to plant trees and they will be most productive when they are planting trees only. Other jobs, such as moving brush, loading, etc. must be kept to a minimum. Ideas are currently being explored in this regard in areas such as plant supply, brush management, etc.

We should support contractors in attempting to get **financial aid** from the Forest Service for establishment equipment (in the same way as harvesting equipment in the past). Co-operation with the Irish Forestry Contractors Association would be worthwhile and they are anxious to move with us in this direction.

Initially, we must be **selective** in where we position the planting machines. They are of most benefit where there are shortages of either forest workers or establishment managers, although this should not be a limiting factor. The idea of a dedicated mechanised planting manager should be explored.

Initially, these planting machines will be most suitable for dry sites. We must work with contractors, however, to assess their use on **wetter sites**. Novel approaches to using a range of machines on such sites will need to be explored. Early indications suggest that the EcoPlanter is not suitable for wet sites.

The **contractors** who get involved in mechanised planting should be encouraged to expand their portfolio of work on these sites to cover the entire establishment phase - until plantations are 'free to grow'.

Coillte Forestry Services must decide on the balance of bareroot/container stock and work with **Nurseries** in relation to improving plant quality and bringing price down.

IMPLEMENTATION PLAN

The Implementation Plan outlined below **assumes that the survival and early growth of plants, planted by the EcoPlanter, will at least match if not surpass that of conventional practice**. We should have a better 'fix' on this later this autumn.

This plan also assumes that as the number of mechanised planting units' increases, the nursery production of such plants will expand to keep pace with demand.

Figure 8 below suggests a planned expansion of the planter fleet over the next number of years. Whether this occurs depends on many of the issues outlined above. It is suggested that the number of planters and the area planted by them will level off as the availability of suitable sites peaks at 2000-2500ha. The majority of these planters will be initially located in the south, southeast and east of the country – where most of the suitable sites will be located. The expansion of mechanised planting into the wetter soils in other parts of the country will initially be slow because of the inability of these machines to carry out drainage work with current techniques. Contractors should be encouraged,

however, to develop a range of available machinery and to look at alternative approaches to this problem.

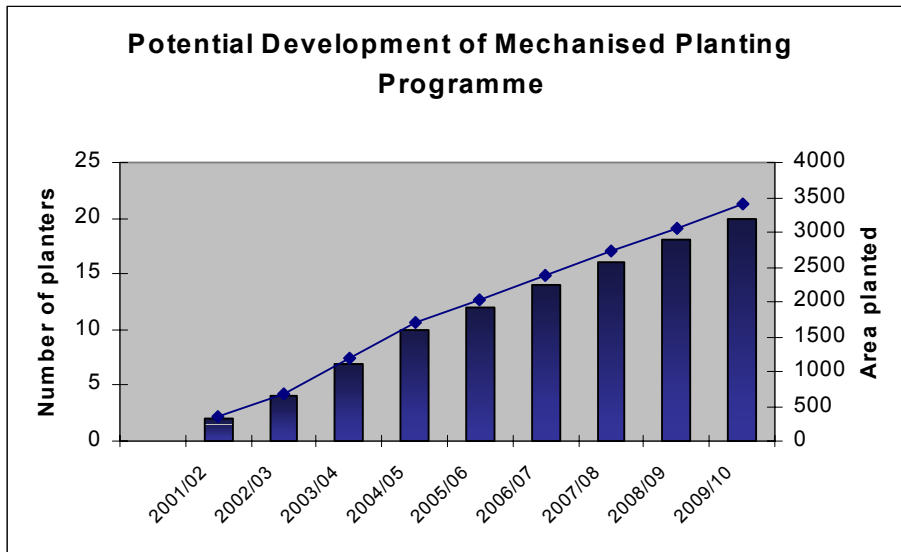


Figure 8. Suggested ‘phase-in’ of planting machines

This rate of expansion will be less than that experienced with the harvesting/forwarding fleet over the last 15-20 years. Since the mid 1980's, the harvesting/forwarding fleet has expanded from an almost zero base to its current levels of approximately 140 harvesters and 180 forwarders. The planting fleet will not experience the same growth due to the issues highlighted above. Given the scenario outlined above, however, the requirement for container stock for mechanised planting would quadruple to over eight million plants by 2010.

CONCLUSION

Mechanised planting was successfully introduced to restock sites in the east of the country about three years ago with the Bräcke Planter. In January of this year, the EcoPlanter began work in the Kilkenny area.

On a task by task comparison, mechanical planting is currently more expensive than our normal manual planting operation. The potential savings from mechanisation will have to come about through reductions in overhead/supervision costs. We must also strive to increase productivity as this has an enormous bearing on cost/ha.

We must evaluate and compare both systems in relation to establishment survival and early growth and we must monitor and document the work of both. The current balance of container/bareroot planting stock will have to change. This will require investment by our Nurseries Division.

We must improve our co-operation with contractors if developments are to be made in this area. The introduction of specific mechanised planting managers should improve efficiencies for both contractors and Coillte.

ACKNOWLEDGEMENTS

The author wishes to thank the contractors who have invested in mechanised planting equipment in the recent past – Alfie Neville, Ger O'Connor and Eoin O'Neill. Without their courage and determination,

this project would not have gotten off the ground. In operating the equipment, Denis Shannon and John Neville are always on hand to help test improvements on the ground.

John Bardon in the Coillte Container Nursery in Aughrim has been very co-operative in improving stock quality and transportation. Coillte Establishment Team members, Barry Lawler, Joe O’Gorman, Tysie Fogarty, Eamon Drohan and Dave Cusack have been more than willing to try the unknown in their forest. A special thanks to Declan Egan and Joe Kilbride for their help with this project.

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GROWTH OF SIX CONIFEROUS SPECIES IN DIFFERENT BIOCLIMATES IN CROATIA

Ms. Sanja Perić, Mr. Stevo Orlić, Mr. Mladen Ivanković, Forest Research Institute, Croatia

SUMMARY

With the aim of determining a good selection of coniferous species for the establishment of cultures, the Forest Research Institute in Jastrebarsko began research work in 1960. Trial planting comprised three indigenous and three foreign species. The indigenous species included a Scotch pine (*Pinus sylvestris* L.), Black pine (*Pinus nigra* Arn.) and Norway spruce (*Picea abies* Karst.), and the foreign species were European Larch (*Larix decidua* Mill.), Weymouth pine (*Pinus strobus* L.) and Douglas fir (*Pseudotsuga taxifolia* var. *viridis* Asch. et Gr.).

These are economically the most interesting coniferous species which are often used in Croatia for establishing new cultures in non-forested areas and for reconstruction of lower quality stands of broadleaves.

In spring of 1969 three comparative trials were established in three ecologically characteristic forest regions of Republic of Croatia.

One of them is located in the eastern region on what once used to be forest soil (Durgutovica), the second on agricultural soil in the north-west region (Slatki potok) and the last one in fern and heath areas in the south-west of Croatia (Lokve).

For the establishing of trials were used planting material of well-known provenance the same seed crop, the same nursery production and the same quality class.

The trials were established in a randomised block design in three repetitions. 432 plants of each species were planted in a trial or 1296 plants in three trials altogether. The number of plants of all the species in one trial is 2592 or 7776 plant in all the trials.

One trial with its protective cover spreads over the area of 1,5 hectare. The distance between the plants in the trials is 2,0 x 2,0 m.

A necessary condition for successful production could simply be expressed in this way: "The right species in the right place". It can be achieved when the basic indicators of productive ability of stands as well as bio-ecologic traits of the species are known.

An absolute success may be expected only in the cultures where the highest degree of harmonisation of species requirements regarding stands has been obtained.

The results of the 32-year development of plants of the aforementioned species indicate the following:

- Indigenous species demonstrated higher survival rate than foreign species whereas foreign species reached greater height and bigger DBH than indigenous species.
- Weymouth Pine demonstrated the biggest wood volume of all foreign species planted in 3 localities.
- The same is valid for Norway spruce among indigenous species.
- The relations between species are harmonised with their bio-ecological traits.

Key words: coniferous species, culture, survival, growth, height, DBH, wood volume, bio-ecological traits

La croissance de six essences résineuses dans différents bioclimats de Croatie

Exposé de M^{me} Sanja Peric

Résumé

L'Institut de recherche forestière de Jastrebarsko a commencé son activité en 1960 afin de sélectionner des essences résineuses en vue de la plantation de forêts. Il a procédé à des essais, utilisant trois essences autochtones et trois essences étrangères. Les essences autochtones étaient le pin sylvestre (*Pinus sylvestris* L.), le pin noir (*Pinus nigra* Arn.) et l'épicéa (*Picea abies* Karst.), tandis que les essences étrangères étaient le mélèze d'Europe (*Larix decidua* Mill.), le pin Weymouth (*Pinus strobus* L.) et le Douglas (*Pseudotsuga taxifolia* var. *viridis* Asch. et Gr.). Trois essais parallèles ont été menés: dans la région orientale, sur ce qui était autrefois un sol forestier (Durgutovica); sur le sol agricole de la région du nord-ouest (Slatki potok); et dans la région du sud-ouest, sur des sols couverts de fougères et de bruyères (Lokve). Les premiers résultats concernant la croissance des essences autochtones et étrangères, obtenus dans le cadre d'essais comparatifs menés sur le territoire de la Croatie, ont été publiés en 1979. Le document décrit l'étude des caractéristiques bioécologiques des essences susmentionnées dans différents bioclimats. Ont été analysés, pour chacune des six essences, les paramètres suivants: hauteur totale, accroissement de la hauteur, diamètre à hauteur d'homme, accroissement du diamètre à hauteur d'homme, survie.

Выращивание шести хвойных пород деревьев в различных биоклиматических зонах Хорватии

Основной документ, подготовленный г-жой Санья Перич

Резюме

Лесной научно-исследовательский институт в Ястребарско в 1960 году приступил к исследованиям с целью отбора наилучших пород хвойных деревьев для закладки леса. В качестве опытных культур были посажены три местных и три зарубежных породы деревьев. К местным породам относятся сосна обыкновенная (*Pinus sylvestris* L.), сосна черная (*Pinus nigra* Arn.) и ель (*Picea abies* Karst.), к зарубежным – лиственница европейская (*Larix deciduas* Mill.), сосна Веймутова (*Pinus strobes* L.) и лжетсуга тиссолистная (*Pseudotsuga taxifolia* разновидность *viridis* Asch. et Gr.). Были созданы три параллельные испытательные зоны: одна – на бывших лесных почвах в восточном регионе (Дургутовица); другая – на сельскохозяйственных землях в северо-западном регионе (Слатки поток); и третья – в юго-западном регионе, на пустошах, поросших папоротником и вереском (Локве). Первые результаты выращивания местных и зарубежных пород деревьев в сравниваемых испытательных зонах на территории Республики Хорватия были опубликованы в 1979 году. Настоящий документ представляет собой исследование биоэкологических характеристик вышеупомянутых пород деревьев в различных биоклиматических условиях. По всем шести породам деревьев анализировались следующие параметры: общая высота, прирост по высоте, диаметр на высоте груди, прирост диаметра на высоте груди и приживаемость.

INTRODUCTION

There are approximately 75 000 ha of coniferous cultures in Croatia. Another 330 000 ha of unoccupied forested and non-forested areas are available for possible forest harvesting. The largest areas available for establishing new coniferous cultures are located on the Mediterranean, Sub-Mediterranean and inland fern and heath areas (Matić, Dokuš, Orlić 1992.). Continuous work on the selection of species and their provenance, as well as monitoring the success (growth and increment, as well as biomass production) of certain species in different edaphic, climatic and habitat conditions enables us to achieve better results in harvesting coniferous cultures. For successful production one needs to adhere to the principle “The right species in the right place” (Orlić 1979). This can be implemented only if the biological i.e. ecological characteristics of the species as well as the basic indicators of the productive capability of the stand (soil quality) are known. During the last 40 years many scientists in Croatia have conducted research in existing cultures and have published many studies (Komlenović, Dokuš, Mayer, Orlić, 1975; Komlenović 1976, 1987; Orlić 1979, 1993; Dokuš, Orlić 1986; Matić 1986; Orlić, Komlenović 1988; Komlenović, Orlić, Rastovski et al. 1995). A large number of researchers from different countries also study this topic (Holmsgard & Bang 1977, Schrober 1978, Hansen & Baker 1979, Royce & Barbour 2001, Lindstrom 2002, Laclan 2002, Meunier et al 2002, Niinemets et al 2002, etc) .

This paper shall demonstrate the results of research conducted on the success rate of six different species of conifers in comparative trials on three different locations in Croatia.

RESEARCH LOCATIONS AND METHODS

A series of comparative trials was set up in the spring of 1969 in three characteristic ecological i.e. forest areas in Croatia. The localities and their geographical position are given in Table 1 and Illustration 1 (next page).

Table 1: Geographical position of the localities

Forest – Locality	Latitude	Longitude	Altitude (m)
Durgutovica Vinkovci	45° 19'	18° 38'	110
Bjelovar, Slatki potok	45°46'	17°03'	142
Karlovac, Lokve	45°26'	15°17'	195

The Lokve locality is situated in brake-tracts and heaths (Karlovac Forest Administration) in SW Croatia. The climate is perhumid (Bertović, 1972). The Slatki potok locality is situated in NW Croatia in the hilly area of Bjelovar on agricultural land (Bjelovar Forest Administration). The climate is humid. The climate symbol according to Köpen is Cfwbx”. The Durgutovica locality is situated in the East of Croatia on a once forested area (Vinkovci Forest Administration). The basic meteorological data is given in Table 2.

Illustration 1: Position of the localities

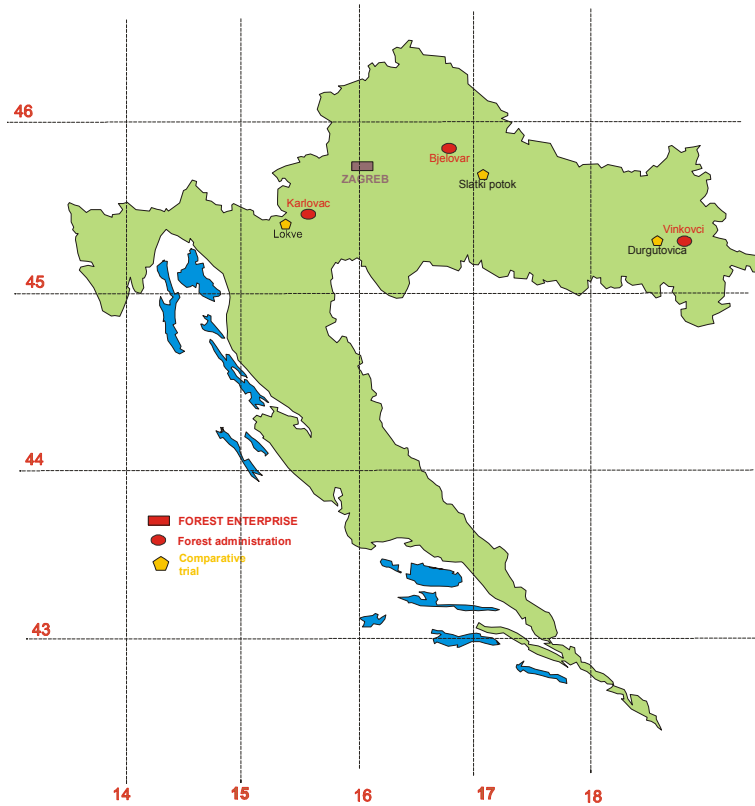


Table 2: Meteorological data per station

Station/ Locality	Air temperature at 2 m, °C				Mean annual rel. air humidity, %	Precipitation, mm			
	Mean Annual	Amplitude of the mean annual temp.		Absolute max. temp.		Absolute min. temp.	Mean Annual	Min. annual sum	Max. annual sum
KARLOVAC	11,2	9,9	12,3	37,0	-21,8	77	1061,5	896,5	1187,7
BJELOVAR	10,8	9,8	11,8	36,9	-18,8	80	813,6	655,2	957,8
VINKOVCI	11,8	10,5	14,2	36,7	-21,0	82	673,2	470,0	790,5

The research encompasses the economically most interesting coniferous species (indigenous and foreign) that are most commonly used in Croatia for establishing new cultures outside forest areas and for reconstructing degraded broadleaf stands.

Planting material of known origin was used for the trial, with the same seed crop, identical nursery production and class of quality. The basic data on the origin and age of the seedlings is given in Table 3.

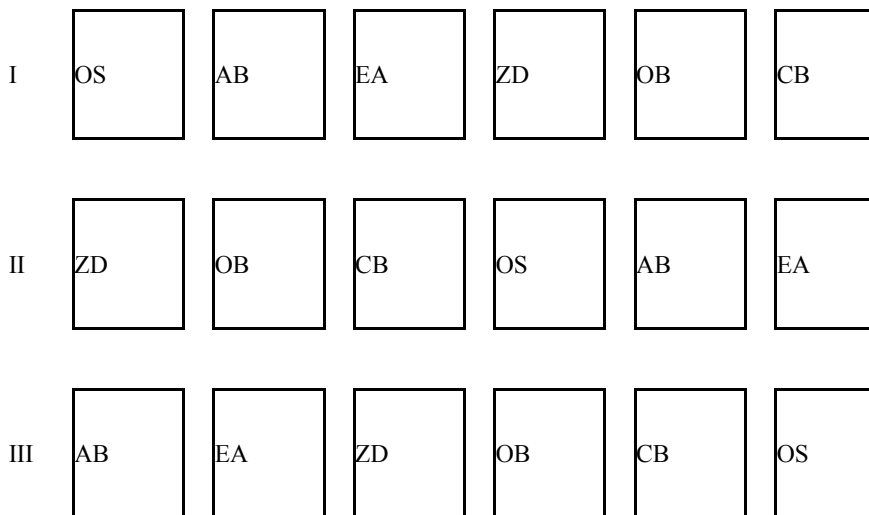
Table 3: Species and age of research seedlings

Species	Symbol	Provenance	Age
Norway spruce (<i>Picea abies</i> Karst.)	OS	Ključ, BiH	2+2
Scotch pine (<i>Pinus sylvestris</i> L.)	OB	Visoč, BiH	1+2
Black pine (<i>Pinus nigra</i> Arn.)	CB	Titovo užice, Yugoslavia	1+2
European Larch (<i>Larix europea</i> L.)	EA	Kuleć, Brno, Czech R.	1+1
Weymouth pine (<i>Pinus strobus</i> L.)	AB	Ponovec, Slovenia	1+3
Douglas-fir (<i>Pseudotsuga menziesii</i> Franco)	ZD	Vernonia Oregon, USA	2+3

The trials were established in a randomised block design with three repetitions. Illustration 2 shows the layout of the trial. A total of 432 plants of every species (144 plants per lot) were planted during the trial, and the total number of plants per trial was 2591. The size of each trial including the protective cover equalled 1.5 ha. The planting distance was 2.0x2.0 m (2500 plant/ha).

Illustration 2: Layout of the comparative trial

Block



A series of research was conducted in these comparative trials: survival and height growth during the first five years, total height and breast height diameter by the end of the fifth year (Orlić, 1979), height and width growth and increment and survival 10 years upon establishment (Orlić 1983), breast diameters and height after 23 and 26 years of age, stem wood, average and current increment, analysis of biomass and the concentration of nutrients in the plant matter (Komlenović, 1978; Orlić, Komlenović, Rastovski, Ocvirek, 1991, 1997; Komlenović, Orlić, Rastovski 1995.).

This study gives the results of the latest measurement taken in the spring of 2002 for each of the three localities aged 32 years. The basic meteorological data is given for each locality. An analysis has been conducted regarding survival per species and locality. Total height and breast height diameter were measured on each tree. The wood volume and average age increment were calculated on the basis of the collected data. One entry tables – tariffs were used for calculating wood volume (Hamilton, 1975.). The statistical processing was conducted in Statistica and SAS 8.12 programmes. Descriptive statistic was done for all analysed variables. Difference between analysed species (*Picea abies*, *Pinus sylvestris*, *Pinus nigra*, *Larix europaea*, *Pinus strobus*, *Pseudotsuga mensesii*) for height and DBH were testing using ANOVA for each location separately. If these difference was statistical significant ($p < 0,05$) Scheffe test for multiple comparison were used for testing which species make this difference (Sokal and Rahlf, Biometry 1995).

RESEARCH RESULTS AND DISCUSSION

Survival

The survival rate of the plants was monitored in all the trials at 1, 10 and 32 years of age. The data is given in Table 4.

Table 4: Survival per species and locality

Data	Year	Species						Sum per
		OB	CB	OS	EA	ZD	AB	locality
Trial: Durgutovica								
Planted (pc)	1969.	432	432	432	432	432	432	2592
Survival, %	1969.	71	88	93	73	80	83	81
Survival, %	1978.	58	85	84	69	60	70	70
Survival, %	2001.	15	35	75	27	49	60	43
Trial: Slatki potok								
Planted (pc)	1969.	432	432	432	432	432	432	2592
Survival, %	1969.	86	91	100	96	86	96	92
Survival, %	1978.	84	85	82	41	16	78	64
Survival, %	2001.	46	53	73	31	16	55	45
Trial: Lokve								
Planted (pc)	1969.	432	432	432	432	432	432	2592
Survival, %	1969.	81	91	99	90	95	98	92
Survival, %	1978.	76	74	97	73	65	96	81
Survival, %	2001.	9	16	79	39	34	57	38
Sum per species								
Planted (pc)	1969.	1296	1296	1296	1296	1296	1296	7776
Survival, %	1969.	79	90	97	86	87	92	88
Survival, %	1978.	73	81	88	61	47	81	72
Survival, %	2001.	23	35	76	32	33	57	42

As can be seen in the above Table, the data on survival varies per year but nevertheless certain regularities can be established. Throughout the monitored years the highest survival rate is recorded in Norway spruce and Weymouth pine. A high survival rate is registered with the Black pine in the Durgutovica and Slatki potok localities (35%, 53%), while the low survival rate in the Lokve locality (16%) is the result of grave damage due to snowbreakage and wind breakage. The lowest survival rate throughout the trial period was recorded for the European Larch, Douglas fir and Scotch pine. If we are to look at survival rates per species for the year 2001 we can notice that it ranges from 9% for the Scotch pine on the Lokve locality to 79% for the Norway spruce at the same locality.

The Weymouth pine and Norway spruce have a uniform survival rate on all three localities, which point to a wide ecological amplitude of these species. The European Larch and Douglas fir are species that haven't shown tolerance in regard to locality selection and they have the lowest survival rate in 2001 ranging from 32% to 33%. A survival rate of only 23% for the Scotch pine is the result of values ranging from 9% to 46%. As regards locality, the locality with the highest survival rate of 45% was Slatki potok.

Height growth

Table 5 gives an overview of mean heights per tree species and locality.

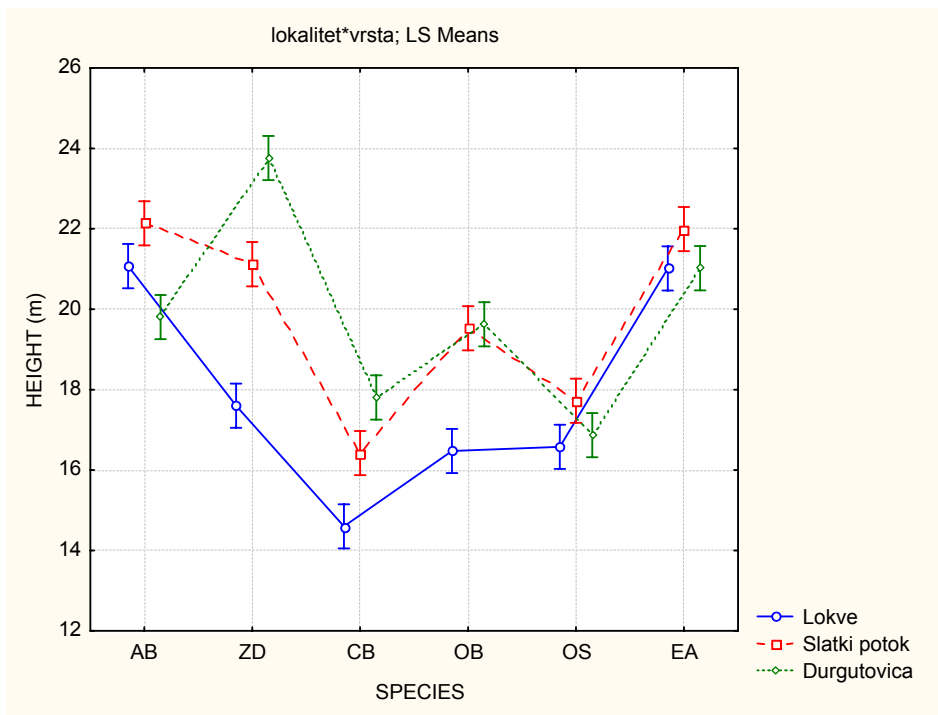
Table 5: Mean heights and standard deviation

Species	Height, m					
	Durgutovica		Slatki potok		Lokve	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
OB	19,63	0,17	19,53	0,15	16,48	0,71
CB	17,81	0,04	16,43	0,11	14,60	0,67
AB	19,81	0,13	22,14	0,32	21,07	0,82
ZD	23,76	0,41	21,12	0,82	17,60	0,94
EA	21,02	0,32	22,00	0,03	21,02	0,49
OS	16,87	0,02	17,72	0,21	16,58	0,12

The European Larch (22,00m) and Weymouth pine (22,14m) are the leading species regarding height on the Slatki potok and Lokve localities. On the Durgutovica locality the Douglas-fir (23,76 m) is higher. The lowest heights were recorded for the Norway spruce and Black pine on all localities. This data corresponds to the data from earlier measurements (Orlić 1979,1983). The relation between species is in accordance with their biological features and ecological requirements. The European Larch and Weymouth pine are superior species as regards the intensity of height growth during their young years in comparison to the Norway spruce and Black pine.

Illustration 3 gives a graphical overview of the mean heights and a 95% reliability interval per species and locality.

Illustration 3: Mean heights per species and locality



It is evident from the graph that the Black pine has had the smallest growth, and the narrowest range of heights was recorded with the European Larch. The data collected on height was analysed using ANOVA for each location separately. It has been statistically proven that significant differences exist in localities (Table 6). Scheffe test for multiple comparison were used for testing which species make this difference (Illustration 4).

Table 6: ANOVA for height and for each location separately

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Species-Lokve	5	103,5885833	20,7177167	44,71	< 0,0001
Spec-Slatki potok	5	83,44702778	16,68940556	116,84	< 0,0001
Spec-Durgutovica	5	89,37409444	17,87481889	331,66	< 0,0001

Illustration 4: Scheffe multiple comparison test, heights

Scheffe Grouping	Mean	N	Species
L o k v e A	21,0733	3	3
A			
A	21,0167	3	5
B	17,6033	3	4
B	16,5800	3	6
B	16,4767	3	1
C	14,6000	3	2

Scheffe Grouping	Mean	N	Species
S l a t k i p o t o k A	22,1400	3	3
A			
A	21,9967	3	5
A	21,1233	3	4
B	19,5267	3	1
C	17,7233	3	6
D	16,4267	3	2

Scheffe	Grouping	Mean	N	Species
D u r g u t o v i c a	A	23,7633	3	4
	B	21,0233	3	5
	C	19,8067	3	3
	C	19,6267	3	1
	D	17,8067	3	2
	E	16,8700	3	6

Legend:

Symbol of species	Species
1	OB Scotch pine
2	CB Black pine
3	AB Weymouth pine
4	ZD Douglas fir
5	EA European Larch
6	OS Norway spruce

On the Lokve locality the species are divided according to the Scheffe multiple comparison test (Illustration 4) into three different groups. Significant differences exist between the Black pine and the other species. There is no major difference in height between the Waymouth pine and European Larch. These two species have the largest height values in this locality. The third group is composed of the Douglas fir, Norway spruce and Scotch pine. The graphical presentation shows the dominance of foreign species on this locality as regards height as well as the significant difference between the Douglas fir and the two other foreign species (Waymouth pine and European larch). On the other hand, on the Slatki potok locality there are no significant height differences according to the Scheffe test between trees of foreign species (Waymouth pine, Douglas fir, European larch). The indigenous species are significantly different from one another. Each indigenous species differs in height from all of the foreign species. On the Durgutovica locality the species are divided into five groups also in accordance with the Scheffe test. Only the Waymouth pine and Norway spruce don't have significant differences. All the other species have significantly differ in height.

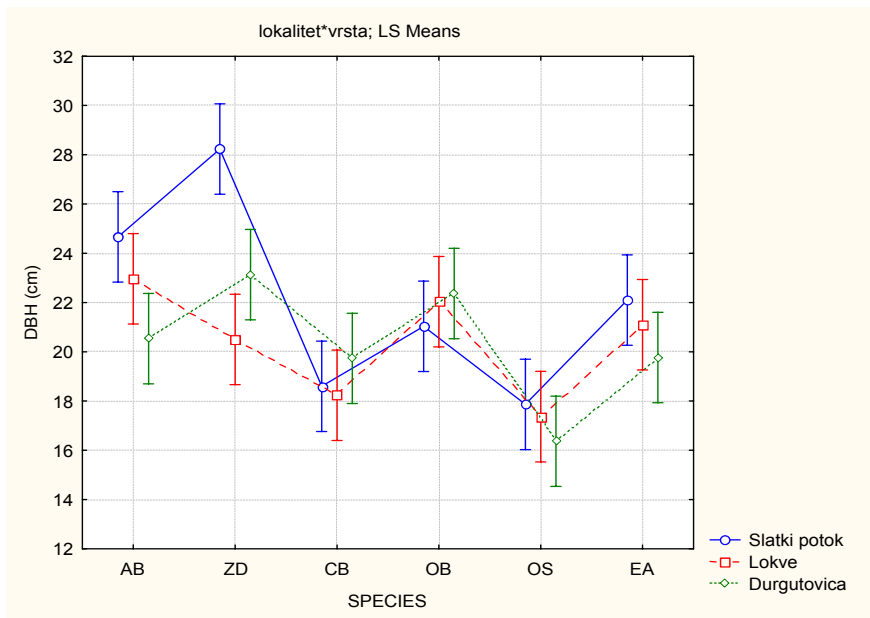
Diameter growth

At age 32 the Douglas fir and Weymouth pine had the highest average breast height diameter. Data is given in Table 7 and Illustration 5.

Table 7: Average values for breast height diameter and standard deviation, cm

Species	Breast height diameter, cm					
	Durgutovica		Slatki potok		Lokve	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
OB	22,37	0,76	21,03	1,14	22,03	2,40
CB	19,73	0,21	18,60	0,52	18,23	2,20
AB	20,53	0,71	24,67	2,05	22,97	2,74
ZD	23,13	1,45	28,23	2,87	20,50	2,50
EA	19,77	0,85	22,10	0,10	21,10	1,14
OS	16,37	0,06	17,87	0,68	17,37	2,40

Illustration 5: Mean DBH per species and locality



The Douglas fir has the widest range within one species on all the monitored localities. On the Slatki potok locality all the species except for the Black pine and Norway spruce have shown the highest values of breast height diameters. It has been statistically proven that significant differences exist in breast height diameters depending on localities (Table 8). The data was analysed using a single analysis variance (ANOVA) and tested with the Scheffe multiple comparison test (Illustration 6).

Table 8: ANOVA for DBH and for each location separately

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Species-Lokve	5	70,93333333	14,18666667	3,31	0,0416
Spec-Slatki potok	5	226,5383333	45,3076667	18,73	< 0,0001
Spec-Durgutovica	5	85,28500000	17,05700000	25,91	< 0,0001

Illustration 6: Scheffe multiple comparison test, DBH

Scheffe Grouping	Mean	N	Species
A	22,967	3	3
L A			
o A	22,033	3	1
k A			
v A	21,100	3	5
e A			
A	20,500	3	4
A			
A	18,233	3	2
A			
A	17,367	3	6

Scheffe Grouping	Mean	N	Species
S A	28,233	3	4
l A			
a B A	24,667	3	3
t B			
k B C	22,100	3	5
i B C			
p B C	21,033	3	1
o C			
t C	18,600	3	2
o C			
k C	17,867	3	6

Scheffe Grouping	Mean	N	Species
D A	23,1333	3	4
u A			
r B A	22,3667	3	1
g B A			
u B A C	20,5333	3	3
t B C			
o B C	19,7667	3	5
v C			
i C	19,7333	3	2
c			
a D	16,3667	3	6

According to the Scheffe multiple comparison test for breast height diameters (Illustration 6) on the Lokve locality there are no significant differences between the six species subject to the research, which is also proven by the border value of $F = 0,0416$. On the Slatki potok locality the species were divided into three groups according to the same test. The foreign species – Douglas fir and Waymouth pine – had the largest values for breast height diameter that did not significantly differ from each other. The European larch and the Scotch pine do not significantly differ from the Waymouth pine, but they do differ from the Douglas fir, Black pine and Norway spruce. When comparing groups A, B and C that are the result of the Scheffe test, none of the indigenous species significantly differ from the European larch. The Scheffe test for breast height diameters on the Durgutovica locality shows four different groups. The Norway spruce significantly differs from the other species. It has the lowest values for breast height diameters on this locality. Apart from the Norway spruce, there are significant differences between the Scotch pine and Black pine, the Black pine and Douglas fir, and the Douglas fir and Norway spruce

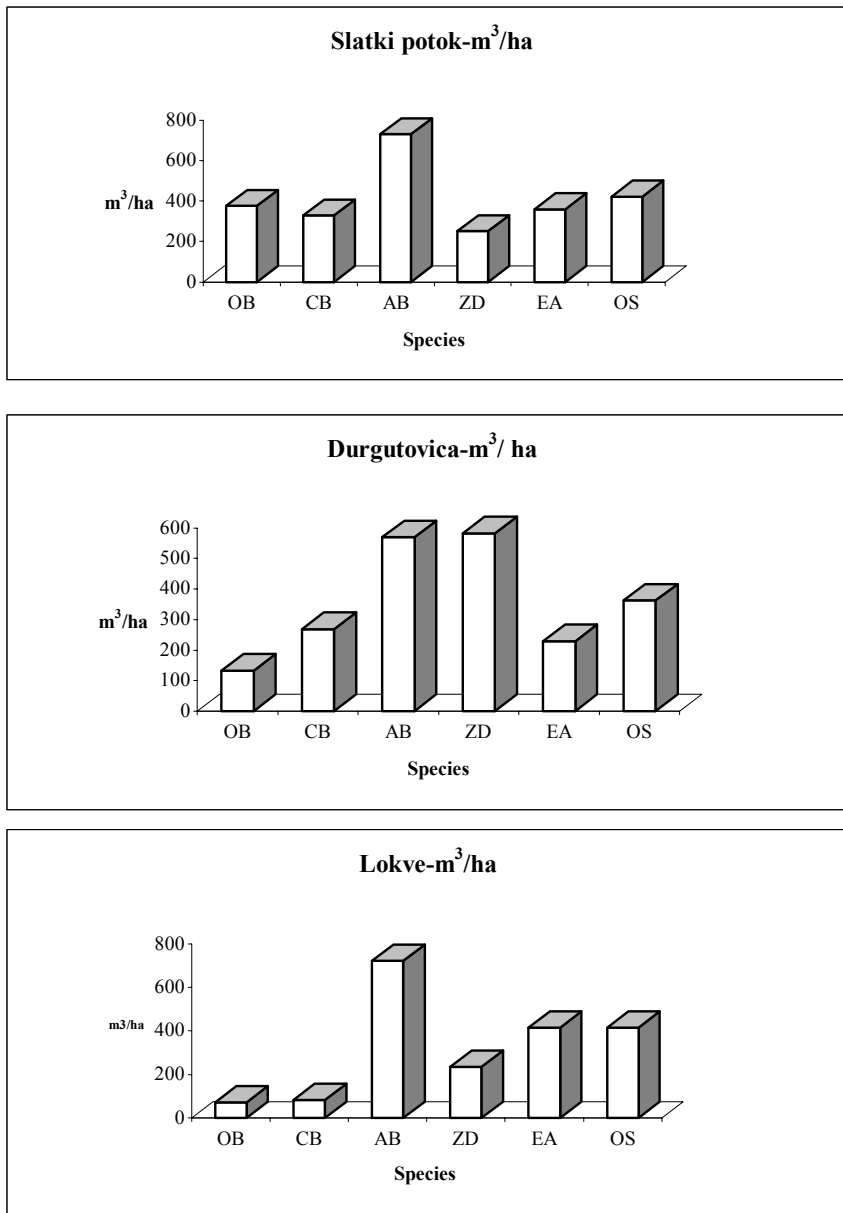
Wood volume and basal area

This study has also conducted an analysis of wood volume according to tree species and locality. The data is given in Table 9 and Illustration 7.

Table 9: Average values for wood volume and basal area

Species	Stem wood, m ³ /ha			Basal area, m ² /ha		
	D	SP	L	D	SP	L
OB	132,909	376,153	72,028	15,3667	43,0371	9,4093
CB	267,874	328,299	81,876	29,0675	38,5168	11,0114
AB	569,209	731,028	722,129	54,2332	64,4589	63,9395
ZD	582,074	250,522	236,475	51,7875	25,5264	27,1638
EA	229,492	360,456	414,495	21,7276	34,1106	38,6164
OS	361,823	422,172	415,265	40,4339	45,7723	46,7519

Illustration 7: Overview of wood volume per tree species and locality



The overview illustrates that the species with the most wood volume in all three localities is the Weymouth pine. The wood volume ranges from 569 m³/ha to 731 m³/ha. On the Durgutovica locality along side the Weymouth pine, the Douglas fir has the highest wood volume value. The Scotch pine (72 m³/ha) and Black pine (81 m³/ha) have an extremely low wood volume value on the Lokve locality. These results are related to the earlier mentioned snow breakage and wind breakage on this locality. On the Slatki potok locality, most of the monitored species (every species except the Douglas-fir) have had the highest wood volume values. When taking into consideration all the factors i.e. survival rate, height, breast height diameter and wood volume we can generally conclude that all the species grow best on the Slatki potok locality.

CONCLUSIONS

On the basis of the research conducted on the six different conifer species in their 32nd year over three localities we can conclude the following:

Throughout the monitored years (1,5,10,32) the highest survival rate was recorded for Norway spruce and Weymouth pine, and the lowest for European Larch, Douglas fir and Scotch pine.

The Weymouth pine and Norway spruce have a harmonized survival rate on all three localities. This indicates wide ecological amplitude of these species.

The European larch and Weymouth pine have the highest height values on the Slatki potok and Lokve localities, and on the Durgutovica locality they follow the values for the Douglas fir. The lowest values for height pertain to the Norway spruce and Black pine on all localities.

Statistical analysis has proven significant differences in breast height diameters and heights depending on tree species and locality, as well as the existence of interaction between locality and species.

The highest values for breast height diameter were in average achieved by Douglas fir and Weymouth pine, and the lowest by Norway spruce and Black pine.

The Weymouth pine has the highest average wood volume value on all three localities.

The Slatki potok locality has proven to be the best as regards growth success for all six species of conifers.

Different climatic conditions and productive capabilities of the stands as well as biological characteristics influence individual species on different localities.

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AFFORESTATION IN POLAND: SILVICULTURAL EXPERIENCES

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SUMMARY

In Poland, the afforestation of lands unsuitable for agriculture is carried out in accordance with the principles of forest silviculture and the amended guidelines of forest management on post-agricultural lands. The most important elements of afforestation process are: soil preparation, the selection of the most suitable species composition, spacing density, and species mixture in plantations. Besides traditional planting methods, natural regeneration, particularly of small-seeded species and intensive plantations (Scots pine and birch), is also used in the afforestation of post-agricultural lands.

This paper discusses the issues directly connected with establishing first generation stands on post-agricultural lands. These issues were the subject of long-term studies at the Silviculture Department of the Forest Research Institute in Warsaw. The main topics of the paper are:

- the past and current status of afforestation in Poland;
- the directions of forest management on post-agricultural land;
- the characteristics of the afforestation process (silvicultural practice); and
- the future of forest research in this field.

Le boisement en Pologne: la sylviculture et les enseignements qui s'en dégagent

Exposé de M. Wojciech Gil et M. Jan Łukaszewicz

Résumé

En Pologne, le boisement de terres impropres à l'agriculture s'effectue conformément aux principes de la sylviculture et aux principes directeurs modifiés relatifs à la gestion des forêts sur les terres postagricoles. Les principaux éléments du processus de boisement sont: la préparation du sol, la sélection de l'éventail d'espèces le plus approprié, la densité et l'espacement, ainsi que le mélange d'essences au sein des plantations. Outre les méthodes traditionnelles de plantation, on utilise également, dans le boisement des terres postagricoles, la régénération naturelle, notamment d'essences à petites semences, et les plantations intensives (pin sylvestre et bouleau).

Les auteurs examinent les questions directement liées à l'établissement de formations arborées de première génération sur des terres postagricoles. Ces questions ont fait l'objet de longues études au département de sylviculture de l'Institut de recherche forestière de Varsovie.

Les principaux thèmes abordés dans le document sont les suivants:

- l'état passé et présent du boisement en Pologne;
 - les orientations de la gestion forestière sur les terres postagricoles;
 - les caractéristiques du processus de boisement (pratique sylvicole);
 - l'avenir de la recherche forestière dans ce domaine.
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Облесение в Польше: лесоводческий опыт

Основной документ, подготовленный г-ном Войцехом Джилом
и г-ном Яном Лукашевичем

Резюме

В Польше облесение земель, непригодных для ведения сельского хозяйства, осуществляется в соответствии с принципами лесоводства и руководящими принципами лесопользования на бывших сельскохозяйственных угодьях. Наиболее важными элементами процесса облесения являются: подготовка почвы, подбор наиболее подходящих пород деревьев, густота посадки и породный состав на лесопосадках.

Кроме традиционных методов посадки деревьев, в процессе облесения бывших сельскохозяйственных угодий также применяется естественное лесовозобновление, особенно мелкосеменными породами, и закладка лесопосадок интенсивными методами (сосна обыкновенная, береза).

В настоящем документе обсуждаются вопросы, непосредственно связанные с закладкой лесопосадок первого поколения на бывших сельскохозяйственных угодьях. Эти вопросы были предметом долгосрочных исследований на кафедре Лесного научно-исследовательского института Варшавы. Основными темами документа являются:

- прошлая и нынешняя ситуация с облесением в Польше;
 - направления лесопользования на бывших сельскохозяйственных угодьях;
 - характеристики процесса облесения (практика лесоводства); и
 - будущая лесная научно-исследовательская деятельность в этой области.
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INTRODUCTION

Afforestation means restitution of forest ecosystems, which for various reasons and in various times were replaced in favour of other ways of land management. Facing the threats of the civilisation and the need of natural environment protection, afforestation has become one of the crucial issues of contemporary forestry management. It is the way to increase forest resources, a tool for nature and landscape protection, the way to enhance the protective functions of forests with regard to waters (reducing the risk of floods through the afforestation of catchments) and soil (preventing erosion processes), promoting aesthetic and recreational values of the environment, reclamation of polluted and degraded lands, a measure mediating social-demographic tensions (employment), an element of spatial policy, rationalisation of land allocation policy and regional development, as well as many other material and spiritual benefits resulting from multifunctional role of forests and bettering man's living conditions.

THE PAST AND THE PRESENCE OF AFFORESTATION IN POLAND

The reforestation of abandoned farmlands began in Poland at the turn of the 19th and 20th century, however, it became most intensive in the period between the World Wars. Nearly 300 thousand hectares of stands planted before the outbreak of the Second World War have been preserved until today. The afforestation process in the post-war Poland is illustrated on Figure 1. It is reported that the greatest scope of afforestation works took place in the years 1949 - 1967 amounting to 45 thousand hectares of land per year (in the aggregate over 850 thousand hectares of land). In record year 1960, 62

thousand hectares were afforested. In the years 1968 - 1980 only 18 - 19 thousand hectares per year were afforested to fall in 1981 - 1991 to 5 - 8 thousand hectares per year. In 1993, after signing loan agreements with the International Bank for Reconstruction and Development and the European Investment Bank, an increase in afforestation was recorded. The land afforested in the period 1947 - 2000 totalled 1322 thousand hectares of post-agricultural lands and wastelands including 761 thousand hectares of the state-owned and 561 thousand hectares of the non-state owned lands (Grzywacz 2002).

In June 1995, the Polish government adopted the National programme for the augmentation of Poland's forest cover for the years 1995 - 2020 in which about 600 thousand hectares were foreseen for afforestation. So far, programme implementation was proceeding according with the plan. In the years 1995 - 2000, 110 thousand hectares of post-agricultural lands and wastelands were afforested which accounted for 110% of the plan for the years 1995 - 2000.

The programme for the augmentation of the country's forest cover is being implemented in following ways:

- afforestation of State Treasury-owned lands by the State Forests Holding and of lands owned by physical and legal entities by appropriate forest districts.
- afforestation of private lands by their owners. In this case the assistance of the foresters and the state is given, including: renting the professional equipment, supplying planting material and state's subsidies on the basis of new Act about destination agricultural land for afforestation (from 8 June 2001 r.).

THE DIRECTIONS OF FOREST MANAGEMENT ON POST-AGRICULTURAL LAND

The main directions of forestry management on post-agricultural lands and wastelands foreseen for afforestation are (Fonder 2002):

1. Establishment of forest plantations which in the future will become multi-functional close-to-nature forest ecosystems;
2. Establishment of forest plantations functioning as the forecrop - I generation of the future forest;
3. Establishment of plantations of fast-growing species for wood production, at wide spacing in short rotation (40 - 60 years);
4. Establishment of forest tree plantations (poplar, willow) for mass production in mini-rotation;
5. Introduction of plant communities in the areas under the impact of extreme threats to natural environment (mainly industrial pollution) - protective zones around industrial plants.

These directions take into account the functions of the planned new forest areas and the ways of forest management i. e. their species composition, horizontal structure (forms of mixture), vertical structure (storeys). All the activities taken by the foresters should be adapted to the local habitat conditions and needs resulting from the state of the environment and the existing threats. The great attention is paid to the non-production functions of forests and manage them in such a way as to create relatively stable, resistant and vital biocoenoses.

The paper concentrate on the issues directly connected with the establishing of forest stands (two first points above) on post-agricultural lands on the lowlands (near 90% of Poland's area). These issues were the subject of the long-term studies at the Silviculture Department of the Forest Research Institute.

SILVICULTURAL EXPERIENCES

The methods used in establishing forest plantations are similar to those of the artificial regeneration of stands on clear-cut areas. The afforestation process includes several important stages. Unsuitable silvicultural practices on any of them could be unfavourable to health conditions of forest stands.

This stages are following (Silvicultural principles 1988, Complex principles... 1998, Gil, Łukaszewicz 1998, Gil, Gorzelak 1999):

Soil analyses

Such analyses are necessary to determine soil fertility and should facilitate planning of suitable tree species composition. Lacking the proper soil analysis, post-agricultural lands were so far generally afforested with Scots pine because of low soils fertility and often for political reasons: quick and easy production of seedlings and easy afforestation methods. In this way the lands were quickly afforested, yet the problem of proper forest-forming processes and sustainability of these forests have been left for the next generations. This problem has become very serious. It is due not only to the unsuitable species composition of young stands but also technological mistakes made during the afforestation campaigns (mainly to incorrect planting during social labour campaigns involving school children or army).

If soil analysis cannot be done, current arable soil classification for a given area should be used. In Poland arable soils of VI class correspond to dry pine forest or fresh pine forest, of V class – to fresh pine forest - fresh mixed forest, of IV class – to mixed broadleaved forest and of III class – to fresh broadleaved forest. Wetlands classified as arable soils of V and VI class and grasslands with a high ground water level corresponding to soils of V and VI class should be left unafforested as areas of ecological utility.

The additional problem is the necessity of analysis of grub (*Melolontha melolontha*) numbers in uncultivated soils and possible chemical treatment, which is also important for good health condition of new plantation.

Soil preparation

Soil preparation prior the afforestation of post-agricultural lands aims first and foremost at:

- liquidation of strongly compacted soil layer at a depth of 15 – 30 cm caused
- by the equipment used in the past,
- liquidation of unrequired effects of the occurrence of arable soil layer,
- weed control
- facilitation of the correct planting of seedlings.

Most of post-agricultural lands are covered with weeds, which make seed germination and growth of seedlings difficult. Many methods of weed control are used on lands which are subject to be afforested or reforested. Our current status of knowledge confirms the correctness of the methods, which lead to the exposition of the soil mineral layer, soil scarification and mixing with the humus layer. In practice, the mechanical methods are most frequently used. Soil preparation should be carried out in the heavily weeded areas using mouldboard and active disc ploughs. It was stated that complete ploughing decrease susceptibility of various species of trees to diseases caused by root-rot fungus (*Fomes annosus* = *Heterobasidion annosum*) (Sternak 1983). Soil scarification can bring about unfavourable effects only on very dry naturally loose soils as it may deepen soil dryness.

Soil preparation is carried out in autumn, so that it could absorb and retain water at the beginning of spring.

The most serious mistake is too shallow ploughing with agricultural ploughs or furrowing with forest ploughs, without loosening and scarification of the soil, which results in the improper development of pine root system and susceptibility to diseases.

Species composition

Scots pine is the main forest-forming species planted on the poorest soils. The admixture of broadleaved species favours soil processes and natural colonisation by forest fungi.

Besides Scots pine, silver fir, European larch and Norway spruce it is recommended to plant the following trees and shrubs: elder, verrucose birch, European beech, bird cherry, sessile oak, pendunculate oak, hedge-row thorn, wild pear, crab tree, rowan, maple, sycamore, hazel, small-leaf lime, black alder, grey alder, evonymus sp., elm sp., white willow, willow, wild cherry.

These species can be the components of the main stand and can be used to establish bird refuges (biological resistance groups) in an area of 1-2 ares in plantations or to afforest edges of stands at the border with open terrain. A well-established refuge should be composed by shrubs of various heights with scattered tall shade-giving trees. It is recommended to surround the whole refuge with the belt of thorny shrubs protecting its inside from unrequired penetration. In refuges deprived of natural water bodies water must be supplied by installing artificial containers. Such a refuge should not be disturbed for several years allowing the plants to grow freely. Only then tending treatments can be carried out, usually in autumn or winter.

Species composition of plantations established on post-agricultural lands in Poland is given in Table 1 (Complex principles... 1998). The share of Scots pine (the most common forest tree species in Poland) in species composition ranges from 80% on the poorest soils to 30% on more fertile ones. However, the mean share of Scots pine in total afforested area is smaller than the present share in the forest land of State Forest (about 70%). It was stated that, with respect to the dominant species, conifers constitute approx. 53% of the afforested area (Gil et al. 1999).

Plant density

Proper spacing is required to create conditions for tree growth in plantations and further development of young stands established on post-agricultural lands. In Poland, the recommended spacings for some tree species growing on post-agricultural lands are as follows:

- Scots pine - 1.5 x 0.7 – 0.5 m (9 – 13 thousand seedlings per ha; lower density is used in worse site conditions),
- European beech - 1.5 x 0.8 m (8.5 thousand seedlings per ha),
- sessile oak and pendunculate oak - 1.5 x 0.9 – 0.8 m (7 – 8 thousand seedlings per ha),
- verrucose birch and other broadleaved species - 1.5 x 1.5 m (ca 4.5 thousand seedlings per ha).

Species mixture

The species mixture in plantations varies and depends on the size of the plantation. The species covering more than 20% of the afforested area should be planted in clumps (clump size above 5 ares), and the species covering less than 20% of the area – in groups (group composed of several seedlings). The species covering about 20% of the area can also be planted in small clumps (clumps below 5 ares).

Natural regeneration

Silviculture has developed the method for natural regeneration of different tree species by the wind. This method can also be applied in afforestation of post-agricultural lands. The location of the afforested land in relation to the stand edge, species composition, age and structure of the neighbouring stand, soil physical and chemical properties, herbaceous cover as well as climatic conditions decide of the selection of the natural regeneration method. The minimum distance of neighbouring stand to the afforested land is: for Scots pine at least 50 m at the leeward and 20 m at the

windward, for Norway spruce - 30 m and 15 m, for birch and aspen - 120 m and 60 m, and for alder - 60 m and 30 m.

The natural regeneration by the wind is used with reference to Scots pine, verrucose birch, aspen, black alder, the species, which are of the greatest importance in making poor post-agricultural lands productive. In natural conditions they are the pioneer species in the deforested areas. It is assumed, that over the period 1995 – 2020 an area of 100 thousands of hectares of former agricultural lands will be covered by naturally regenerated forests.

To obtain the effective natural seeding, the following conditions should be met:

- the proper preparation of soil, according to herbaceous cover,
- the proper structure of stand, which could be formed by tending.

Tending cuttings

It was stated that beside proper initial number of seedlings, proper tending of forest cultures and thickets is necessary for growing stable and productive stands. The incorrectness and arrears of tending cuts in the first age classes (almost 1 mln ha of forest growing on post-agricultural lands are in the age below 40 years!) cause the decrease in resistance of young stands (especially in case of Scots pine and Norway spruce) to the effect of wet snow or wind and influence on health condition of stands (Zajaczkowski 1999). The susceptibility of stand to damages caused by snow and wind is connected with its age, height, species composition, stocking degree and health condition, and with properties of the soil. The greatest number of damages caused by wind appears on wet soils or on poor soils, improperly prepared (with strongly compacted soil layer), where trees have flat root systems. Soil preparation, accurate planting and proper tending cuts help in avoiding damages.

The Scots pine trees in the age of 20 – 30 and Norway spruce in the age of 30 – 50, growing on wet, fertile soils, are especially susceptible to damages caused by wet snow. The proper species composition, smaller number of seedlings per ha and early beginning of tending cuts could help to avoid damages (Zajaczkowski 1996).

Insufficient frequency of tending is also the cause of the occurrence and spreading of root-rot fungus (*Fomes annosus* = *Heterobasidion annosum*) and *Armillaria* sp. Today the infectious diseases of serious intensity are recorded on nearly 180 thousand hectares. The infected stands require quick conversion and persistent control of these pathogens. In 1983, the fungal (*Gremmeniella abietina* and *Cenangium ferruginosum*) epifitosis attacked mainly pine stands in two age classes: below 20 years (Ib) and 20-40 years (II). The disease caused sanitary felling on an area of about 13 thousand hectares.

The proper kind of thinning, the criteria of crop tree choice, intensity and thinning cycle in stands growing on agricultural lands are defined in “Silviculture principles” (1988) and “Complex principles of agricultural land utilisation for forestry” (1998). The new idea is the conception of the stabilised group thinning (Zajaczkowski 1990), which is the variety of Schädelin’s selective thinning. This method coexists with the ideas of semi-natural silviculture.

The forest management of forest – open area zone.

Prior to or during the afforestation of post-agricultural lands the area at the edge of the future forest and the neighbouring open terrain (arable land, lake, etc) should be correctly managed. Correct management can reduce the negative effects of deformed open areas on forests such as soil degradation, reduction of the retentive capacity of forest ecosystems, deformation of plant and animal communities. In the future, such edge between forest and open area can be a buffer against forest fires or water soil erosion.

The forest - open area zone is an area of 20 - 30 m of width. The main forest-forming species should be planted here in a highly wide spacing with tree and shrub species suitable for the microsite. The species such as hedgerow thorn, wild pear, crab tree, rowan, small-leaf lime, and wild cherry should

be the hosts for other organisms. Also, heavily branched conifers such as Norway spruce and common juniper should be planted to create favourable nesting conditions for birds.

Intensive plantations

Intensive plantations of light-demanding trees with loose canopy in short rotation (40 - 50 years) are an important element of post-agricultural land management. Intensive plantations lack the selected genetic material and intensive use of mineral fertilisers. Scots pine and verrucose birch are the most suitable species for intensive plantations. Intensive plantations can be established on fertile and medium fertile soils.

Scots pine plantations should be established at wide spacing (5 -7 thousand seedlings per ha). When trees reach the height of about 2 m (5-year-old plantation) intensive thinning treatments should be carried out leaving the highest and thickest trees ranging between 1 - 3 thousand trees per ha. They form bio-groups composed of the best individuals. The gaps are filled with the admixture species - biocoenotic and phytomeliorative plants. The effect of these measures is the multi-species stand growing in groups and clumps similar to naturally regenerated formation on a non-forest land with fast growing pine as the main species.

Birch plantations should be planted at wide spacing (1 – 2 thousand seedlings per ha) with a simultaneous introduction of the admixture species such as rowan and spirea. They are planted both between the birch rows and between birch seedlings in the row. The plantation established in this way should become a stable stand of birch and admixture species, which play the environment-shaping and protective role. Due to the loose canopy of the stand no improvement cutting is needed.

THE FUTURE OF FOREST RESEARCH IN THE FIELD OF AFFORESTATION

On the ground of scientific and practical knowledge concerned afforestation in Poland, we can state that forest research in this field should be concentrate in the future on following problems:

- comparison of various methods of soil preparation in bearings of restoration its biological activity and efficiency,
- effect of strongly compacted soil layer on growth of tree species,
- study of optimum planting density and species mixture in afforestations, with regard to costs of them,
- consequence of intensive plantations of forest trees in bearings of conversion of agricultural lands into forest sites,
- methods of conversion of Scots pine stands on post-agricultural lands,
- methods of post-agricultural lands magement from the point of view of forest - pasture farms creation,
- methods of post-agricultural lands magement from the point of view of natural forest – grass lands restoration.

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