N. Weber
(ed.)

NEWFOR – New Forests for Europe: Afforestation at the Turn of the Century

Proceedings of the Scientific Symposium
February 16th–17th, 2000 • Freiburg, Germany

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Deutsche Bundesstiftung Umwelt

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Preface

NEWFOR – New Forests For Europe: Afforestation at the Turn of the Century was chosen as motto for a joint scientific symposium that took place at the University of Freiburg, Germany, in February 16–17, 2000. The conference was based on a close cooperation with the German Foundation Stiftung Wald in Not and the European Forest Institute.

Why should one talk about afforestation again, after a series of meetings focussing on the important ability of new forests to fix carbon dioxide? Many European countries are still facing a large discrepancy between afforestation aims on the one hand and their implementation on the other. This is even true for those countries where considerable results have been achieved in the last decades. Afforestation activities are affected by a lot of hindrances on local and regional level. New ways have to be found to defuse the conflicts between agriculture, forestry, nature conservation.

The symposium consisted of one keynote speech and 19 contributions that covered a wide range of afforestation issues. The presentations were given in five sessions, starting with *Afforestation Policy of the EU* and its implications for the respective countries. Further sessions were assigned to the headings '*New Approaches of Afforestation Planning*', '*Landowner and Afforestation*', '*Assessing and Monitoring of Afforestation*'. Moreover, special emphasis was placed on *Afforestation in Eastern Europe* and the preconditions for creating new forests in this region. Country reports were presented about the situation in Bulgaria, Hungary, Latvia, Russia and Ukraine. One evening session was dedicated to issues of afforestation in Germany.

Several institutions and a lot of single actors have contributed to the success of the meeting. Without the generous financial support of the foundation Stiftung Wald in Not and the personal assistance of Dr. Christoph Abs the symposium could not have been realized. The European Forest Institute encouraged the meeting, too, and gave the opportunity to publish the proceedings in its publication series. The invited lecturers from all over Europe contributed with interesting insights in their ongoing research activities. Some of them have been working on afforestation affairs for many years, so the participants could profit from their long-term experience – and hopefully the readers will as well.

Last but not least, I want to thank Norbert Weber for organizing the symposium and for editing the proceedings. Afforestation and afforestation policy have been a research interest of Norbert Weber for a long time. He had already planned and managed a workshop on afforestation of agricultural land in Brussels, December 1991. Thus, he was predestined for organizing NEWFOR and for the editor's task.

I'm sure that these proceedings will meet with the interest of a broad readership.

Prof. Dr. Karl-Reinhard Volz
Institute of Forest Policy, University of Freiburg, Germany

Executive Summary

Norbert Weber

Institute of Forest Economics and Forest Planning, Professorship of Forest Policy,
Dresden University of Technology, Germany

The Scientific Symposium NEWFOR

Organized by the Institute of Forest Policy, University of Freiburg, the European Forest Institute and the German Foundation *Stiftung Wald in Not*, the symposium NEWFOR – New Forests For Europe: Afforestation at the Turn of the Century should give an overview of recent afforestation research in Europe. The meeting, generously sponsored by *Deutsche Bundesstiftung Umwelt* and *Andreas-Stihl-Stiftung*, was attended by 20 invited speakers from 11 countries all over Europe and a representative of the European Commission. More than 30 additional participants followed the presentations and took part in the discussions.

Opening addresses were presented by

- Prof. Dr. M. Becker, Dean of the Faculty of Forest Sciences, Freiburg,
- Prof. Dr. H. Spiecker, Chairman of the Scientific Advisory Board of the European Forest Institute,
- Prof. Dr. W. Rumpf, Vice-Chairman of the foundation *Stiftung Wald in Not*, and
- Prof. Dr. K.-R. Volz, Director of the Institute of Forest Policy, University of Freiburg.

The presentations started with an illustrative keynote speech of Prof. Dr. A. S. Mather, University of Aberdeen, summarizing recent developments and trends of afforestation. Comprehensive country reports rendered basic information, assessing and monitoring of afforestation were choosen as special issues. Due to the increased interest of the European Union in the developments in Eastern Europe, some countries with economies in transition (Bulgaria, Hungary, Latvia, Russia, Ukraine) were given special attention.

New Forests For Europe?

What are the reasons for the discrepancy between afforestation aims and afforestation reality in many countries in Europe? This was the starting point for planning of the symposium.

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During the meeting, it became clear that analyzing the situation of afforestation in Europe involves a lot of further questions:

- Which kind of afforestation are we talking about? For example, at the international level 40 separate definitions have been counted.
- Afforestation in Europe very often took place in the form of waves, but at which place of the wave are we now in single European Countries and in Europe as a whole? Will there be an afforestation wave in Eastern Europe as a consequence of changes on the agricultural and socio-economic sector?
- Does the planting of new forests increase the forest area in some countries definitely, or is it just a small compensation of huge losses of forests, e.g. due to fire?
- Is afforestation a suitable compensation for 'set-aside' of a part of the existing forests and will it facilitate the process of declaring these areas as protected areas?
- Who is responsible for the implementation of afforestation programmes? Are politicians or landowners the driving force?

New Forests For Europe!

In spite of these considerations, there will be new forests anyway as a consequence of processes of natural succession, e.g. in Alpine regions. This development takes place automatically, due to the rural exodus. On the other hand, there should be new forests planted. This goal is fixed in a lot of political programmes on regional, national and international scale. On national level, many forest laws and political programmes contain the target of planting new forests. On the European, Pan-European and International level, three examples can be mentioned:

- Agenda 2000: afforestation as an accompanying measure of agricultural policy,
- Lisbon-Resolution L 2: afforestation of former agricultural land and land without tree cover should be taken into consideration, if this leads to an economic, ecological, social or cultural valorization,
- The Kyoto agreement: new forests should be planted to act as a sink for carbon dioxide.

If there is a consensus that new forests are desirable, who is responsible for implementation? In many countries, public authorities are no longer the leading actors in afforestation activities. There is a clear shift from state afforestation to private afforestation. So the landowners as addressees are gaining importance. Very often, they are not informed about afforestation as an alternative for land use. But also the public has to be considered as an important factor. The partly negative image of afforestation has to be corrected. Mono-cultures, conifer forests, negative impact of afforestation on amenity as past experiences influence today's attitude towards the creation of new forests.

Progress and Deficiencies in Afforestation Research

In contrast to the early 1990s, remarkable progress in afforestation research can be recognized:

- Landscape simulation, as an illustrative means of assessing the preferences of people concerning new forests, has been improved.

- Remote sensing, as a tool of assessing the area balance of forests and clearings / other losses, e.g. due to fire, shows more reliable results.
- Sophisticated Planning and Modelling techniques (e.g. Indicative Forest Strategies for Scotland and Ireland, Leitbilder for Bavarian landscapes) have been developed.
- Highly-developed site mapping and silvicultural know-how can help secure the establishment of healthy forests with a high ecological and economic value.

As a consequence, scientists today can provide better preconditions for politicians for setting more realistic aims and for the implementation of political programmes. However, research deficits on the socio-economic sector are evident. Socio-economic aspects of afforestation are gaining importance with respect to explaining the lacking success of former afforestation programmes. Some important issues are the landowners as individuals, changes in the ownership structure, the abandonment of countryside, the perception of changes in the landscape by urban dwellers. In Eastern European countries, the consequences of the transition processes on afforestation behaviour are not yet clearly analyzed.

The best planning techniques have no results if the landowner does not know anything about afforestation as an alternative land use and the financial subsidies available. In addition, very often the planners don't have enough information about the attitudes and preferences of the landowners and the public. If other decision-makers (officers of agricultural authorities, environmentalists, foresters) hold the opinion that there are enough forests in the respective areas, the implementation of even well-developed afforestation plans will not be feasible.

Afforestation: Progress, Trends and Policies

Alexander Mather

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Abstract

Progress in afforestation in Europe is reviewed in quantitative terms, and the relationship between forest expansion and agricultural retrenchment is discussed. It is noted that the former is lesser than the latter, and that there is no direct national relationship between forest expansion and agricultural contraction. It is also noted that the provision of forest services is an important underlying purpose of new forests, and that this function has been growing in importance relative to the timber production function. Trends towards increasing public participation in forest-related matters are outlined, and various challenges arising from these and other trends are discussed.

Keywords: Europe, afforestation, post-industrial forest, forest policies, public participation

1. Introduction

One of the main land-use changes in Europe over the last century has been the expansion of the forest area. This expansion seems set to continue, perhaps at an accelerating rate, in the foreseeable future as further retrenchment occurs in agriculture. Both the relationship of afforestation to shrinking agriculture and the role and purpose of the new forests are matters of debate at present. Constructions or perceptions of European forests have changed over the last half century, and major questions arise about their purposes and hence about their locations in the years ahead. This paper begins by outlining trends in forest area in Europe, before considering trends in policy and future prospects.

2. Trends in European forest area

At the global scale, Europe is an anomalous continent in terms of forest trends. While the global forest shrinks, the European forest expands. During the 1990–95 period, for example,

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European forests expanded at an average annual rate of 0.3%, while those in Asia, for example, shrank at a rate of 0.7% (forest-area statistics in this paper are based on 'total forest' figures in State of the World's Forests (FAO 1999), which in turn rely on the 1990 and 1995 Forest Resource Assessment). Furthermore, this expansionary trend has been in operation for many decades, as Table 1 shows.

During the 19th and early 20th century, long-established trends of deforestation were halted in many European countries, and then were reversed. Both planting and spontaneous regeneration have been involved in the subsequent expansion, and the two main modes of expansion vary in their relative importance in different countries, and in their policy relationships and implications.

Expansion is usually linked to change and adjustment in agriculture, and in particular to rising yields. In practice, yield increases tend to be greatest in the more fertile areas, and with relatively static demand for food, land of more marginal productivity in agriculture may be abandoned. Afforestation may follow, either through spontaneous regeneration or by planting, often in state-promoted afforestation schemes.

The drivers of afforestation are complex, and include both active and passive factors. Passive or permissive factors include the release of former agricultural land. More active factors include economic incentives, operating directly through the market or more usually through subsidies and grants. The underlying motives for these grants and subsidies may be related to timber production, but more usually, especially in recent decades, they are linked to environmental management in some form. Such incentives may be powerful 'pull' factors, but they sometimes operate in settings of friction or resistance. Traditional farmers, for example, may be unsympathetic to the notion of their land going under forests. In some areas opposition may also stem from environmental groups, especially if exotic species are used and if valued landscapes are modified or transformed.

In Europe excluding the former USSR, total forest increased by 1.9 million ha to nearly 146 million ha. Including the European part of the former USSR, the increase amounts to around 2.6 million ha in an area of 938 million ha, but it should be noted that 'change' data are not available for the Russian Federation.

Figure 1 shows the pattern of forest expansion in Europe during the first half of the 1990s. Central European countries and Scandinavia experienced relatively little change, in absolute or relative terms, whereas much of Western and Eastern Europe have seen substantial expansion. In Ireland, for example, the forest area grew by 14% between 1990 and 1995, mainly by the afforestation of marginal farmland, while in Belarus and the Baltic states significant increases of around 5% were achieved.

Forest expansion can be linked to agricultural contraction, which has been a significant phenomenon across much of the continent (Figure 2), but important provisos must be made. First, expansion of the forest area in Europe (including the European parts of the former USSR) amounts to little more than one-third of the apparent area of agricultural contraction.

Table 1. Forest expansion in selected European countries.

Country	Expansion from	Low forest % of land area	Present forest % of land area
Denmark	1810s	4	10
France	1830s	14	27
Scotland	1920s	5	15
Switzerland	1860s	18	29

Source: FAOSTATS; author from various sources.

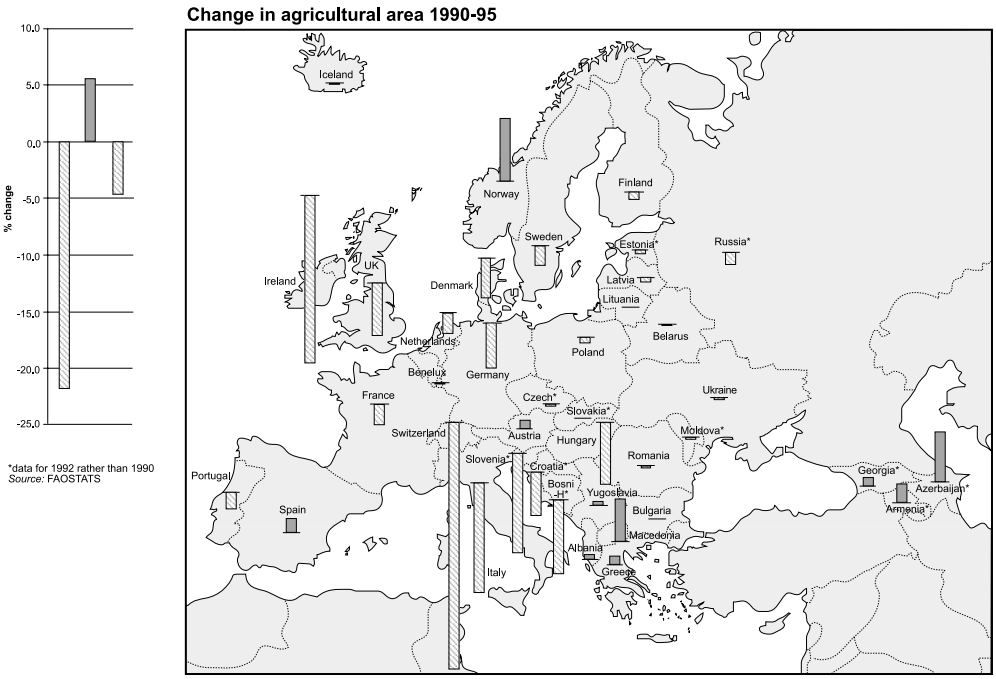

Figure 1. Change in forest area 1990–95. Source: based on data in FAO (1999a).

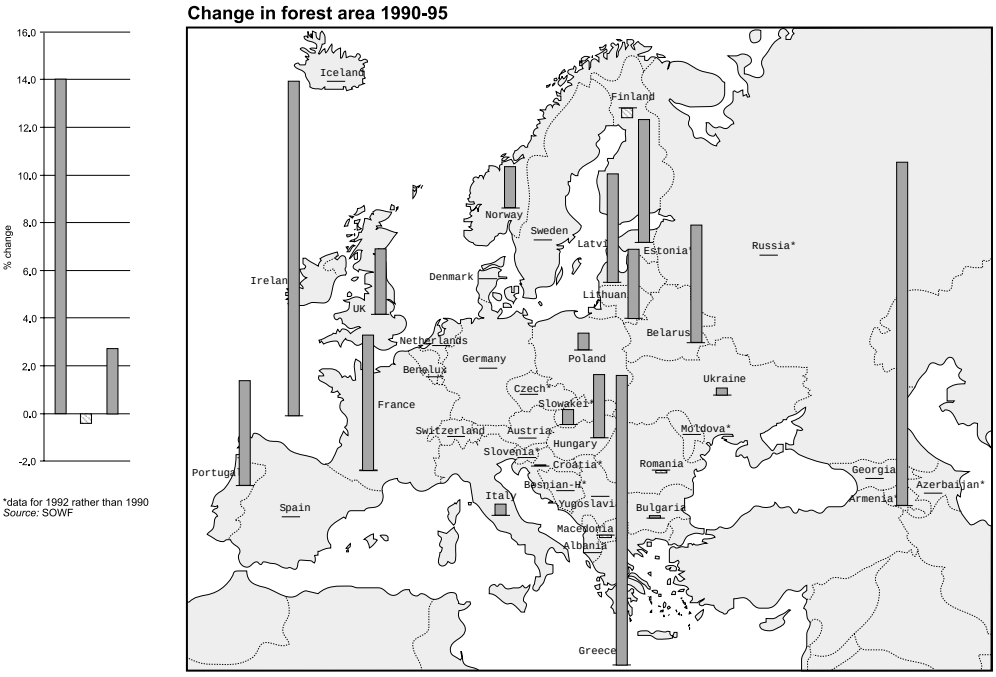

Figure 2. Change in agricultural area 1990–95. Source: based on FAOSTAT.

Second, the patterns of forest expansion and agricultural contraction (by country) are not correlated in a statistically significant manner. Clearly the pattern of variation in forest expansion cannot be explained solely in terms of the retrenchment of agriculture.

The rate of afforestation varies not only across countries, but also through time within individual countries. In Britain, for example, annual afforestation rates have fluctuated from under 20,000 ha to 40,000 ha or more. Paradoxically, afforestation rates in Britain were higher in the 1960s, when a policy of protection of agricultural land was in operation, than in the 1990s when various incentives were provided for the conversion of agricultural land to forest. The complexity of the interaction of the drivers of afforestation is such that it is very doubtful whether useful modelling of Europe-wide afforestation rates can be achieved in the foreseeable future. It can certainly be concluded that 'progress' has been achieved in the reforesting of Europe during the 1990s, and indeed over many previous decades, but confident, credible explanation of the pattern of progress is more elusive.

3. The purposes of the new forests

A shift towards multi-functionality of forests is apparent over much of the continent. Two major trends are apparent that have profound implications for forest management and forest policy. One is a shift in emphasis from forest products (and especially timber) to forest services (such as recreation and wildlife conservation). Related to this shift is a swing from private profits to public benefits. Paradoxically, this shift has coincided in time with the retreat of the state from many areas of activity: nevertheless, public funding – of some form – is both vital and central to the trend.

It remains to be seen whether this late-20th century paradigm shift is as substantial as the 19th century one away from traditional multi-purpose use, integrated with agriculture, and towards one of timber primary, separated from agriculture (Table 2). The extent to which mono-functionality geared to timber production became established varied across the continent, being greater in northern and central Europe than in the Mediterranean lands, for example. Similarly, the timing and extent of a transition to the post-industrial paradigm vary between the different parts of the continent. Nevertheless, despite such variations it is argued that continent-wide trends can be discerned, for example in the resolutions of the European Ministerial Conferences (e.g. Ministry of Agriculture, Rural Development and Fisheries 1998).

Regulation, in the widest sense, is a feature of the post-industrial forest: the relationship between the desired public benefits and private ownership is mediated through some form of regulation, usually consisting of a mixture of incentives and restrictions. In few places is the changing construction of the forest in the late 20th century reflected more clearly than in

Table 2. Forest paradigms.

	Function	Regime
Pre-industrial	Multi-functional Wood, fuel, grazing, fodder, food	Communal
Industrial	Mono-functional Industrial wood	Private
Post-industrial	Multi-functional Recreational, wildlife, amenity, wood	Regulated

Source: based on Mather (1990)

relation to native woodland in Britain. Thirty years ago, when the dominant construction of the forest was as a timber farm, such woodland was regarded as scrub. Now it is cherished. Conversely, some plantations of exotic species, selected for their timber production, are now being felled to waste, in the pursuit of goals of conservation of biodiversity.

This trend towards the post-industrial forest can be illustrated in various ways. In Britain, for example, there has been a spectacular growth in broadleaved planting over the last 10–15 years (Figure 3), to the extent that it now accounts for approximately half of the annual area of new planting.

In practice it serves as a rough proxy for the pursuit of objectives other than timber production, and it reflects the 'greening' of forest policy at the end of the 20th century. It also reflects a changing locational pattern of new planting. Until the mid-1980s, most afforestation in Britain was confined to the uplands, but with the relaxation of controls on the planting of agricultural land thereafter more lowland habitats suitable for broadleaved species were afforested. Similarly in the upland, the rise of planting of native pinewoods reflects the pursuit of goals of biodiversity rather than maximum timber production (Figure 4).

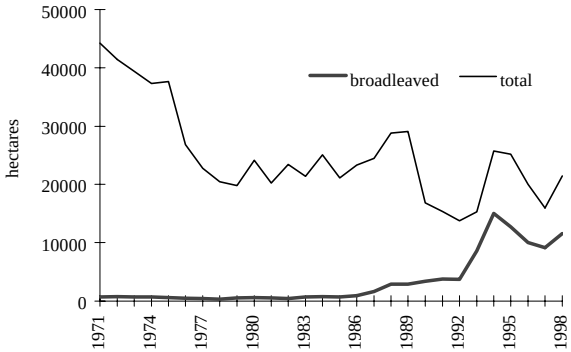

Figure 3. Annual rates of new planting in Britain: broadleaved and total. Source: based on data in Forestry Commission Annual Reports.

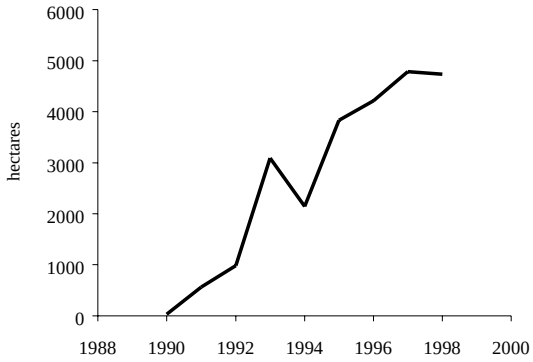

Figure 4. Annual rates (in ha) of new planting of native pinewoods in Britain. Source: based on Forestry Commission Annual Reports.

These trends in the purposes and composition of forests have been accompanied by significant but as yet incomplete changes in the administrative infrastructure. At the continental scale, the European Ministerial Conferences have potentially significant shifts.

At Lisbon in 1998, for example, it was resolved that "The interaction between forestry and society in general should be promoted through partnerships. Therefore an adequate level of participation, education, public relations and transparency in forestry is needed." (Ministry of Agriculture, Rural Development and Fisheries 1998). The extent to which forestry and afforestation were previously characterised by technocratic, top-down administration varied from country to country, but the prevailing trend is clearly towards greater participation at both policy and implementation levels. In Britain, for example, the Forestry Commission now maintains a Public Register of applications for grants for new planting and restocking. Summary details are available in electronic form, and interested persons can view the full application and offer comment on it (http://www.forestry.gov.uk/cs/register.html).

This mechanism operates at the local or planning level, but consultation at the policy level has also become more fully developed in recent years. For example surveys of public opinion on forestry are now carried out by the Forestry Commission in Britain, and often yield interesting results. Table 3 summarises reasons for supporting forestry with public money, as evidenced from the 1999 survey.

While public benefits might be expected to feature prominently in a public survey of this kind, the emphasis on services rather than on material products in the form of timber is very clear. In Britain, the original reason for state support for forestry in general and afforestation

Table 3. Reasons for supporting forestry with public money, percentage of respondents. "In Britain, government grants are given to support forestry … which of the following reasons are good reasons to support forestry with public money?"

To provide good places for wildlife to live	66
To help prevent the greenhouse effect	57
To improve the countryside landscape	55
To bring jobs to rural areas	52
To make the air healthier	50
To provide good places to visit	49
To create pleasant settings for developments around towns	37
To restore former industrial land	34
So that Britain needs less wood, pulp and paper from abroad	29
To provide timber for sawmills and wood processing	21
To provide wood as a renewable fuel for power stations	20

(n=1970, 130 sample points)
Source: Forestry Commission, Survey of Public Opinion on Forestry 1999 http://www.forestry.gov.uk/statistics/contents.html

Table 4. "Would you like to have more or less woodland in this part of the country?" (percentage of respondents)

About twice as much	28	Neither more nor less	12
Increase area by half	25	Less	1
A little more	30	Don't know	4

(n=1970, 130 sample points)
Source: Forestry Commission Survey of Public Opinion on Forestry 1999 http://www.forestry.gov.uk/statistics/contents.html

in particular was timber production, and the state forest service (the Forestry Commission) was established for that purpose. The clear message from Table 4 is that continuing support, and the continuing existence of the Forestry Commission, is now linked to 'post-industrial' objectives.

A similar trend towards consultation, if not full participation, is reflected in another question in the same survey of public opinion. This time the question related to the extent of woodland. As Table 4 indicates, over 80% of the respondents wanted more woodland, compared with 1% who wanted less.

In other words, a policy of forest expansion appears to be supported, at least in principle, by a large majority of the population. It certainly does not follow that local afforestation on the doorsteps of the respondents would be quite so warmly welcomed, but as has been indicated, local views can be expressed at the time of lodging of an application for a planting grant.

A clear trend towards democratisation of forestry-related matters has emerged in Britain in recent years, and at the European level pointers such as the Lisbon resolution indicate movement in a similar direction. Overall, therefore, three major features appear to characterise afforestation in Europe at the end of the 20th century. First, it is occurring over most of the continent, and is linked, although not closely, to agricultural retrenchment. Second, much of the afforestation is directed to the provision of services rather than primarily to the production of timber. Third, there are signs of an increasing degree of democratisation.

5. Problems and challenges

These trends are associated with significant problems and challenges, at least some of which are likely to attract much attention in the years ahead. One of these is the question of location.

5.1 Location of afforestation

Much of the land passing out of agricultural use is likely to be of marginal quality, often in remote or mountainous areas. In some of these areas, the spontaneous reforestation of abandoned land may be unwelcome in changing traditional landscapes. In some other remote areas, however, there may be little opposition to afforestation on landscape grounds, but equally there may be little demand for activities such as forest recreation. Perhaps if new forests are created in such areas there will be a stronger emphasis on timber production than in other locations that are more accessible to urban populations.

Nearer to the main centres of population, the demand for forest recreation is likely to be greater, and this driver of post-industrial afforestation may be stronger. Many of the main cities of Europe, however, are located in areas of fertile farmland, which at first sight would seem less likely to pass out of agricultural use. In other words, a problem of land supply might seem likely. On the other hand, the trends in land ownership and occupancy may favour afforestation, at least around some cities. Demand for hobby or lifestyle farms is growing over much of the continent, and partial afforestation may fit well with the new owners' objectives. In addition, modest areas of forest in peri-urban fringes can serve as useful buffers between town and country, as well as offering valuable recreational and amenity resources. It is therefore perhaps not fanciful to envisage discontinuous belts of forests around the cities, vaguely reminiscent of von Thunen's model of 200 years ago. The determining factor now, however, would not be the transport of firewood and lumber, but the travel of urban people to

peri-urban forest recreation. In short, interesting questions of location emerge from the interaction of release of land from agriculture and type of new forest for which demand exists. Perhaps one of the reasons for the disparity between the extents of agricultural retrenchment and forest expansion is simply a mismatch between the spatial pattern of land coming out of agricultural use and the spatial pattern of demand for recreation and other forest services.

5.2 Timber production and European competitiveness

One of the reasons for the retrenchment of agriculture is surplus food production. While one of the most obvious uses to which surplus agricultural land can be put is afforestation, there are economic impediments as well as other obstacles. At present net annual increment European forests available for wood supply is about 50% higher than fellings annually (Peck and Ottitsch 2000). There is therefore in effect a timber surplus at present. While timber production may be receiving less emphasis in new European forests than it did previously, it is still a forest function. Questions of the demand for the potentially additional supply of timber from new forests therefore arise. Furthermore, there are serious questions of competitiveness of timber from European forests, especially in relation to cheap supplies from fast-growing plantations in countries such as Chile. While certification schemes and similar initiatives may to some extent help to maintain a relatively level playing field in terms of the environmental standards applied to timber production around the world, the fact of geographical variation in growth, as well as in costs of land and labour, may operate against Europe. And if European forests are managed multi-functionally, rather than with a near mono-function emphasis on timber production, the cost differential may widen. In short, serious challenges exist in terms of competitiveness of European timber production. On the other hand, competition may be easier in niche markets for specialised woods, and the trend towards broad-leaved species which has already been demonstrated may be favourable in this respect.

5.3 Planning and democratisation

The trend towards wider and fuller public participation may also present challenges for the planning of the new forests. This challenge, of course, is faced in numerous realms of activity, and not just in forestry. The transition may be especially difficult in forestry, however, because of its traditional ‘top down’ character. In this transition, the role of the technical expert in forestry may come under increasing scrutiny, as it already has to some extent in some areas. In practice the matching of the spatial patterns of land supply and forest demand is extremely difficult, and the achievement of orderly progress based on a partnership between public participation and technical expertise will not be easy.

6. Conclusion

Forests are expanding across much of Europe, have been doing so for decades, and are likely to continue to do so for the foreseeable future. The dominant construction of the forest is at the same time changing: as we move into the post-industrial age the prevailing forest paradigm is changing from an industrial one, focusing on timber production, to a post-

industrial one, in which forest services become more important relative to timber production. The procurement of these public benefits is facilitated by public funding, through various grants and subsidies. In this economic respect, the institutional obstacles are probably less difficult than those that seek to reconcile democratisation of, or public participation in, forest policy and planning with orderly change and orderly afforestation. Globally, the European trend of expanding forests is unusual. With very diverse forest histories and traditions, European countries may be able to learn from each other: they will not find many models to emulate on the wider international scale.

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Afforestation Policy of the EU and its Impacts on Member States

European Experiences with Regulation 2080/92 and the New Afforestation Policy Under Agenda 2000

Louis du Breil de Pontbriand

Administrator, European Commission

Abstract

This paper summarises and updates, whenever possible, the conclusions of the report issued by the Commission in 1997 on the application of Regulation 2080/92. The specifications of an ongoing evaluation of the Regulation, which has been requested by the European Parliament, are also provided.

The general objectives of the reform of the Common Agricultural Policy initiated by Agenda 2000 are presented. The forestry measures in the new Regulations on support to rural development are listed, together with the new monitoring and evaluation tools. The main changes to forestry measures introduced by the new scheme, as well as their consequences, are briefly analysed.

1. European experiences with regulation 2080/92

1.1 Description of the regulation

Flanking measures were adopted in 1992 to accompany the CAP reform. These authorised aid for the environment, early retirement and forestry. As part of one of the main areas of reform – temporary set-aside or reallocating farmland to afforestation or non-food production – Council Regulation (EEC) No 2080/92 of 30 June 1992 instituted a Community aid scheme for forestry measures in agriculture. The aid was part-financed by the Guarantee Section of the European Agricultural Guidance and Guarantee Fund (EAGGF) to promote afforestation as an alternative use of agricultural land and the development of forestry activities on farms, in order to:

- accompany the changes to be introduced under the market organisation rules,
- contribute towards an eventual improvement in forest resources,
- contribute towards forms of countryside management more compatible with environmental balance,

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• Combat the greenhouse effect and absorb carbon dioxide.

The Community provided 75% part-financing in Objective 1 regions and 50% in other regions under the EAGGF Guarantee Section. The aid scheme comprised aid for afforestation costs, a premium to cover maintenance of afforested areas, a premium to cover losses of income resulting from afforestation of agricultural land and investment aid for the improvement of woodlands belonging to farmers. The characteristics of the aid scheme are summarised in Table 1.

1.2 Monitoring and evaluation tools

Commission Regulation (EC) No 1054/94 laying down detailed rules for the financial monitoring of programmes approved under Council Regulation (EEC) No 2080/92 was adopted on 5 May 1994. Its purpose was to establish a reliable system for the financial monitoring of the application of Regulation (EEC) No 2080/92. Thus, it permitted reactions in the framework of the early warning system for budget discipline and estimates of the trend in expenditure affecting future budgets as a result of the multiannual nature of certain commitments entered into under approved programmes, resulting in expenditure to be

Table 1. Summary of the aid scheme.

<table>
<tr><th rowspan="2"></th><th rowspan="2">Maximum amounts of aid</th><th colspan="3">Beneficiaries according to the species planted</th></tr>
<tr><th>Christmas trees</th><th>Fast-growing species</th><th>Other species</th></tr>
<tr><td>Aid for afforestation costs</td><td><table><tr><th>Species planted</th><th>Amount (ECU/ha)</th></tr><tr><td>Eucalyptus</td><td>2.415,0</td></tr><tr><td>Softwood</td><td>3.623,0</td></tr><tr><td>Broadleaves / mixed plantations</td><td>4.830,0</td></tr></table></td><td></td><td colspan="2">Competent public authorities of the Member States
Farmers practising farming as a main occupation (deriving at least 25% of their income from agriculture)
Any natural or legal person undertaking afforestation of agricultural land</td></tr>
<tr><td>Annual premium per hectare afforested to cover maintenance costs in the first five years</td><td><table><tr><th rowspan="2">Species planted</th><th colspan="2">Amount (ECU/ha/year)</th></tr><tr><th>years 1-2</th><th>years 3-5</th></tr><tr><td>Softwoods</td><td>301,9</td><td>181,1</td></tr><tr><td>Broadleaves / mixed plantations</td><td>603,8</td><td>362,3</td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td>Annual premium per hectare to cover losses of income resulting from afforestation of agricultural land</td><td><table><tr><th>Recipient</th><th>Amount (ECU/ha/year)</th></tr><tr><td>Farmer</td><td>724,5</td></tr><tr><td>Non-farmer</td><td>181,1</td></tr></table></td><td></td><td></td><td>Any private-law natural or legal persons other than farmers participating in the early retirement scheme under Council Regulation (EEC) 2079/92</td></tr>
<tr><td>Aid for the improvement of woodlands</td><td><table><tr><th>Type of investment</th><th>Amount</th></tr><tr><td>Shelterbelts</td><td>845,3 ECU / ha</td></tr><tr><td>Firebreaks</td><td>181,1 ECU / ha</td></tr><tr><td>Waterpoints</td><td>181,1 ECU / ha</td></tr><tr><td>Forest roads</td><td>21.735,0 ECU / km</td></tr><tr><td>Cork oak stands</td><td>1.691,0 ECU / ha</td></tr><tr><td>Others</td><td>845,3 ECU / ha</td></tr></table></td><td></td><td></td><td>Farmers or associations thereof</td></tr>
</table>

charged to the Community budget over several years. Under this Regulation the Member States forward information on progress in implementing the aid scheme every six months and expenditure forecasts every quarter.

Besides the information provided under Regulation (EC) No 1054/94, the Member States were also supposed to forward additional technical information to the Commission each year on the basis of a supplementary questionnaire.

Table 2 summarises the information collected through both systems.

1.3 First conclusions: the 1997 report

In conformity with in Article 8(3) of the Regulation 2080/92 a report on its application was submitted to the European Parliament and the Council in 1997. The report was based on the results available with respect to the application of the Regulation between 1993 and 1996. It analysed the information forwarded by the Member States to the Commission on the achievements of the programmes by 30.4.1996.

The report admitted it had to be regarded as an activity report rather than as an evaluation, even though it contained elements related to the latter. The short period covered limited the

Table 2. Information collected under Regulation 1054/94 and through the supplementary questionnaire.

Geographical level	Type of information		Data provided			
			Number of beneficiaries, demands or authorizations	Area (ha) or other indicator (km, number)	Cost	
	Status of applications	Type of aid / Specific distribution			Total	Eligible for Community part-financing
Country	Applications to join the scheme	Private afforestation	■	■	■	■
		Improvement	■	■		
	Authorizations granted	Private afforestation	■	■	■	■
		Improvement of woodland	■	■		
	Applications definitively approved	Private afforestation	■	■	■	■
		Public afforestation	■	■	■	■
		Public and private afforestation	■	■		
		Species & type of land	■	■		
		Maintenance	■	■	■	■
		Income loss	■	■	■	■
		Farmers / non-farmers	■	■	■	■
		Improvement of woodland	■	■	■	■
		Type of investment	■	■	■	■
Objective 1 regions	Applications to join the scheme	Private afforestation	■			
		Improvement of woodland	■			
	Authorizations granted	Private afforestation	■	■		
		Improvement	■			
	Applications definitively approved	Private afforestation	■	■		■
		Public and private afforestation	■	■		■
		Maintenance	■	■		■
		Income loss	■	■		■
		Farmers / non-farmers		■		
		Improvement of woodland	■	■		■
Region	Applications definitively approved	Public and private afforestation	■	■		■
		Improvement of woodland	■	■		■

■ Data provided under Regulation 1054/94

■ Data requested in the supplementary questionnaire

representative nature of the results and did not permit precise conclusions to be drawn about the application of the Regulation or produce an accurate verdict on how successful it has been.

The main results and conclusions of the report are summarised below.

Quantitative results

- Despite the prolonged drought in 1994–95 which seriously slowed down the pace of *afforestation* on the Iberian Peninsula, Spain, the United Kingdom, Ireland and Portugal together accounted for over 80% of the 500 000 ha of agricultural land afforested under the Regulation. Spain dominated with 47%. The highest number of beneficiaries of the aid for afforestation was also in Spain. Private individuals had mainly been in receipt of the aid for afforestation costs (98%);
- The *decrease in utilised agricultural area* (UAA) resulting from afforestation in most Member States had been marginal. Highest decrease was in Ireland (1.35%), Portugal (1.25%) and Spain (0.95%). The main *increase in forest area* ensuing from afforestation had occurred in Ireland (almost 12%). It was only just above 2% in the United Kingdom and less than 2% in all other Member States;
- The *average area of afforested land* per private beneficiary was around 6 ha. The largest gap was between Portugal at one end of the scale (30 ha) and Greece, Germany and Austria at the other (all around 1 ha);
- Overall, 40% of afforested areas in the EU involved coniferous *species* and 60% broad-leaves or mixed plantations. However, the spread varied widely between Member States (for instance below 10% conifers in the Netherlands, Greece and Germany, and over 80% in Ireland);
- 61% of land afforested were permanent grassland and pasture, 36% arable land and 3% land under permanent crops (vines, orchards, etc.). This proportion varied widely between Member States. Countries such as the Netherlands or Denmark generally had undertaken afforestation of arable land, while Austria and Ireland concentrated on permanent grass-land and pasture;
- The highest number of beneficiaries of the *premium covering income loss* had been in Germany, where it had been granted to more than 90% of those in receipt of aid for afforestation. In the United Kingdom the premium was awarded to farmers only. In Finland and Greece (each with a high number of "part-time" farmers) mainly non-farmers had benefited from the premium;
- Germany, Denmark and Finland together accounted for 80% of the 26 000 beneficiaries of the *aid for the improvement of woodlands* belonging to farmers, while this aid had practically not been in some Member States such as France and Ireland. 85% of the 180 000 ha affected by this measure were in Spain (38%), Finland (26%) and Germany (21%). In southern Europe (Spain, Portugal and Greece) this aid was mainly used for fire protection measures (firebreaks, waterpoints) in line with Regulation (EEC) No 2158/92 on protection of the Community's forests against fire, for forest paths, and for the renewal and improvement of cork oak stands (in Portugal especially). In northern Europe the aid helped developing shelterbelts in Denmark, and restructuring the existing drainage system and regenerating unproductive stands in Finland. In Germany and the United Kingdom the investment in farm woodland concentrated on forestry measures to increase the stability and environmental value of stands. Finally, with 7300 km of new forest roads, the network was extended throughout the Community but mainly in the southern countries.

Conclusions

- Aid for afforestation has existed for a long time, both at Community level and in some Member States. The Community launched various schemes to encourage the afforestation

of agricultural land between 1980 and 1990, including the Integrated Mediterranean Programmes and measures relating to agricultural structures. However, the implementation of Regulation (EEC) No 2080/92 had given a new boost to this type of afforestation, largely because it had introduced a premium to cover income loss which guaranteed an annual source of income for the farmer for a period of up to 20 years.

- The scheme had largely been applied in Member States or regions wishing to expand their forest area. The concentration of agricultural production on the most productive cultivated land and marginalization of less productive agricultural land had been the main factors determining whether or not agricultural land was converted to forest use in these regions, which were often marked by low existing afforestation and a desire to increase this rate in order to boost wood-based industries, and a recognition of the need to curb rural decline by afforesting agricultural land doomed otherwise to be abandoned.
- In terms of area, over 65% of afforestation had been carried out in areas believed at risk of fire under Council Regulation (EEC) No 2158/92 on protection of the Community's forests against fire. In these areas, afforestation is an effective means of combating soil erosion and climate change (Annexe IV to the International Convention to Combat Desertification recommends afforestation to offset the impact of desertification). Decisions adopting the programmes provided for under Regulation 2080/92 ask the Member States to include fire prevention measures in plans to afforest high-risk areas and in particular to comply with plans to protect forests against fire approved by the Commission under Regulation 2158/92.
- The average area of afforested land per beneficiary is generally relatively low. Although this value does not reflect the attempts to group together smaller properties and thus obtain larger, unbroken forest areas, it could be said that in some regions farmland had been broken up into small plots of land, leading to "postage stamp" patches of woodland, hampering profitable forest management although benefiting landscape. Moreover, the premium covering income loss paid to these "mini woodlands" does not bring in a significant compensation for farmers. Several reasons have been put forward to explain this situation: farmers' tendency to convert just a small proportion of their land to forestry use rather than making a total changeover; attempts to improve poor quality agricultural land (land producing low yields or where farm mechanisation is difficult) and extend existing wooded areas ("fleshing out" existing wooded areas); and the time factor, which means that afforestation can be achieved in small stages over several years, thus improving the balance between the time required to establish forest plantations and the low funds left over from farming activities.
- While it was difficult to distinguish general rules on the type of land used for afforestation, it could be said that:
  - In arable crop areas, where per hectare added value is high, the afforestation rate is low. There are not many possibilities of releasing land and the few woodlands that have been created are intended to combat wind or soil erosion or for game reserves;
  - In intensive livestock farming areas, where farm value added is relatively high, agricultural activity remains stable and afforested areas are fairly small;
  - Woodlands are established preferably on permanent grassland in areas where livestock breeding is less profitable, or on unproductive arable land, in other words areas with low per hectare agricultural value-added, low market values and low rents in general.
- The effect of Member States' decisions fixing the rate of aid to compensate for income loss within the scale laid down in the Regulation on the one hand and for other agricultural measures, such as set-aside and Regulation 2078/92, on the other was by no means negligible. It was likely, for instance, that potential afforesters had been discouraged in Germany, where the fixed set-aside premium was often more attractive than the afforestation premium; on contrary, in Extremadura (Spain), the afforestation scheme seemed to be

more attractive for farmers in comparison to the agri-environmental measures. However, other factors also plaid a part in farmers' decisions (such as the reduction in land value or the difficulty of reversing the process, for example).

The fact that the premium covering income loss had been limited to farmers practising farming as a main occupation might also have hindered afforestation in regions where many rural players cannot derive more than 25% of their income from farming (this is true both of the EU's northernmost regions, where small farms are frequently combined with large forest properties, and of the southern regions, where farmers also have to work in areas outside farming as such).

- In the 1980s the potential role of afforestation within the context of the CAP reform was considerably over-estimated. Forecasts considered only hypothetical areas (15–20 million hectares) of agricultural land that might possibly be afforested without taking into account the various environmental, economic, social and legal constraints framing choices of how to use released agricultural land.
- As regards the *CAP-related objectives* of the Regulation, afforestation of agricultural land had had probably only a small impact on reducing surplus agricultural production. But it had surely contributed to rural development by encouraging pluriactivity on the part of farmers.

  The *environmental policy objectives* had not always been reached. In some cases non-compliance with the environmental conditions laid down in the programmes or faulty interpretation had produced a negative impact on the environment (for example when conditions laid down to preserve valuable biotopes were ignored). Within the context of global climate change the contribution of the afforestation to carbon dioxide fixation had been of course very modest. However, the policy of afforestation of agricultural land was an important part of the global environment policy to which the EU committed itself at the 1992 Rio Conference (UNCED).

  Concerning *forestry policy objectives*, Member States had made use of the flexibility in the Community framework laid down in the Regulation to choose various options in line with their forestry policy and focus either on developing their wood-based industries or on the environmental and social functions of the forests. In Ireland, for example, where the aim is to double forest area over the next thirty years so as to create economically viable wood-based industries, the programme largely focused on plantations with a high economic return (sitka spruce, pine, etc.). In contrast, the United Kingdom programme strove to integrate application of the Regulation into an overall regional planning policy focusing on the countryside and environmental aspects.
- Regulation (EEC) No 2080/92 was directly applicable throughout the European Union, although each Member State was free to choose what exactly they wished to focus on. Starting from the basis of a fairly general European law, each country and region has adapted the Regulation to their particular needs. Several elements, such as the interests of individuals, the policies followed and the areas concerned, have a positive or negative impact on the choices that can be made when afforesting agricultural land. Some of these elements are shown in the Table 3.
- France and Ireland made practically no use of investment aid in farm woodland. In Ireland this was probably due to the fact that projects linked to Regulation (EEC) No 2080/92 concentrated entirely on afforestation, since the operational forestry programme adopted within the framework of the EAGGF Guidance Section for Objective 1 regions offered to part-finance measures that improved the existing forest and was not limited to farm woodland. In France, national aid systems do not always make it easy to distinguish forest belonging to farmers from that belonging to other private owners. It is therefore difficult for it to meet the eligibility criteria laid down by Regulation (EEC) No 2080/92.
- Rather than having a real impact on improving the economic viability of farm woodland,

Table 3. Incentives and disincentives of aid for afforestation.

Incentives	Disincentives
Agriculture, CAP	
- Low-productivity agricultural land - Search for other production niches to bring in additional income	- Competition with aid awarded under other Regulations (2078/92, set-aside) - Concern about Community, national or regional guarantees needed to continue premiums long term - Irreversible nature of the measure (land cannot be returned to agricultural use)
Regional planning	
- Development of the forest stand	
Employment	
- Opportunity to employ the available workforce profitably in agriculture's low season	
Environment	
- Improvement of the environmental and landscape quality of rural areas - Combat against soil erosion and desertification	- Possible reduction of scenic value due to species choice
Statutory	- Conflict with the farm lease act
Socio-economic and financial	
- Reversion to farming impossible for farmers' descendants - Improvement in wildlife value - Increase in market value of marginal land areas (remote areas, land poorly suited to agricultural use, tiny plots of land on the edge of the forest, etc.) - Establishment of an area for leisure use - Diversification of financial investments - Promotion of regional heritage of large landowners in certain areas	- Unfavourable economic climate for wood-based industries - Reduction in financial value of agricultural land after afforestation - Continual investment required at the start and long-term repayment

aid measures to improve farm woodland were more like ongoing forestry management aid, simply extended to cover farm woodland and thus backing up existing national aid in most cases. Furthermore, by limiting aid to afforested areas linked to farms, the Regulation could only partly attain its objectives of long-term improvement of forestry resources and more environmentally compatible countryside management.

1.4 Update of the first results

Unfortunately all Member States did not provide regularly the Commission with the information requested in the supplementary questionnaire. The only information continually updated was the one requested by Regulation 1054/94 which did not include details on the distribution of afforested land by species planted and by type of agricultural land, and on the different measures financed to improve farm woodland.

The latest available information is synthesised in Appendix 1. Compared with the previous situation, main changes are:

- Spain, Portugal, the United Kingdom and Ireland together still account for over 80% of the agricultural land afforested under the Regulation, which now amounts to nearly 900 000 ha. Spain still dominates with 45% and Portugal has overtaken the United Kingdom and Ireland. The total number of beneficiaries now amounts to more than 130 000;
- The average area of afforested land per private beneficiary is now close to 7 ha. Portugal is still at one end of the scale (25 ha) and Greece, Germany and Austria at the other (all around 1 ha), joined by Denmark;
- There are now more beneficiaries of the premium covering income loss in Spain than in Germany. 50% of the beneficiaries are in those two countries;
- Germany now accounts for nearly 50% of the beneficiaries of the aid for the improvement of woodlands belonging to farmers, which now exceed 40 000.

1.5 The new evaluation of the Regulation

Regulation 2080/92 contains no requirement concerning evaluation. However, arguing that the report that the Commission published in 1997 was not sufficient to really assess the cost-effectiveness of the scheme, the European Parliament requested a more thorough evaluation of the Regulation ("Otila Report", 30.9.1998). This demand was subsequently echoed by the Economic and Social Committee as well as by the Budget DG of the Commission.

The evaluation unit of DG Agriculture published in the Official Journal on 2.2.2000 an invitation to tender for the carrying out of this evaluation. It states that the evaluation should focus on the accountability of the Commission vis-à-vis the budgetary authorities in terms of the impacts that have been achieved and how these have served the objectives. The evaluation should examine the effectiveness of the scheme, i.e. how far it has achieved its goals, and its efficiency, in the sense that the resources mobilised (financing, legislation, administration, etc.) are in reasonable proportion to the effects that have been achieved. The evaluation must also pay attention to unexpected effects or negative effects of the scheme, for example, resulting from afforestation at less suitable locations.

A number of evaluation questions have been worked out. They are arranged within five main themes, i.e. rural development, forestry, agriculture, environment and implementation and programme management. The evaluator will have to elaborate criteria and indicators and any other necessary methodology in order to answer the questions. The findings concerning the individual evaluation question should finally be drawn together in order to provide a comprehensive answer concerning the contribution of the assisted actions to the objectives listed in Article 1 of Regulation 2080/92. The evaluation questions are listed in Appendix 2.

2. The new afforestation policy under Agenda 2000

2.1 General objectives of Agenda 2000

At the end of its meeting held from 22 February to 11 March 1999, the Agriculture Council reached, by qualified majority, a political agreement on the overall Presidency compromise in agreement with the Commission concerning the agricultural aspects of Agenda 2000. The overall agreement on Agenda 2000 was reached at the European Council in Berlin on 24–25 March 1999.

The priorities for the European Commission when it drew up its proposals for reforming the CAP was to ensure that European agriculture would become more competitive on both the EU and global markets, more environmentally sensitive and that farmers livelihoods would be protected.

The main purpose of the new policy for rural development is to establish a coherent and sustainable framework for the future of Europe's rural areas. The new policy is guided by a multi-sectoral, integrated approach to rural development. On the one hand, it recognises that farming plays a number of roles including the preservation of the rural heritage. On the other hand, it recognises that the creation of alternative sources of income must be an integral part of rural development policy.

A major innovation has been to bring a series of rural development measures together in a single, coherent package offering support to all rural areas in 3 main ways:

- By creating a stronger agricultural and forestry sector. The principal measures include those for the modernisation of agricultural holdings and for the processing and marketing of quality agricultural products. In addition the viability of agricultural holdings will be facilitated by measures for the establishment of young farmers and through improved conditions to encourage early retirement from farming. Forestry has been formally recognised as a key element of rural development for the first time where a new measure will seek to support the sector where it serves an ecological function.
- By improving the competitiveness of rural areas. Here, the principle objectives are to support the quality of life of the rural community and to promote diversification into new activities. The measures are designed to create alternative sources of income and employment for farmers and farming families and for the wider rural community.
- By maintaining the environment and preserving Europe's unique rural heritage. Agri-environment measures will support environment-friendly agricultural methods. They will be the only compulsory element in the new generation of rural development programmes and hence a decisive step towards the recognition of the multi-functional role of agriculture. As an additional measure which will help in the further 'greening' of the CAP, the traditional compensatory allowances in support of farming in less favoured areas will be extended to areas where farming is restricted by the existence of specific environmental constraints.

Guiding principles for the new rural development policy are those of decentralisation of responsibilities and flexibility. It is for the Member States to come forward with proposals for rural development programmes targeted at an appropriate geographical level. They can draw on a menu of rural development measures set out in the regulation according to their needs and priorities. The regulation itself reflects a major step in the direction of the simplification of European legislation: a single text replaces nine previously existing regulations.

2.2 Forestry in the new regulations on support to rural development

Council Regulation (EC) No 1260/1999 of 21 June 1999 lays down general provisions on the Structural Funds for the period 2000 to 2006. As regards agriculture, specific provisions are laid down in two other regulations:

- Council Regulation (EC) No 1257/1999 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) and amending and repealing certain Regulations;
- Commission Regulation (EC) No 1750/1999 of 23 July 1999 laying down detailed rules for the application of Council Regulation (EC) No 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF).

As far as forestry is concerned, Regulation 1257/1999 brings together previously isolated measures in Council Regulation such as 1610/89 (scheme to develop and optimally utilise woodlands in rural areas in the Community), 2080/92 (aid scheme for forestry measures in agriculture) and 867/90 (improvement of processing and marketing conditions for forestry products). Forestry measures are grouped in one chapter (chapter VIII), consisting in the four following articles:

- Article 29 specifies the objectives and the beneficiaries of the forestry measures;
- Article 30 describes the different eligible measures;
- Article 31 lays down the provisions as regards the afforestation of agricultural land;
- Article 32 introduces a new measure that allows for providing aid to forests with a prominent protective and ecological role.

Regulation 1750/1999 dedicates one section (section 8) in Chapter II (rural development measures) to forestry where it complements or clarifies several provisions of regulation 1257/1999:

- Article 24 clarifies which types of ownership exclude forests from support under Article 29 of regulation 1257/1999;
- Article 25 gives supplementary information on agricultural land eligible for support for afforestation according to Article 31 of Regulation 1257/1999;
- Article 26 defines which “farmers” can benefit from the premium to cover loss of income, and which “fast-growing species cultivated in the short term” are excluded from maintenance and income assistance according to Article 31(1) and 31(3) of Regulation 1257/1999;
- Article 27 specifies that support under Article 32 of Regulation 1257/1999 may not be granted in relation to areas for which support under Article 31 has been granted, and adds specific provisions for payments with a view to maintaining fire-breaks through agricultural measures.

2.3 New monitoring and evaluation tools

The new tools for the monitoring and the evaluation of the forestry measures in the national or sub-national programmes of the Member States are currently under discussion. They consist of:

- A questionnaire with monitoring indicators that Member States shall communicate on a regular basis to the Commission. This questionnaire is annexed in Appendix 3;
- Guidelines for evaluation, which will be used before the launching of the programmes (ex-ante evaluation) and after they have been carried out (ex-post evaluation). The questions included in these guidelines are listed in Appendix 4.

2.4 Differences between the previous and the new regulations and consequences for forestry measures

2.4.1 Financing and programming

All forestry measures under Regulation 2080/92 were financed by the Guarantee Section of the EAGGF and were presented by the Member States in autonomous programmes. Regulation 1257/99 modifies both the financing and programming rules. Furthermore in

Regulation 2080/92 the rate of Community part-financing was fixed to 75% in regions covered by objectives 1 and 6 and to 50% in other regions. Regulations 1257/99 and 1260/99 introduce new co-financing rates.

Tables 4 and 5 below present the new programming and financing rules and rates.

2.4.2 Other differences

Main differences between the new scheme and that of the previous Regulation are:

- Public authorities are now excluded from afforestation aid;

Table 4. New financing and programming rules.

<table>
<tr><th colspan="2"></th><th>Afforestation of agricultural land</th><th>Other forestry measures</th></tr>
<tr><td colspan="2" rowspan="2">Objective 1
(Regions whose development is lagging behind)</td><td rowspan="3">Financing:
EAGGF Guarantee</td><td>Financing:
EAGGF Guidance

Programming:
according to DG Regions' regulation</td></tr>
<tr><td rowspan="2">Non-objective 1</td><td>Objective 2
(areas facing structural difficulties)</td></tr>
<tr><td>Non-objective 2</td><td>Programming:
rural development programming</td></tr>
</table>

Table 5. New co-financing rates.

		Ceilings for the contribution of the EAGGF (in % of total eligible cost)			
		Non-revenue generating investments	Revenue generating investments		Innovative actions, technical assistance
			Investment in infra-structure generating substantial net revenue	Investments in firms	
Objective 1	Countries of the **Cohesion Fund**	**80%**	**50%** *	**35%** **	**100%**
	Outermost regions and outlying **Greek islands** which are under a handicap due to their distant location	**85%**	**40%** *		
	Other regions	**75%**			
Non-objective 1	**Objective 2**	**50%**	**25%** *	**15%** **	
	Non-objective 2				

* These rates may be increased by an amount for forms of finance other than direct assistance, provided that this increase does not exceed 10% of the total eligible cost

** In the case of investments in small and medium-sized undertakings, these rates may be increased by an amount for forms of finance other than direct assistance, provided that this increase does not exceed 10% of the total eligible cost

Table 6. Conditions for the eligibility of forestry measures in regulations 1257/99 and 1750/99.

<table>
<tr><th colspan="3">Measures</th><th colspan="11">Restrictions / conditions</th></tr>
<tr><td rowspan="3">AFFORESTATION</td><td rowspan="3">Agricultural land
(1257 / 31)</td><td>Planting</td><td colspan="5"></td><td rowspan="3">Agricultural land shall include in particular [land] where farming takes place on a regular basis
(1750 / 25)</td><td rowspan="3">Excluded: Christmas trees
(1257 / 31.3)</td><td rowspan="3">Excluded: Farmers benefiting from early retirement support
(1257 / 31.3)</td><td rowspan="3">Planting must be adapted to local conditions and compatible with the environment
(1257 / 30.1 & 31.1)</td><td rowspan="12">Forests must be owned by private owners or by their associations or by municipalities or by their associations
(1257 / 29.3 & 1750 / 24)</td><td rowspan="12">Support shall contribute to the fulfilment of the undertakings given by the Community and the Member States at international level
(1257 / 29.4)

Support shall be based on national or subnational forest programmes or equivalent instruments which should take into account the commitments made in the Ministerial Conferences on the Protection of Forests in Europe
(1257 / 29.4)</td><td rowspan="12">Measures proposed in areas classified as high or medium forest fire risk must conform to the forest protection plans presented by the Member States under Regulation 2158 / 92
(1257 / 29.4)</td></tr>
<tr><td>Maintenance</td><td colspan="5"></td></tr>
<tr><td>Premium to cover loss of income</td><td colspan="5">Maximum amount of EURO 725 /ha/year ((associations of) farmers devoting an essential part of their working time to agriculture and deriving from it a significant part of their income) or EURO 185/ha/year (any other private law person) (1257 / 4, 1750 / 26.1)</td><td>Excluded: fast-growing species cultivated in the short term
(1257 / 31.3 & 1750 / 26.2)</td></tr>
<tr><td colspan="2">Other land (1257 / 30)</td><td colspan="9"></td></tr>
<tr><td rowspan="9">OTHER MEASURES</td><td colspan="2">Investments in forests to improve their economic, ecological or social value (1257 / 30)</td><td colspan="9"></td></tr>
<tr><td colspan="2">Promotion of new outlets for the use and marketing of forestry products (1257 / 30)</td><td colspan="9"></td></tr>
<tr><td colspan="2">Measures to maintain and improve the ecological stability of forests
(1257 / 32)</td><td colspan="2"></td><td rowspan="2">Payment per hectare: minimum EURO 40 maximum EURO 120
(1257/ 32.2)</td><td rowspan="2">Excluded: areas where afforestation of agricultural land is supported
(1750 / 27.1)</td><td rowspan="2">Protective & ecological role of the forests must be of public interest
(1257 / 32.1)</td><td rowspan="2">Costs of maintenance & improvement measures must exceed the income from forestry
(1257 / 32.1)</td><td rowspan="2">Protective & ecological values of the forests must be ensured in a sustainable manner
(1257 / 32.1)</td><td rowspan="2">Measures must be laid down by contract & their cost specified therein
(1257 / 32.1)</td></tr>
<tr><td colspan="2">Maintaining fire-breaks through agricultural measures
(1257 / 32)</td><td>Excluded: areas subject to agri-environment support
(1750 / 27.1)</td><td>Measures must be consistent with Common market rules
(1750 / 27.1)</td></tr>
<tr><td colspan="2">Investments to improve and rationalise the harvesting, processing and marketing of forestry products (1257 / 30)</td><td colspan="9">Investment related to the use of wood as a raw material is limited to all working operations prior to industrial processing
(1257 / 30.1)</td></tr>
<tr><td colspan="2">Establishment of associations of forest holders (1257 / 30)</td><td colspan="9">Associations must be set up in order to help their members to improve the sustainable and efficient management of their forests (1257 / 30.1)</td></tr>
<tr><td colspan="2">Measures to restore forestry production potential damaged by natural disasters and fire (1257 / 30)</td><td colspan="9"></td></tr>
<tr><td colspan="2">Measures to introduce appropriate prevention instruments (1257 / 30)</td><td colspan="9"></td></tr>
<tr><td colspan="2">Support for vocational training
(1257 / 9)</td><td colspan="12">Support shall contribute to the improvement of the occupational skill and competence of persons involved in forestry activities, and their conversion. Training shall in particular be designed to prepare them for the application of forest management practices to improve the economic, ecological or social functions of forests</td></tr>
<tr><td colspan="2">Other measures (1257 / 33)</td><td colspan="12">Must relate to (conversion of) farming / rural activities and concern the protection of the environment in connection with forestry and landscape conservation</td></tr>
</table>

- Except for the premium to cover loss of income and for some maintenance measures no maximum amount is now fixed in the Regulation;
- Investments for the improvement of woodlands are not anymore limited to farmers or their associations.

Table 6 overleaf recapitulates the conditions and restrictions on the eligibility of the different forestry measures in the new Regulations.

2.4.3 Consequences

More initiative is given to Member States as regards the operation of measures in favour of forestry. It will be up to the countries to decide to support the afforestation of agricultural land, while the implementation of the scheme was previously mandatory.

The control and the evaluation (ex-ante and ex-post) of the measures undertaken by the Member States under their forestry programmes will gain in importance. Appropriate systems (including the definition of relevant indicators) will have to be implemented;

At the administrative and organisational levels, the new regulation might have consequences both in the Member States and in the Commission. For instance in DG Agriculture, the follow-up of the scheme for the afforestation of agricultural land, which was until now ensured by unit F.I.3 (Forestry and environment) should fall under the responsibility of geographical units in Directorates F.I and F.II (Rural development).

References

EEC Council Regulation 2080/92. Official Journal of the European Communities, 30.7.1992, No. L. 215: 96.
EC Council Regulation 1054/94. Official Journal of the European Communities, 6.5.1994, No. L. 115: 6.
Report from the Commission to the Council and the European Parliament on the application of Regulation (EEC) No 2080/92 instituting a Community aid scheme for forestry measures in agriculture. 28.11.1997, COM(97) 630 final.
Report on the report from the Commission to the Council and the European Parliament on the application of Regulation (EEC) No 2080/92 instituting a Community aid scheme for forestry measures in agriculture. Committee on Agriculture and Rural Development, Rapporteur: Mr Jyrki Otila, Session Documents of the European Parliament, 30.9.1998, A4-0346/98.
EC Council Regulation 1260/1999. Official Journal of the European Communities, 26.6.1999, No. L. 161: 1
EC Council Regulation 1257/1999. Official Journal of the European Communities, 26.6.1999, No. L. 160: 80
EC Commission Regulation 1750/1999. Official Journal of the European Communities, 13.8.1999, No. L. 214: 31

Appendix 1. Update of the first results

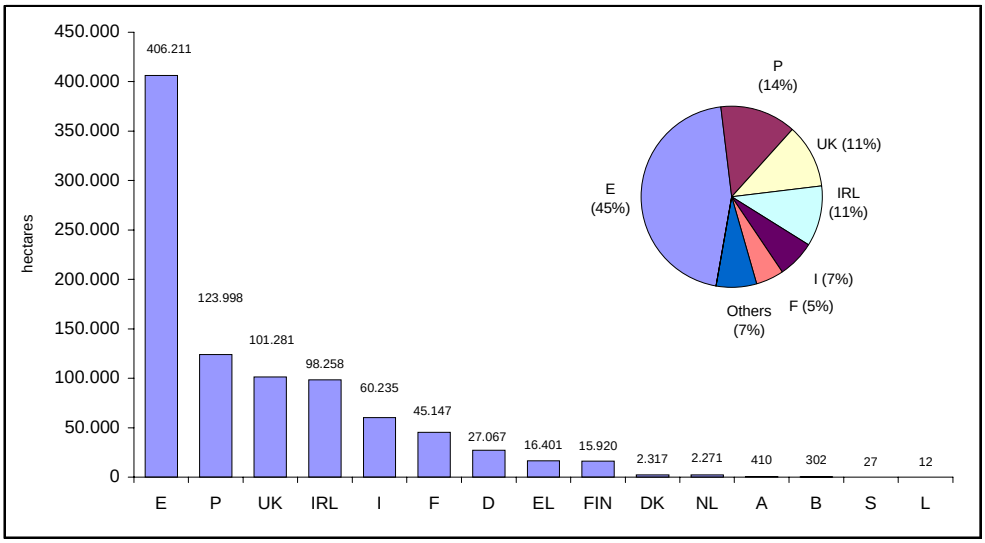
Information forwarded by the Member States under Regulation 1054/94 on progress in implementing the programmes

Cumulative situation at 30.4.1999

PRIVATE AFFORESTATION	Aid for **afforestation** *(applications definitively approved - after completion of work)*	Number of recipients		131 966
		Area	ha	899 857
		Total cost eligible for Community part-financing	M€	1 443
		Average cost		
		- per hectare	€	1 554
		- per recipient	€	10 936
	Premium for **maintenance of woodland**	Number of recipients		79 272
		Area	ha	662 437
		Total cost eligible for Community part-financing	M €	551
		Average cost		
		- per hectare	€	832
		- per recipient	€	6 951
	Compensation for **loss of income**	Number of recipients		99 486
		Area	ha	762 023
		of which:		
		- farmers	ha	544 297
		- other recipients	ha	217 726
		Total cost eligible for Community part-financing	M €	2 054
		Total cost eligible per recipient	€	20 650
AID FOR INVESTMENTS FOR THE **IMPROVEMENT OF WOODLANDS** *(applications definitively approved)*		Number of recipients		41 828
		Total cost eligible for Community part-financing	M €	190
		Total cost eligible per recipient	€	4 538

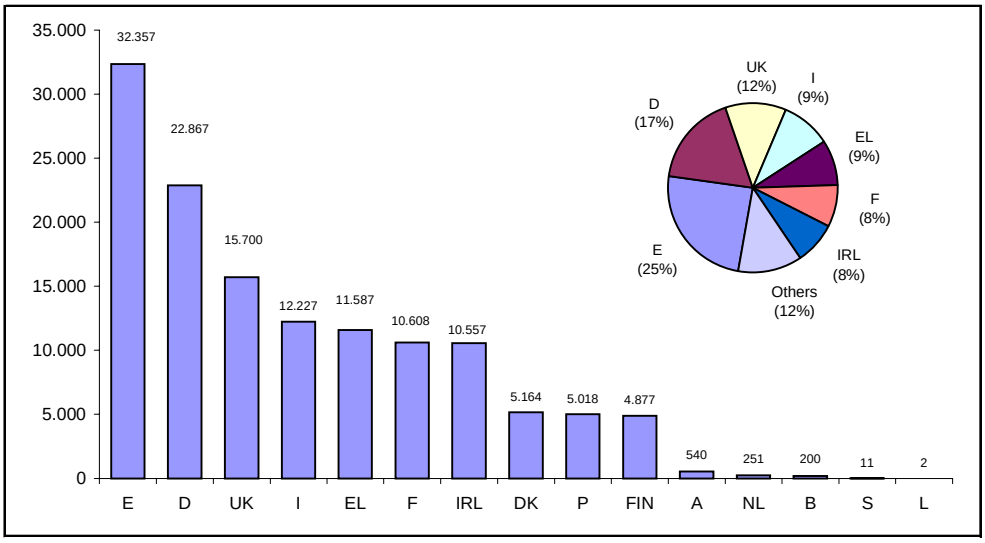
Total cost eligible for Community part-financing	**M €**	**4 238**

1. Aid for afforestation



EU total : ha 899 857

Figure 1.1. Areas afforested.



EU total : 131 966

Figure 1.2. Number of recipients of afforestation aid.

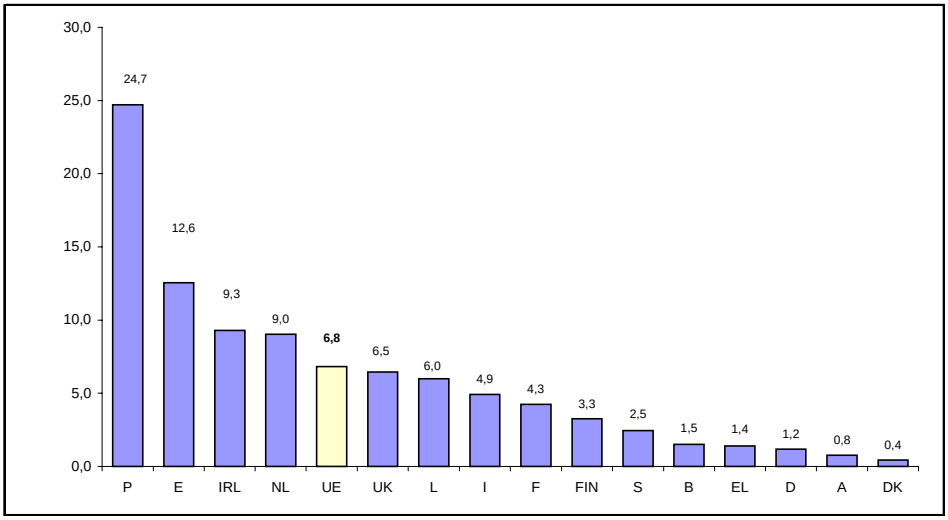


Figure 1.3. Average area afforested per recipient.

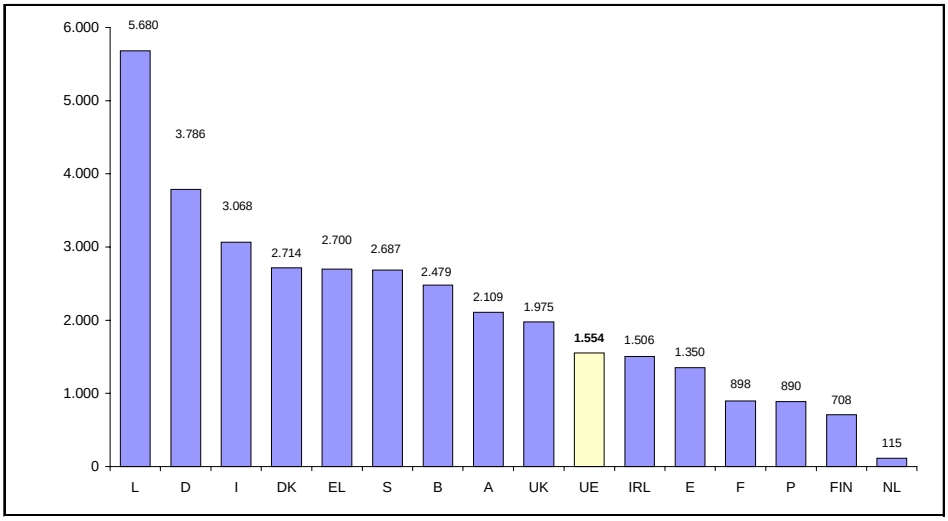


Figure 1.4. Average cost of afforestation per hectare.

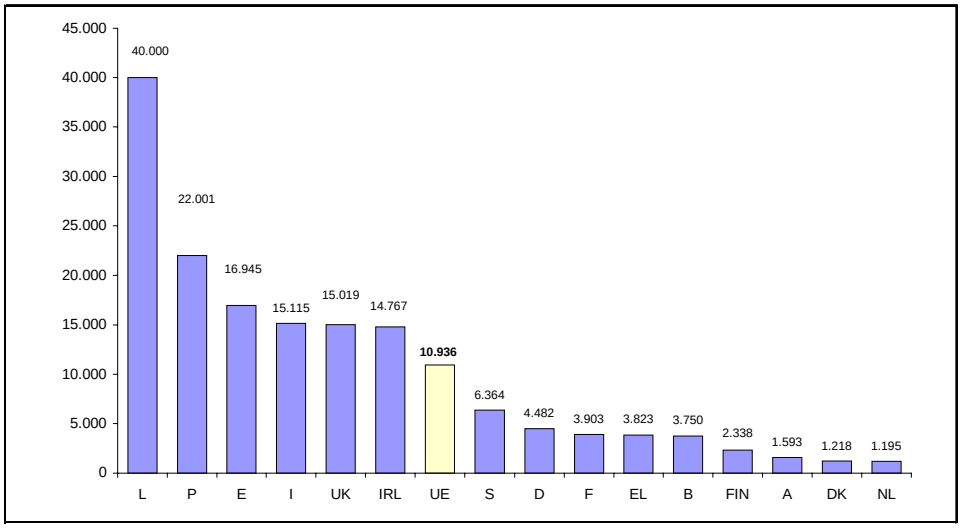
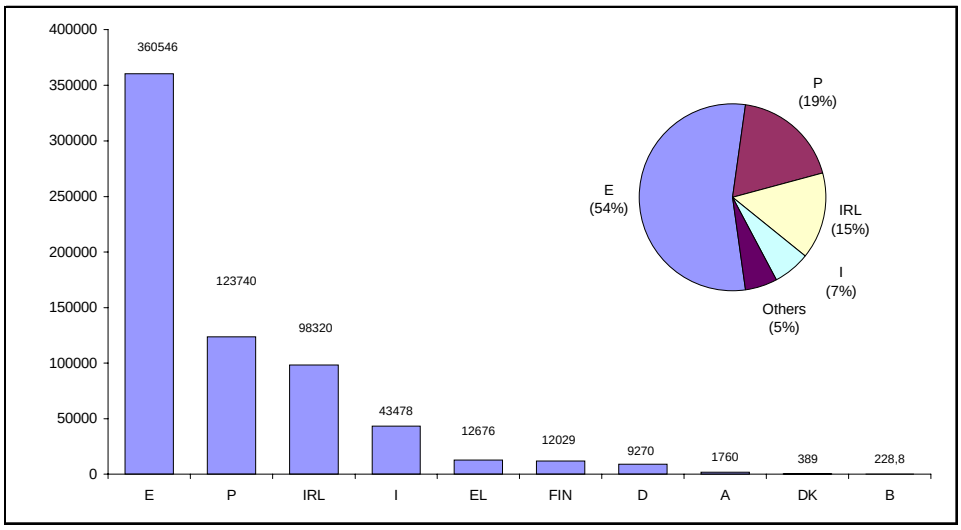


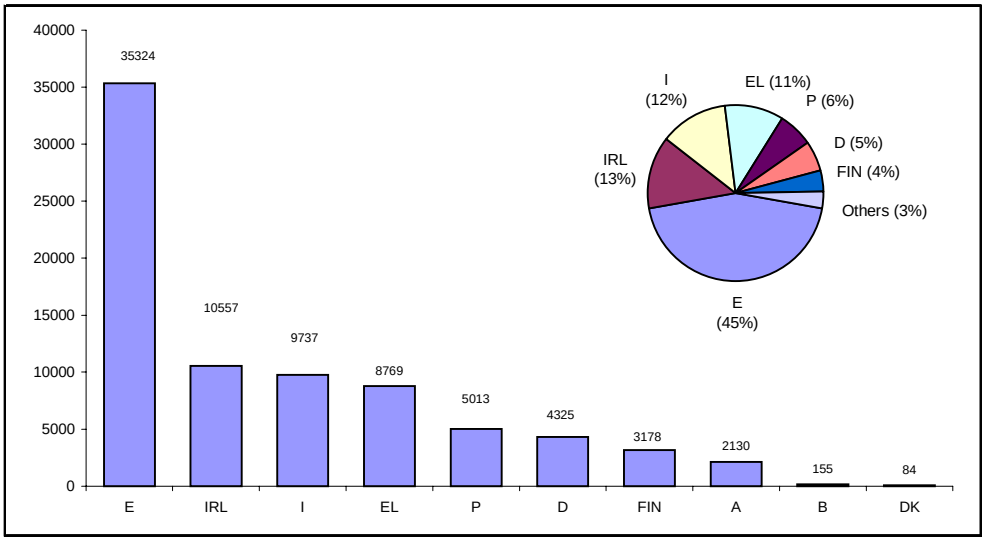
Figure 1.5. Average cost of afforestation per recipient.

2. Premium for maintenance of woodland



EU total : ha 662 437

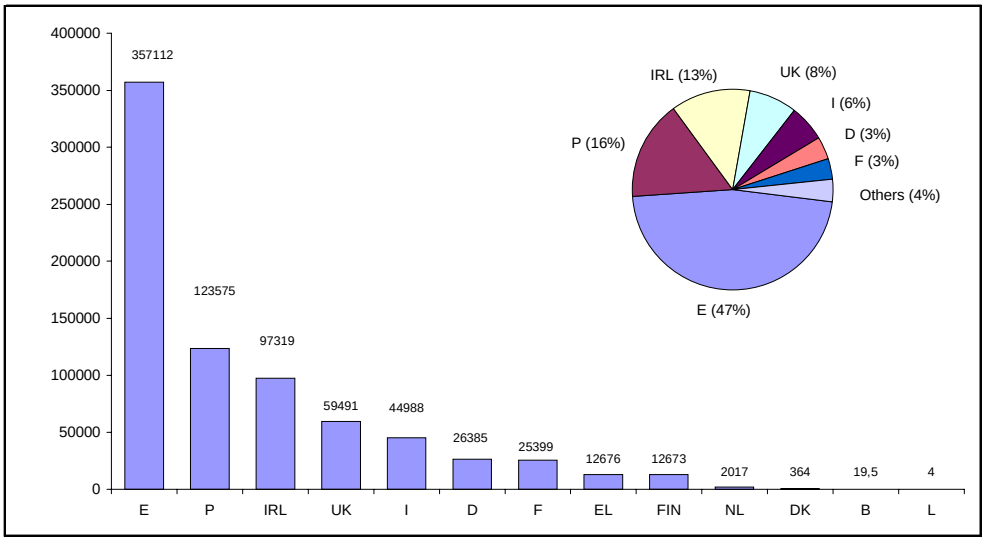
Figure 2.1. Maintenance of woodland – Areas.



EU total : 79 272

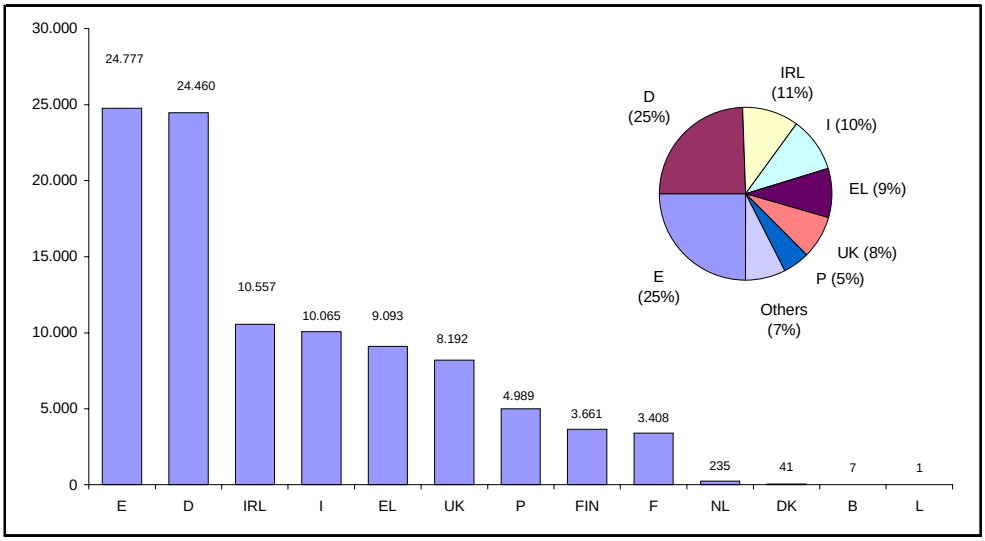
Figure 2.2. Maintenance of woodland – Number of recipients

3. Compensation for loss of income



EU total : ha 762 023

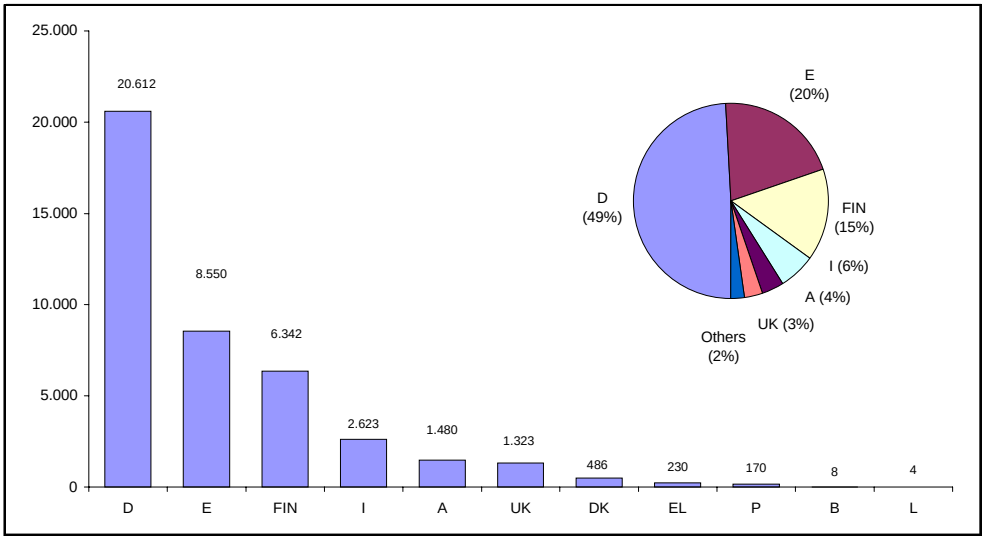
Figure 3.1. Compensation for loss of income – Areas.



EU total : 99 486

Figure 3.2. Compensation for loss of income – Number of recipients

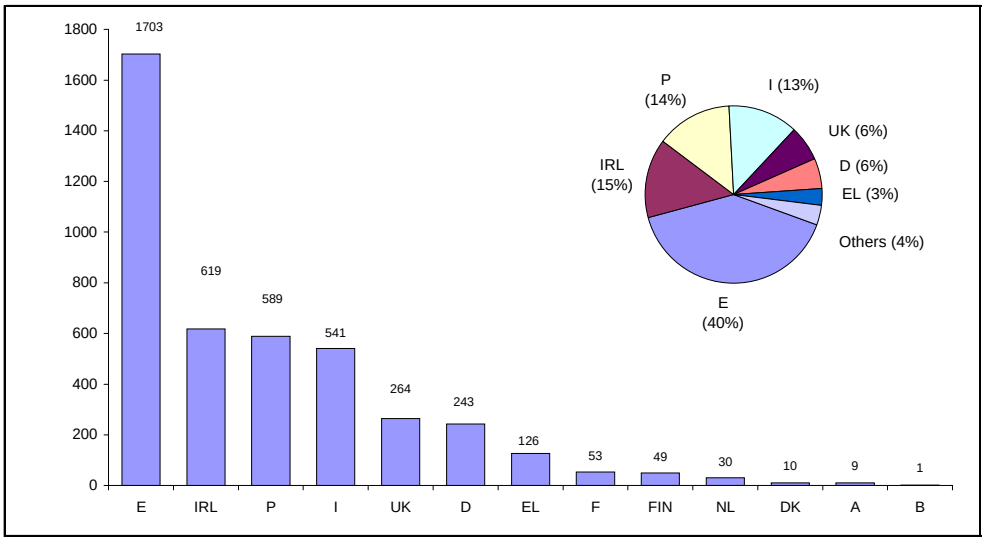
4. Aid for investments for the improvement of woodlands



EU total : 41 828

Figure 4. Improvement of woodlands – Number of recipients.

5. Total cost eligible for Community part-financing



EU total : M€ 4 238

Figure 5.1. Total cost eligible for Community part-financing.

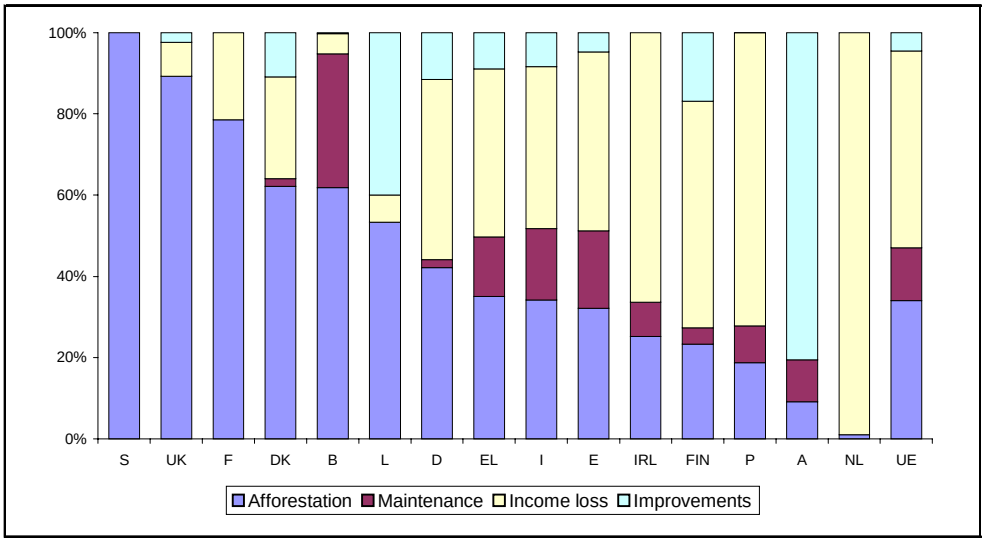


Figure 5.2. Total eligible cost distributed by type of measure.

Appendix 1. Specifications for an evaluation of Regulation 2080/92 – Principal evaluation questions by theme

Theme **a**	***Rural development***

Question **1**	***To what extent have the forest activities helped cushion the effect of the 1992 reform by promoting rural development?***

At least the following aspects should be taken into account:

- Diversification of activities for farmers: *(type and significance of new/additional activity (immediately and prospectively),*
- Employment: *(balancing of seasonal variation for farmer/employees, off farm employment)*
- Farm income: *(net income from the previous land-use compared to the premium to cover income-loss; actual costs of planting and maintenance compared to the premiums)*
- Implications for land use: *(prevented land abandonment; prevention of other beneficial land uses such as permanent set aside or agri-environmental undertakings)*
- Complementarity with alternative approaches and measures, particularly the forest measures under Objective 1 and 5b measures: *(synergy and/or duplication; effectiveness, efficiency, sustainability and side-effects of the alternatives)*

Theme **b**	***Forestry***

Question **2**	***To what extent have forest resources been improved?***

Sub-question **2.1**	***How significant is the anticipated long-term increase in forest production?***

At least the following aspects should be taken into account:

- Anticipated wood production from afforestation: *(hectares x yield class; assortment [hardwood, softwood …]*
- Anticipated increase in forest production due to forest improvement: *(enhanced silviculture, forest protection)*
- Afforestation in zones prone to forest fire

Sub-question **2.2**	***Can better product quality/added value be anticipated from the woodland improvement measures?***

At least the following aspects should be taken into account:

- Assortment: *(species changes, larger dimension thanks to longevity, reduced damage …)*

Sub-question **2.3**	***Can enhanced stability and longevity of the tree stands be expected due to the forest improvement measures?***

At least the following aspects should be taken into account:

- Improvements in the structure of forests that normally would be conducive to stability and longevity: *(age structure, species composition, regeneration system)*
- Accessibility of the stands for surveillance and operations*: (road construction)*

Theme **c**	***Agriculture***

Question **3**	***To what extent has afforestation contributed to constraining agricultural production in surplus?***

At least the following aspects should be taken into account:

- Area afforested that otherwise would have been used for commodities in surplus: *(break down to previous use of the land: dairy, beef, sheep, cereals, etc)*
- The agricultural productivity of the afforested land: (*lower agricultural productivity than the average land on the beneficiary holding; lower agricultural productivity than the average land in the neighbouring area)*
- The efficiency of afforestation measures in constraining agricultural production in surplus: *(has expenditure on afforestation been counterbalanced by reduced spending within the Common Market Organisation, cf., indents 1 and 2 above; improved uptake thanks to the changes introduced in 1992 such as compensation for loss of income, obligation for Member States to implement the scheme, raised premiums, widened eligibility criteria)*

Theme **d**	***Environment***

Sub-theme d.1	***Climate change***

Question **4**	***To what extent have the forest activities helped in alleviating climate change?***

At least the following aspects should be taken into account:

- The estimated total carbon storage from afforestation within the time horizon of the Kyoto protocol, i.e. 2012 as well as the trend in carbon storage beyond this horizon. This estimate should comprise both carbon stocked in wood and the build up of carbon in the underground-biomass. The potential release of soil carbon in the afforestation phase, e.g., from afforestation of permanent grassland should be taken into account.
- The contribution to the total carbon storage from the improvement measures concerning existing woodlands, arising from possible improvements in productivity, stability, longevity and from avoided reemission of CO_2 plus avoided emission of other greenhouse gases due to fire prevention

Sub-theme d.2	***Biodiversity***

Question **5**	***To what extent has the forest measures contributed towards biodiversity?***

At least the following aspects should be taken into account:

- Composition of new plantings: (*mixtures, endemic or threatened species at various geographical levels)*
- Landscape patterns*: (afforestation in districts with low or missing forest cover; ecotones including edges adapted to the surrounding landscape; corridors between previously isolated habitats)*
- Negative effects: *(damage/disturbance to valuable habitats, especially Natura 2000 areas, through afforestation)*

Sub-theme d.3	***Protective functions (desertification, erosion, water cycle …)***

Question **6**	***To what extent has the forest activities enhanced the protective function of forests, especially regarding natural resources?***
At least the following aspects should be taken into account: ▪ Desertification or erosion of vulnerable lands ▪ Water: *(replacing polluting crops; constituting barriers against run- off; enhancing infiltration into the ground)* ▪ Negative effects on natural resources	

Theme **e**	***Implementation & programme management***

Question **7**	***To what extent were the national/regional programmes for implementing the regulation conducive to the objectives and uptake of the regulation?***
At least the following aspects should be taken into account: ▪ Consistency with the objectives of the regulation: (*parts of the 2080/92-objectives that were effectively pursued)* ▪ Modulation and duration of premiums: *(influencing species choice or other desired options)* ▪ The use of the implementing provisions in Article 4 of the regulation: *(purposes pursued)* ▪ Dead-weight: *(measures repealed [national level]; among beneficiaries)*	

Appendix 3. Monitoring indicators for forestry measures in the new rural development Regulations

h. Afforestation of agricultural land and i. Other forestry measures (Ch. VIII, art. 29-32).

h. i. 1. Level of supports (new beneficiaries).

			Number of beneficiaries			Unit of reference[1]	Number of units enjoying support			Total costs borne by the beneficiaries			Total amount of eligible costs			Average amount of support per beneficiary		
			private	public	total		private	public	total	private	public	total	private	public	total	private	public	total
h. Afforestation of agricultural land (art. 31)	Annual crops[2]	Conifers			0	ha			0			0,00			0,00			0,0
		Broadleaves			0	ha			0			0,00			0,00			0,0
		Rapid growth plantations[3]			0	ha			0			0,00			0,00			0,0
		Total[4]			0	ha	0	0	0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0
	Permanent crops[2]	Conifers			0	ha			0			0,00			0,00			0,0
		Broadleaves			0	ha			0			0,00			0,00			0,0
		Rapid growth plantations			0	ha			0			0,00			0,00			0,0
		Total[4]			0	ha	0	0	0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0
	Permanent meadows and pastures[2]	Conifers			0	ha			0			0,00			0,00			0,0
		Broadleaves			0	ha			0			0,00			0,00			0,0
		Rapid growth plantations			0	ha			0			0,00			0,00			0,0
		Total[4]			0	ha	0	0	0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0
	TOTAL (h.)[4]				0	ha	0	0	0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0

[1] Unit used to estimate the degree of achievement of the project, for instance "ha concerned", "projects supported", etc.

[2] "Annual crops", "Permanent crops" and "Permanent meadows and pastures" refer to the utilisation of the parcel before afforestation.

[3] Including poplars in rotation shorter than 15 years.

[4] Avoid any double counting of a single beneficiary

h. Afforestation of agricultural land and i. Other forestry measures (Ch. VIII, art. 29-32).

h. i. 1. (continued) Level of supports (new beneficiaries).

			Number of beneficiaries			Unit of reference[1]	Number of units enjoying support			Total costs borne by the beneficiaries			Total amount of eligible costs			Average amount of support per beneficiary		
			private	public	total		private	public	total	private	public	total	private	public	total	private	public	total
i. Other forestry measures	Other afforestation	Conifers			0	ha			0			0,00			0,00			0,0
		Broadleaves			0	ha			0			0,00			0,00			0,0
		Rapid growth plantations			0	ha			0			0,00			0,00			0,0
		Sub-total (i')[3]			0	ha	0	0	0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0
	Total afforestation (h+i')[3]				0	ha	0	0	0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0
	Improve economic ecological or social value of forests (art. 30)				0				0			0,00			0,00			0,0
	Harvesting, processing and marketing of forestry products (art. 30)				0				0			0,00			0,00			0,0
	New outlets (art. 30)				0				0			0,00			0,00			0,0
	Associations of forest holders (art. 30)				0				0			0,00			0,00			0,0
	Restore forestry production potential damaged by natural disaster/fire (art. 30)				0				0			0,00			0,00			0,0
	Fight against fire (art. 30)				0				0			0,00			0,00			0,0
	Maintain and improve the ecological stability of forests for public interest (art. 32)				0				0			0,00			0,00			0,0
	Maintain fire-breaks through agricultural measures (art. 32)				0				0			0,00			0,00			0,0
	…[2]				0				0			0,00			0,00			0,0
	TOTAL (i.)[3]				0	ha			0	0,00	0,00	0,00	0,00	0,00	0,00	0,0	0,0	0,0

[1] Unit used to estimate the degree of achievment of the project, for instance "ha concerned", "projects supported", etc. In case no physical indicator would be pertinent, don't fill the cells in question.

[2] One or several of the objectives registered here may be split into several rows, for example to specify actions in favour of forest accessibility or wood as energy. The objective to which is linked any add

[3] For the aggregated totals, the reference unit is "hectares concerned by the different measures". Avoid any double counting of a single beneficiary. Total i. includes sub-total i'.

Appendix 4. Questions for the evaluation of the forestry measures in the new Regulations on support to rural development

Question		Evaluation criterion(a)	Programme indicator(s)
To what extent are forest resources being maintained and enhanced through the programme…	particularly by influencing land-use and the structure and quality of the growing stock?	Increase of wooded area on previous agricultural and non-agricultural land	Area of assisted plantings (hectares)
		Anticipated increase of volume of growing stock thanks to planting of new woodland and improvement of existing forests	Anticipated yield thanks to assistance… (a) Anticipated average annual increment in the plantings (m3/hectare/year and hectares concerned) (b) Anticipated change in average annual increment in due to forest improvement in existing forests (m^3/hectare/year and hectares concerned)
		Anticipated improvement in quality (assortment, diameter…) and structure of growing stock thanks to forest improvement	Change in species distribution of growing stock due to assistance
	particularly by influencing the total carbon storage in forest stands?	There is additional build up of carbon in the growing stock	- Average annual net carbon storage from 2000–2012 (million tons/year) - Trend in average annual net carbon storage beyond 2012 (million tons/year)
To what extent have the assisted actions enabled forestry to contribute to the economic and social aspects of rural development…	by maintenance and encouragement of the productive functions on forest holdings?	More rational production of forest products (or services)	- Medium term change in annual costs for silviculture, harvesting and transport/collection, stocking operations thanks to the assistance (€/m^3) - Ratio of {afforestation premiums} to {net-income from previous land use} - Share of holdings with less than [50] hectares of woodland being connected to association of forest holders or similar organisation thanks to assistance (%)
		Enhancement of outlets	Additional outlets for products of small dimension/low quality (m^3)

Question		Evaluation criterion(a)	Programme indicator(s)
To what extent have the assisted actions enabled forestry to contribute to the economic and social aspects of rural development… (cont.)	by maintenance and development of income, employment and other socio-economic functions and conditions?	More activities/employment on holdings	Activity on holdings from {own execution of assisted planting/improvement works} plus {anticipated work at the holding deriving from the assisted action in the mid term} (hours/hectare/year) (a) of which falling in periods where agricultural activity level is below the capacity of the farm (hours/farm/year + number of farms concerned) (b) of which leading to additional or maintained employment on forest holdings thanks to assisted activities (full time equivalents/year)
		More activities in rural community, due to primary or secondary production on holdings or due to initial processing and marketing	- Volume of supply of basic forest products for small scale, local processing (m^3/year) - Employment outside holdings (logging, initial processing and marketing, and further local, small scale processing and marketing) directly or indirectly depending on assisted actions (full time equivalents/year)
		Greater attractiveness of area for local population or rural tourists	- Additional attractive/valuable area or sites due to assistance (number and/or hectares per habitant in programme area): (a) of which culturally/historically/recreationally sites; upgraded or made accessible (number/habitant in relevant area) (b) of which wooded area with public access (planted or existing) in regions with very low forest cover (hectares/habitant in relevant area) (c) of which having significant tourist capacity located in vicinity (number, hectares or bed-nights/year) - Descriptive indicator: cases of adverse effects such as 'closing-up' of landscapes with associated loss of activities
		Increased income in rural areas	Income due to assisted activities (a) of which additional sustainable income on holdings due to assisted activities (€/hectare/year) (b) trend in additional income thanks to knock-on activities or assisted off-farm activities (€/beneficiary/year)

Question		Evaluation criterion(a)	Programme indicator(s)
To what extent have the assisted actions enabled forestry to contribute to the economic and social aspects of rural development… (cont.)	by maintenance and appropriate enhancement of protective functions in forest management?	Appropriate protection actions undertaken	Area planted/managed with a view to protective functions (hectares)
		Land and socio-economic interests are protected	Magnitude of interest depending on protection: (a)Area (land or water bodies) protected (hectares) (b) Description of the type of economic interest depending significantly on protection and the magnitude of the interest (for example expressed in approximate number of habitants, number of night beds, million €/year, etc)
To what extent have the assisted actions contributed to the ecological functions of forests…	by maintenance, conservation and appropriate enhancement of biological diversity?	Genetic and/or species diversity protected/improved by using endemic tree species or mixtures in assisted actions	Area planted/regenerated/improved with endemic tree species (hectares) (a)of which in mixture (hectares) (b) of which providing in situ conservation of genetic resources (hectares)
		Protection/improvement of habitat diversity through the upkeep of representative, rare or vulnerable forest ecosystems/habitats that depend on specific assisted forest structures or silvicultural practices	- Critical sites maintained/improved due to assistance (hectares) (a) of which in or linked to Natura 2000 areas (hectares) (b) of which protected/restored from natural hazards (hectares) - Abundance of protected of vulnerable non-commercial species/varieties of flora & fauna in assisted areas (number of different species/varieties and, where appropriate as %-change in the abundance of key species)
		Protection/improvement of habitat diversity through beneficial interaction between assisted areas and the surrounding landscape/countryside	- Area planted in zones with low or missing forest cover (hectares) (a) of which in or linked to Natura 2000 areas (hectares) (b) of which forming corridors between isolated, precarious habitats (hectares) - 'Ecotones' established (forest edge…) of significant value for wild flora and fauna (kilometres)
	by maintenance of their health and vitality?	Less damage to soil and growing stock from silvicultural or harvesting operations	Volume of growing stock subject to reduced damage thanks to assisted equipment or infrastructure (m3/year)
		Prevention of calamities (particularly pests and diseases) through appropriate forest structure and silvicultural practice	Area where improved forest structure or silvicultural practice has been introduced (hectares)
		Production potential protected or restored from damage arising from natural hazards	Area protected or restored from damage arising from natural hazards (including fire) (hectares)

A Critical Appraisal of Afforestation Programmes in the Light of Finnish and Irish Experiences

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Abstract

Grant-aided field afforestation has been an instrument for agricultural production control in Finland since the late 1960s. Strong regional variations in the intensity of field afforestation activities have occurred in Finland, dependent upon variations in the level and direction of regional and local socio-economic development, the physical structure of agriculture and the life-cycle stage of the agricultural population. Strong temporal variations in field afforestation activities have also occurred. These variations suggest that the levels of field afforestation, as often aimed at in afforestation programmes are not sustainable.

The paper addresses some of the issues that have influenced the success or failure of field afforestation programmes in Finland and Ireland. The aim is to place field afforestation in a broader rural policy context, and as such try to present lessons which may assist the avoidance of mistakes in future afforestation programmes. Some aspects of field afforestation programmes in Ireland serve to support the Finnish experience.

Keywords: Field afforestation, Finland, Ireland, regional variations, temporal variations, resistance to field afforestation, integrated land use policy

1. Background

Field afforestation has long been employed in Finland as a policy instrument for reducing the area of agricultural land in an attempt to control agricultural over-production. The first legislation in this respect being introduced in 1967 and the first major field afforestation programme began two years later with the introduction of a field reservation (set-aside) programme (Selby 1974, 1980a and b). Since then, field afforestation has been a permanent part of a set of policy instruments for controlling and balancing agricultural production. Indeed, many parallels existed between Finnish agricultural policy and that of the Common Agricultural Policy (CAP) of the European Union prior to Finland's accession to membership

Norbert Weber (ed.)
NEWFOR – New Forests for Europe: Afforestation at the Turn of the Century
EFI Proceedings No. 35, 2000

in 1995. The main difference was Finland's commitment to 100% agricultural self-sufficiency in times of crisis; a policy which led to strongly protectionist agricultural policies and associated market distortions (OECD 1989).

A set-aside scheme very similar to the one introduced in Finland was introduced by the E.U. in 1985 (Council Regulation (EEC) 797/85, 1096/88). Similarly, support for the afforestation of agricultural land has become one of EU's agricultural and land use policy instruments (e.g. Council Regulations (EEC) 1610/89, 2328/91, 2080/92, 1257/99).

In Central Europe, social economic aspects of field afforestation have largely been considered in the context of job creation – as reflected in European Union regulations (e.g. No.1610/89 and No.2080/92) which address the development of farm and rural community woodland schemes. In Finland, where a high percentage of the land area is already under forests, the approach to field afforestation has been rather different. An important difference between Finnish and Central European field afforestation activities remains that in Central Europe field afforestation is purposefully linked to rural diversification, while in Scandinavia field afforestation symbolises the termination of agricultural and the loss of rural vitality (Selby 1974, 1980, 1990, 1994), even though economic assessments of field afforestation have demonstrated its profitability at the farm-level (e.g. Aarnio and Rantala 1994).

For a number of reasons, some of which will be discussed in this paper, field afforestation as a land use policy instrument has not been universally accepted by the farming community. This is true not only for Finland (where c. 80% of the land area is forested and only 8% of the land area is under fields), but also for many European countries (where as little as 10% of the land surface may be under forests), even though the regulations supporting field afforestation ostensibly aim at the diversification of the rural raw material base in these countries. Indeed, tacit recognition of this resistance is contained in Council Regulation (EEC) No. 2080/92 – Instituting a Community aid scheme for forestry measures in agriculture:

> *"experience in the afforestation of agricultural land by farmers shows that existing aid schemes for promoting afforestation are insufficient, whereas afforestation of agricultural land withdrawn from agricultural production in recent years has proved unsatisfactory."*

The recently introduced Council Regulation (EC) 1257/99 (on support for rural development from the EAGGF and amending and repealing certain Regulations) also seems to have recognised the criticisms and experiences of past field afforestation activities. Article 31 §1 states that:

> *"Support shall be granted for the afforestation of agricultural land provided that such planting is adapted to local conditions and is compatible with the environment."*

The paper addresses some of the issues that have influenced the success or failure of field afforestation programmes in Finland and Ireland. The aim is to place field afforestation in a broader rural policy context, and as such try to present lessons which may assist the avoidance of mistakes in future afforestation programmes. Some aspects of field afforestation programmes in Ireland serve to support the Finnish experience.

2. Spatial variations in field afforestation in Finland

Considerable regional variations in the intensity of grant-aided field afforestation have occurred in Finland since its introduction in 1969. In the poorer eastern regions of Finland, up to 20% of the 1969 arable area has been afforested, with the figure exceeding 50% in some

localities. In the south-western and western regions, which have better socio-economic conditions and larger more viable farms, field afforestation since 1969 has accounted for less than 5% of the arable area.

Myrdal's theory of circular and cumulative causation (Myrdal 1957) was used to explain these regional variations in afforestation (Selby 1980a,b). The theory permits the identification of growth and backwash areas, and in-between areas with spread effects, i.e. growth spreading outwards from growth centres. The theory proposes that regions move away from socio-economic equilibrium (the growth centres attract capital and labour and so continue to grow, while backwash areas loose capital and labour and continue to decline). The direction of change can only be halted by external forces, e.g. government intervention, or the discovery of new resources, which may slow a region's decline, halt it, or even cause renewed growth. Myrdal's theory, modified by a Finnish application for assessing farm-forestry (Hahtola 1973), permitted the following *a priori* model for variations of field afforestation at the regional, local and farm levels:

$$y = b_0 + b_1 pas + b_2 fod + b_3 psec + u \qquad (1)$$

Where

y = Intensity of field afforestation
pas = Poor agricultural structure
fod = farm ownership disturbances
psec = Poor socio-economic conditions
u = residual, or random term

Two dependent variables were employed. Dependent variable y_{artreg} was the proportion of fields in a region or locality by seeding and planting, while y_{natreg} was an estimate of the proportion of fields which had been abandoned and afforested by natural regeneration. The independent variables were constructed from regional and local statistics, and used as such (so-called original variables) or used in factor analyses to construct "complex" variables (factor scores) to operationalise each element of the model. The models passed rigorous testing, and provided robust degrees of determination with highly significant probabilities.

The most significant explanatory variables were derived from the factors constructed to operationalise *Poor agriculture structure* (small-forest farm factor), *Farm ownership disturbances* (generation transfer factor) and *Poor socio-economic structure* (agriculture and social change factor).

At the local level, the model's strongest dependent variables were factors which operationalised *Poor agricultural structure*, *Poor socio-economic* and *Farm ownership disturbances*. Again, high degrees of determination were associated with very robust statistical test results (Selby 1980a,b). At the farm level, scores from a *utilisation of means of production* factor was negatively and significantly correlated with field afforestation activities, while the a *forestry* factor, and a *reduced dependence on agriculture* factor both correlated positively and significantly with field afforestation activities. *Distance from farmstead* and *stoniness* were the two main physical parameters of fields which increased their probability to be afforested.

3. Temporal variations in field afforestation in Finland

3.1 Temporal variations in afforestation in Finland

Considerable temporal variations in grant-aided field afforestation have occurred in Finland, and it is perhaps these variations which best demonstrate inherent weaknesses in field

afforestation programmes. As seen in Figure 1, after the introduction of grant-aid for field afforestation in 1969 in association with the Field Reservation (set-aside) programme, there was an initial peak of activity which reached c. 12 000 ha in 1972. The Field Reservation (set-aside) programme was terminated in 1974 (the contracts could last up to 15 years, until 1987) to c. 2500 ha/year throughout most of the late 1970s and 1980s. New incentives were planned to coincide with the final reservation/afforestation contracts in 1987, but the programme was still-borne in view of competing land clearance legislation (outlined in section 4 of this paper).

A temporary increase in the afforestation premium at the beginning of the 1990s gave rise to a peak of activity which reached c.17 000 ha in 1992, only to fall to a predicted 5 000 ha in 1994 with the premium's suspension in the face of EU membership in 1995. Membership of the EU led to a new field afforestation programme aimed at achieving 10 000 to 20 000 ha of afforestation a year for a five-year period (Table 1).

The main conclusion from these temporal variations is that after the original peak of activity in 1972 which followed the novelty of the original grant-aided field afforestation programme, success peaks have been more pre-emptive than planned in nature. While greatly increased premiums in the late 1980s were responsible for a rise in field afforestation activity, during 1990s the peaks in field afforestation activities have been caused by pre-emptive

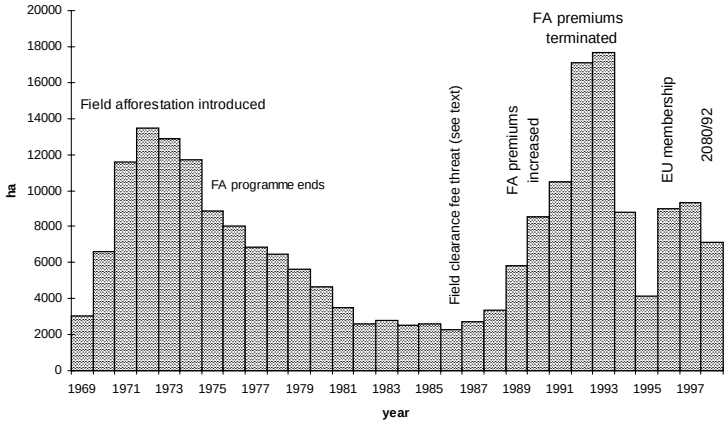

Figure 1. Variations in field afforestation activities, 1969–1996.

Table 1. Finland's post- EU membership field afforestation targets and achievements (ha).

	1995	1996	1997	1998	1999	Total
Planned target under 2080/92	10 000	10 000	15 000	15 000	20 000	70 000
Early retirement programme	2 500	4 000	4 000	4 000	3 500	18 000
Total	12 500	14 000	19 000	19 000	23 500	88 000
Actual achievement	*4 137*	*9 049*	*9 303*	*7 135*	*(7000)**	*36624 (41.6%)*

*Estimate. NB. Many applications in 1999 as current financing ends. Compare with Field Clearance Legislation.

actions to take advantage of premiums in the face of their imminent demise. A process identical to that created by the field clearance fee (see section 4). Pre-emptive afforestation is invariably followed by periods of less intense activity.

3.2 Temporal variations in afforestation in Ireland

The afforestation of marginal land in Ireland has been practised since the late 1950s. The land concerned was estate which had been acquired for forestry by the State, and it mainly consisted of raw peatlands along the Atlantic seaboard. Until the 1950s the areas planted annually were very small, c. 2000–3000 ha, but during the 1950 and 1960s this rose to 7000 to 10000 ha per year, falling again to around 5000 ha/year by the mid 1980s. Today, much of the Coillte (State) planting is on better gley soils in the Central and Southern parts of the country. The only private forestry prior to the 1980s was on old private estates. The recent trends in afforestation activities by sectors is shown in Figure 2.

The pattern in the private sector is, in fact, very reminiscent of afforestation cycles in Finland (Figure 1).

During the 1980s, several schemes were introduced to encourage the afforestation of private land, and the introduction of farm forestry (Bulfin 1993). The non-agricultural areas of farms was to be brought into productivity in order to improve farm incomes and to create employment potential in underdeveloped rural areas. Some schemes had co-operative functions, e.g. the Western Forest Co-operative, in order to improve the representation and

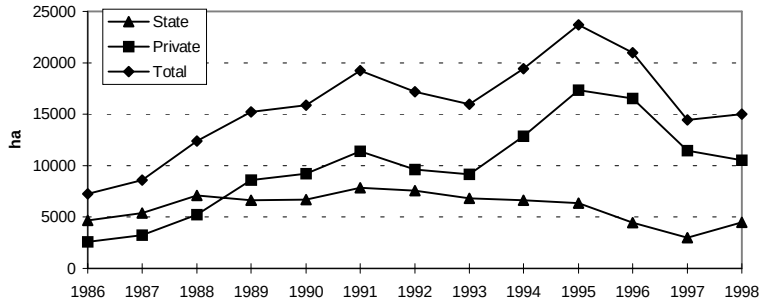

Figure 2. Public and private afforestation activities in Ireland 1986–1998. *Growing for the Future* (1996) updated in private communication with UCD.

Table 2. Afforestation of arable land in Ireland compared to the planned afforestation under Regulation 2080/92.

	1996	1997	1998	Total
Planned target under 2080/92	25 000	25 000	25 000	75 000
Actual achievement	16 556	11 434	19 500	47 490 (63%)

lobbying power of farm forestry (Wall 1996). Such representation, lobbying and extension activities are vital if forestry is to gain social acceptance in regions with no private, non-industrial, farm forestry traditions.

Nonetheless, as in the Finnish case, the planned afforestation targets in the private sector under Regulation 2080/92 (Growing for the Future 1996) in Ireland were far more ambitious than the areas actually achieved (Table 2).

4. Policy contradictions undermining field afforestation programmes

4.1 Land clearances versus field afforestation in Finland

The introduction of a field afforestation programme in the mid-1980s was effectively neutralised by the introduction of a field clearance fee in 1987 (Selby 1990). Land clearances have long played an important role in Finnish agricultural, and even during the post war period, the increasing scarcity of arable land on the market has led to a continuous, if moderate, level of grant-aided land clearance as farms carved new arable and pasture land from forests. During the mid-1980s, however, legislation was introduced to restrict land clearance activities by introducing a fee (300 FIM/are). In the event, the land clearance fee's introduction was delayed for 18 months. In the face of a forthcoming General Election the political risks associated with this unpopular legislation were considered to be too high by parties in the ruling coalition.

The delay in the introduction of the land clearance fee led to a pre-emptive land clearance bonanza, and in 1987 alone, applications were made to clear over 30 000 ha of mainly forest land for fields. Thus, whilst during the period 1969–1987 some 108 000 ha of fields had been afforested under grant-aid schemes, during the same period nearly 102 000 ha of fields were cleared from forests, much of this as a result of the pre-emptive clearing associated with the delay in introducing the land clearance fee. The net reduction in agricultural land by 1987 was therefore only c. 6000 ha.

This was a very modest achievement given the cost to the tax payer of the grant-aided set-aside and afforestation programmes (which also included labour costs and the costs of seedlings) not to mention the costs of much larger subsidies for agricultural structural improvements and production intensification, export subsidies, and so on (OECD 1989).

4.2 Some contradictions in policy instruments in Ireland

Afforestation programmes in Ireland have met with a number of problems, some of which resemble their equivalents in Finland, if not in precise detail then in basic principles. One such case is that of the conflict between Council Regulation (EEC) 2080/92 which creates the financial basis for afforestation and Council Regulation (EEC) 2078/92, the agricultural environment programme which supports the extensification of agriculture. The agricultural environment programme supported by 2078/92 in Ireland is called REPS (rural environment protection scheme).

Irish farming is generally low input, especially on the unenclosed lands. This has made it both easy and attractive for farmers to join REPS. Not only are they paid to do what they have always done, but they can at the same time preserve the open landscape which contains their community values (more of which in Section 5 of this paper). The greatest disadvantage to afforestation in this scheme is that REPS income is not counted in the means test which

farmers are required to take when they seek direct income support via the social security system. Afforestation grants (e.g. via 2080/92), on the other hand, are included in income calculations. Afforestation grants can raise farmers' incomes sufficiently high to disqualify them for income support, while their young forests are still not providing them with adequate income. Under such circumstances, REPS is a much safer option for farmers than afforestation.

The *Irish Farmers Journal*, May 9th 1998 (page 23) addressed this problem in a whole page article and demonstrated clearly the financial superiority of REPS over afforestation:

> *"The bottom line with regard to REPS is that is a scheme which is very acceptable to a large number of farmers and which looks set to be the key scheme onto which many other future EU schemes will be bolted. This being the case, it is imperative that the forestry sector can find a way to live with it. Failure to do so could lead to the demise of the concept of farm forestry, because of the fact that full-time farmers will carry out not planting, whereas farmers with off-farm jobs will quit farming altogether and plant their entire holding to forestry. From the social viewpoint this scenario is undesirable, and it would do nothing for the image of forestry among the remaining members of the farming community."*

Solutions to the dilemma suggested in the *Irish Farmers' Journal* include introducing a much more environmentally friendly version of forestry which would be included as a supplement to REPS, for example, watershed management forestry (to reduce slurry pollution). Also suggested was a reduction of the maximum area eligible for REPS payments with the land so "freed" being afforested.

In the context of public perceptions of forestry, one of the early failures of Irish forestry was the establishment of extensive plantations of pine and spruce in Western Ireland during the 1970s and 1980s. In a largely forest-less landscape, all the negative attributes association with plantation forestry were maximised. The visual disharmony acted as a catalyst for other social and cultural concerns concerning forestry – associated with the historical and environment issues outlined above. Indicative strategies were therefore required to better plan the location, planting and social acceptability of forestry, while at the same time moving forestry from the poorer land of the west to better land in central and southern Ireland (i.e. onto farmland proper). The indicative forest strategy which has been constructed in Ireland, largely at the Agricultural Research and Advisory Board TEAGASC, is a technical (environmental) and cultural impact assessment of land suitable for forestry. Details of this physical planning strategy will be outlined in detail later in this volume by Bulfin (2000).

5. Social and personal space – a source of objections to field afforestation

5.1 The individual and society

The limited success of the policy of grant-aided field afforestation in Finland has been examined in the context of some behavioural assumptions which are assumed to affect afforestation decision making by both farmers and the advisors (who are the *de facto* administrators of the policy instruments). These assumptions concern the bounded rationality of both farmers and advisors within their taken-for-granted worlds of place and space (Selby and Petäjistö 1994, 1995).

Because farmers and advisors work in essentially the same socio-economic and cultural environment, the farming system is assumed to be in a state of *dialectic reproduction* (e.g.

Gregory 1981, Berger and Luckmann 1966, and Ley and Samuels 1978). This creates a situation in which "reality is a social construction...that acts back upon is subjects, sometimes in ways that remain unseen and *taken for granted*" (Ley and Samuels 1978:12), while Duncan (1978) argues that man produces a world both of abstraction – ideas values, norms of conduct – and of real concrete objects, which although of his own making, he nevertheless permits to dominate him as objective, unchanging truths. Similarly, Ley (1977: 504–505) notes that meanings (e.g. the meanings of social constructs) are rarely private, and they are shared and reinforced in peer group actions. Thus, while the individual plays a creative role in forming the society in which he lives, the *dialectic process* creates a feedback to which the individual is not immune. *This is an important contention with respect to the question of field afforestation*, as the *field as an entity* has been created, often in recent history in Finland. It has become an *institution* central to the dialectic between farmer and place, as well as a *metaphor* of rural continuity. It is also a part of the language of the *trialectic* between farmer, advisor and policy maker.

Thus, by implication, cultural background plays a significant role in determining the life philosophies and value systems of individuals. These create psychological needs in the individual, which he/she attempts to satisfy. Thus, changes in the environment which challenge these value systems, and which threaten to compromise the individual's needs, will be met with fear and hostility. Just as the Finnish set-aside programme met with hostility during the early 1970s (Selby 1974), so fear of change may underlie the current resistance to field afforestation. Similar fear and stress situations are reported throughout Europe as farmers learn to cope with environmental constraints which often contradict their traditional value systems – their "received wisdom" as to what "good farming" is all about (e.g. Scerrat and Dent 1994).

5.2 Space, place and attitudes towards field afforestation

5.2.1 The concept of social space

Because of the cultural environmental processes contained in dialectic reproduction, the concepts of *space* and *place* are considered to play a significant role with respect to farmers' and advisors' decision making with respect to field afforestation. *Social space* is seen as the institutional construct of reality, whereas *personal space* is seen as the personal construct of reality and is referred to as *place*.

According to Lefebvre (1991: 33), *social space* is a space which 'incorporates' social actions, the actions of subjects both individual and collective. *Social space* is seen as a language, imbued with social values. But, by containing values, social space also contains power-relations. The agricultural cultural landscape, for example, is symbolic of a particular society *and its reproduction.* The extent to which this space can be treated as a message is defined by the way society or individuals read the message, and in the case of the rural landscape it hardly needs to be stated that it is a symbol which is almost universally understood.

Space is also argued to depend upon social superstructures. Each of the institutions working in a given social space calls for its own space – space which can be organised according to their specific requirements (*ibid*: 85). Thus, there will "partial spaces" for agricultural institutions and "partial spaces" for forestry institutions, and so on.

Field afforestation not only changes space relationships, it also alters the productive structure and "feel" of rural areas. With this in mind, Lefebvre's arguments that the social

space of institutions is "inherent to property relationships (especially the ownership of the earth, i.e. land) and also closely bound up with the forces of production (which impose a form on that earth or land)" (*Op cit*: 104) become indisputable. Space acquires a *political economy*, representing the *power relations* contained therein. *This gives reason to suspect that the policy of field afforestation is unlikely to be very successful*. This is because the *vested interests of the agricultural institutions will resist field afforestation* as increase forest land will weaken their own partial space and strengthen the partial space of forestry institutions. The resistance will be manifested as a reluctance by (agricultural) advisors, who represent certain vested interests, to seriously advance field afforestation at the farm levels, i.e. the lowest level of policy operation.

5.2.2 The concept of place

The field also has a symbolic value, especially to the farmer, as the field is a metaphor for the creativity and socio-economic sustainability of the countryside. This symbolic value is derived from the historical process of settlement and "pioneering" land for cultivation – a process of recent history in Finland. It can therefore be contended that this symbolic value, acting through the psychological mechanism of *ties to place*, may be a significant factor in both farmers' and advisors' resistance to field afforestation.

Arguments relevant to the present problem have been presented by e.g. Tuan (1974), Relph (1981) and Pred (1984). Tuan (1974:213) notes that *place* has more substance than the locational aspect of the term suggests:

> *"It is a unique entity, a 'special ensemble'; it has a history and meaning. Place incarnates the experiences and aspirations of a people. Place is not only a fact to be explained in the broader frame of space, but it is also a reality to be clarified and understood from the perspectives of the people who have given it meaning."*

Tuan (1974: 233–245) argues that the personality of a place arises when people, in describing a place special to them, use expressions which carry a greater emotional charge than merely locational or functional terms. Thus, "the personality of place is a composite of natural endowment (the physique of the land) and the modifications wrought by successive generations of human beings"(*ibid:* 234). Similarly, Pred (1984: 280), placing this process in a structurist epistemology, regards *places* to be the outcome of an historically contingent process conceptualised in terms of an unbroken flow of local events.

It does not require a great deal of imagination to see how the above arguments apply to the problem of field afforestation. The creation of the agricultural landscape, particularly at the local level, has been a dynamic historical process affecting the whole community. Field afforestation would seem to sever this historical process. Consequently, the intrinsic value of fields should not be underestimated when considering the interaction of people, policies and land use in the context of rural vitality.

The issues of place and space are therefore seen to underpin the whole question of radical land use policy changes which effect the reproduction of vital rural social and economic structures. It is not difficult to see that policies aimed at land use change, (set-aside, the afforestation of agricultural land, or even larger-scale afforestation programmes), lead to activities which change or effectively destroy shared, stable places with their own individualities. Consequently, such policies are likely to be met with resistance in the effected community. An individual's decision to afforest fields has repercussions which effect the whole matrix of *space* and *place relationships* within the community.

5.3 Farmers' values and field afforestation

5.3.1 Aspects of Finnish farmers' attitudes towards afforestation

Empirical material collected in Finland in 1992 for farmers and 1993 for local agricultural, forestry and commercial advisors sought to test some of the above propositions (Selby and Petäjistö 1994, 1995). In the case of the 441 farmers, principal component analysis was used to determine the "basic dimensions" of the farmers' attitudes and values and to relate them to certain given preconditions for and objection to field afforestation (Table 3). The four components achieved were:

- *Traditional home-oriented values* (Val1*)* – variables concerning family heritage, links to future generations, agricultural landscape values, and environmental values as well as family farming values were associated with this component.
- *Ecological farming values* (Val2) – variable stressing the importance of extensive methods of agricultural production and ecological farming values were loaded onto this component.
- *Free enterprise values* (Val3) – independence from state assistance for farming characterised this component. Agricultural and environment policies were also considered to be separate entities by farmers contributing to this component. Similarly, the concept of agricultural overproduction was rejected by this value-group.
- *Protectionist values* (Val4) – This component represented farmers whose values rejected the concepts of over-production and free enterprise. Family farming, supported by the state, was seen as the key value. This component differed from the "traditionalists" (Val1) in that the latter accepted the concepts of environmental management and elements of change, whereas the protectionists rejected stewardship and change.

Objections to field afforestation were positively correlated with most value types, with the exception of ecological farming values. Farmers in this group tended to reject the objections and accept the preconditions for field afforestation. (Ecological farming values were also found to be associated with farmers who were otherwise planning to reduce or cease their agricultural production, and this was reflected in their positive plans to afforest fields in the subsequent five-year period.)

Table 3. Farmers' values in relation to preconditions for and objections to field afforestation. Correlation coefficients.

Preconditions & Objections	Value component			
	Val1	Val2	Val3	Val4
Preconditions				
Decreased agricultural support	-0.11*	0.21***	-0.06	-0.08*
Afforestation premium paid as lump sum	-0.13**	0.23***	-0.02	-0.12**
Short-rotation forestry	-0.01	0.13**	-0.07	-0.12**
Objection components[1]				
Emotional objections	0.27***	-0.04	0.14***	0.08*
Tenure change preference	-0.03	0.02	0.13**	-0.02
Security of income (active farming)	0.21***	-0.25***	-0.02	0.22***

***p=0.001 or less; **p=0.002-0.01; *p=0.02-0.10
Where: Val1 - Traditional, home-area oriented values; Val2- Environmentally sensitive farming values; Val3- Free enterprise values; Val4- Protectionist values; [1]Principal components scores

5.3.2 Aspects of Irish farmers' attitudes towards afforestation

It was shown above how in Finland, the instruments to encourage afforestation, such as raising grants and premiums, have only had a limited effect of short duration. Such schemes have been taken up largely by those farmers facing retirement (and who then gain a "pre-retirement bonus"), and then the programmes fail. In Ireland the process of attitude formation has been different, but the outcome is not dissimilar.

Grants, premiums and other fiscal support for afforestation and forestry in Ireland in the 1980s attracted a number of non-farmers (investors and institutions) into forestry (Bulfin 1993, Ni Dhubhain and Gardiner 1993, Ni Dhubhain and Wall 1998). This, amongst other things, had the effect of increasing the price of land in marginal regions, and acted as a barrier to farmers who might normally have bought any available neighbouring farm land to create larger, viable farms. Forestry has therefore been perceived to be working against the interests of rural community – "forcing people off the land". In fact, this is probably not the case. It has been clearly demonstrated in Finland that it been rural socio-economic and agricultural structural problems which have firsts forced the young to move away, and this results in a cumulative cycle of socio-economic decline leaving and ageing farming population and increasing areas of redundant land suitable for afforestation. There is no reason to doubt that the process of rural decline in Ireland is the same as that experienced in Finland. Increasing areas of forestry are only the "tracing elements" telling where agricultural is no longer viable. Be that as it may, many farmers' negative attitudes towards forestry have been strongly influenced those resulting from the negative perceptions of forestry by the rural community as a whole (Multifunctional Forestry… 1998).

The fact that corporations and institutions were buying (marginal) farm land for afforestation also struck a discord with the rural community, not least because large private estates are associated with the colonial history of Ireland (first during the Norman ascendancy and later the English ascendancy). Forestry was practised almost exclusively on these estates, and remains associated with them. Tenant farmers were not involved in estate forestry. Only after the mid-1800s were estate lands redistributed to create a new class of land owner farmers, a process which was completed after Irish independence in 1922. Thus land ownership and independence are emotional issues (as they are still today in Finland – another young country). A knowledge of trees and forestry has therefore failed to develop in the national psyche, while a general lack of understanding of forestry practices by the average tenant farmer and rural citizen has helped to raise the "perceived risk" of embarking on a forestry enterprise.

5.4 Advisors and their attitudes to field afforestation in Finland

In the 1993 mailed inquiry, advisors were asked to express their opinions concerning a number of policy means for reducing the nation's agricultural overproduction problem. The questions were the same normative ones as put to farmers. The responses revealed different attitudes between different groups, but also some surprising similarities (Selby and Petäjistö 1995). For example total support was given to the propositions that *"Forestry should be made more profitable"* and *"Agriculture should have an increased role in landscape management"*. On the other hand, an increase in compulsory fallow did not generally receive support from agricultural advisors, but was accepted more readily by forestry and trade advisors. The result is not surprising, as compulsory fallow implies a reduction in the social space of the agricultural sector, i.e. land is taken out of production and out of the sphere of the agricultural advisors' decision making process – *power relations are threatened.*

The contraction of agriculturists' social space is even stronger in the case of field afforestation, and as expected fewer agricultural advisors (66%) supported this solution that forestry advisors (90%), whose social space would be enhanced by a greater forest area. In a parallel study, only 38% of farmers were found to support field afforestation (Selby and Petäjistö 1992). Nevertheless, it has to be remembered that the question concerned a principle for the country at large rather than a concrete policy for the home commune.

In order to determine the effects of *ties to place*, the advisors were asked to consider policy measures for reducing agricultural overproduction with respect to both the *country at large* and *their home commune* (Table 4). There was a clear tendency for agricultural production reduction measures in the *home commune* to be belittled when compared to the country as a whole. Thus, while nearly half of the agricultural advisors supported *field afforestation* as a *policy principle at the national level*, only one third considered it to be an effective policy *for their home commune*. Similarly, almost all forestry advisors approved of field afforestation as a policy principle and as an effective means of production reduction for the country as a whole, but only 54% considered the solution to be effective *in their home commune!* As over half of the local advisors considered that they had a strong influence on farmers' decision making (Petäjistö and Selby 1994), their negative attitudes to field afforestation in their home commune is likely to play a significant role in their advisory work.

Thus, resistance to field afforestation varies both with professional group and with respect to space and place. The result supports the propositions concerning the influence of "social space" in corporate society. Agronomists who "loose space" are more hostile to field afforestation than foresters who "gain space". Additionally, the measure is seen by all professional groups to be more significant for the country as a whole than for their home commune. The combined effect of "ties-to-place" and objections to a measure seen as "closing" part of local history are clearly discernible. That the forestry advisors' professional interests were found to be subservient to their personal interests indicates that *place* is ultimately stronger than *space*!

The question therefore arises, as *to whether national land use policies are administered objectively at the local level*? The answer on the basis of this investigation would seem to be "Not necessarily". Indeed, the authors of this paper would argue that the attitudes of local

Table 4. Effectiveness of instruments for reducing agricultural overproduction in the country as a whole (Nat) and in the home commune (Ho), by professional groups.

	Agricult. advisor (N=9)		Commercial advisor (N=8)		Forestry advisor (N=11)		Total (N=28)	
	Nat	Ho	Nat	Ho	Nat	Ho	Nat	Ho
Voluntary fallow	89	78	62	62	63	54	71	64
Compulsory fallow	89	67	62	62	82	73	79	68
Production reduction agr.	44	22	62	62	91	73	68	54
Field afforestation	44	33	50	25	100	54	68	39
Environmental farming	22	11	62	62	18	18	32	29

advisors strongly suggest that *policy measures are only as effective as the efficiency of their lowest level of operation.* In this case, the lofty aim of the national level policy makers with respect to field afforestation (up to 20 000 ha per year within the national EU-funded field afforestation programme) does not seem to find support at the local level where the policy is administered (Table 1). Further, it is quite clear that local advisors' motives for not advancing certain policy means, such as field afforestation, are embedded not only in their wish to maintain the social space of their sector of the corporate state, but also to preserve the cultural landscape, *their cultural landscape*, and other symbols and associations of their home commune which help to create and maintain their *ties-to-place*.

6. Discussion – towards an integrated land use policy?

The grant-aided field afforestation introduced in Finland in 1969 and by the EU some 25 years later, initially had similar policy aims, namely to offset the overproduction of many staple goods. In the C.A.P. reforms, field afforestation was also seen as a means of diversifying the countryside. Forests and woodlands would improve the rural resource base, and so improve rural socio-economic conditions by creating new employment and enterprise opportunities. Later, a global dimension entered the Commission's thinking, and European afforestation was seen as a political tool in, amongst other things, the global climate change debate (see e.g. Anz 1993, Volz 1993).

In the event, afforestation, and especially field afforestation, is taking place in Europe under very diverse circumstances. At the two extremes, there are Finland and Ireland, the two examples presented in some detail in this paper. Finland, it will be recalled, has c. 7% of its land surface under fields compared Ireland which has c. 10% under forest.

Both Finland and Ireland have witnessed resistance to field afforestation, with only certain members of the farming community in both countries being prepared to afforest fields: these are often retiring farmers with no heirs, or trustees of farms. Practising farmers who afforest fields seem to be motivated more by the grants and premiums which give them a *de facto* pre-retirement bonus. The same process encourages the pre-emptive peaks in grant-aided afforestation which occur when a given programme's financing is about to terminate.

The strong spatial variations in field afforestation in Finland, and in other EU countries as well, are evidence of an increasing regional specialisations in agriculture (and forestry) and rural areas (see e.g. Mees et al. 1988, de Regt 1989). These specialisations have been termed land use *segregation* by landscape ecologists (e.g. Bruns and Luz 1988, 1989).

The process of *segregation*, as witnessed by land use tendencies of the past two decades or so, is not only functional, it is also ecological, aesthetic, economic and social. The "good" land is segregated from the "bad", the latter forming ecological reserves - but reserves only for those species which adapt to habitats represented on "marginal" land. Evidence of this process is widespread (see e.g. Willerby 1983, Meeus et al. 1988, Whitby 1992, Bethe and Bolsius 1995, Baldock 1996). It is this "marginalised land" which seen by policy makers to be fit for forestry, and so begins the social process, found so strongly in Ireland, that associates "marginalisation" and "rural decline" with forestry. Similarly in Finland, it is the "marginalised land" of the eastern periphery where the highest intensity of field afforestation is found and where rural society is seen to have a very dubious future.

The reverse process to segregation is *integration* (Bruns and Luz 1988, 1989; see also Richardson-Flack 1990). Land use integration seeks to avoid taking large areas (or entire regions) of marginal land out of agricultural production. The main process would be the extensification of agricultural production, with the concomitant reduction of inputs of energy

and agrochemicals. The integrated landscape following such a process would be typified by (Bruns and Lux 1989): agricultural production which would continue to extend to marginal regions; low-input agricultural management which would arrest the depletion of soils, pollution of groundwater and the destruction of natural habitats; a landscape of networks of habitats – fields, forests, hedgerows, nature reserves on selected sites, etc. within patterns of agricultural land. To this list might be added, especially in Central Europe, the *economic, social and ecological rehabilitation of woodlands and forests*. In any case, woodlands and forests would become multi-functional and provide a diverse range of goods and services which could form a basis for rural enterprise (see e.g. Glück and Weiss 1996, Multifunctional Forestry… 1998) – as intended by 2080/92 and reinforced by 1257/99. It is perhaps this function of afforestation which has received least attention in research. For example, studies of the preconditions for afforestation have largely concentrated on economic factors (Weber 1998: 160–161).

To advance the assimilation of woodlands and forestry into rural life, the process of land use integration should also contain a cultural dimension (e.g. Svobodova 1990). As demonstrated above for Finland, cultural ties-to-place were evident in farmers' and advisors' resistance to field afforestation, indicating that (even) professionals respond to threats to (valued) cultural landscapes. Similarly, Irish farmers and land owners have expressed strong doubts about forestry, partly because of their unfamiliarity with forestry but also because of its lack of integration into *their* "lifeworld", and the values they place on *their* agricultural and pastoral landscape. Many of the objections to afforestation nonetheless stem from the fact that the new forests and woodlands are largely economically oriented rather than being *multifunctional* (e.g. Weber 1998, Mather 1993, Multifunctional forestry… 1998).

If field afforestation is to be more widely accepted, the negative effects of field afforestation on rural cultural landscapes have to be reduced. This means that field afforestation (or afforestation in general) must take into consideration the various elements of rural vitality and their sustainability. The framework offered by Council Regulation 1257/99, or that provided by the concepts of the social sustainability of forests as outlined by Criterion 6 (Maintenance of other socio-economic functions and conditions) of the Ministerial Conference on the Protection of Forests in Europe, may provide fertile starting points for analysis. For example, to what extent has field afforestation damaged the rural environment, and has it assisted or hindered rural development? Extension activities to increase public perceptions and awareness of the advantages of forests and forestry will need to be addressed more comprehensively than it is at present (e.g. Terrasson 1998, Multifunctional Forestry… 1998).

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Afforestation in Spain – Stocktaking Report after the Regionalization

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Abstract

Afforestation is considered one of the best solutions for dealing with abandonment of agricultural land, but the implementation in Spain of the National Programme for "Afforestation in Agricultural Land" (1994–1999) had to face two main challenges: firstly, the unfavourable climatic and ecological conditions in many of the areas to be forested; and secondly, the new Spanish model of the State in which the full competence for forestry comes under the jurisdiction of the new autonomous regional governments. The Programme covered over 490 000 ha, and although this is less than the area originally expected (800 000 ha), it still represents a considerable effort in the total amount of the forested area in the U.E. under Regulation (EEC) 2080/92. Significant advances in afforestation techniques and an increase in the environmental integration of Spanish agriculture are other issues to be taken into account.

Keywords: afforestation, forestry, regionalization, Spain

1. Introduction

A great part of the total area of Spain belongs to the Mediterranean region. That means low and highly variable, often torrential, rainfall, recurrent drought (the last during 1990–1995 period), water scarcity, and a precarious environmental balance in many ecosystems. Forest and other wooded land, like typical Mediterranean shrub systems, suffer deforestation, generally due to fire or over-grazing. The combined action of all these factors frequently leads to soil erosion. Even in agricultural land, soil degradation, particularly soil erosion, is a major problem due to deficient farming practices. Many of the soils, today under agricultural use, were covered by forest vegetation a hundred years ago and are light, fragile and shallow from the agricultural point of view, and as a result they can be considered marginal land.

Norbert Weber (ed.)
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Ecological conditions in the Mediterranean basin have determined a specific type of agriculture in which water availability and soil characteristics are the two determining factors for profitable farming. In many rural areas agriculture has played a predominant role, but the impact of both past agricultural policies and advanced technologies on the traditional Mediterranean agricultural practices contributes to the decrease of agricultural land use in marginal areas. The abandonment of such areas leads to the development of scrub vegetation which is vulnerable to fire and affected by erosion. In most of the arid and semi-arid parts of the country, the final stage of this serial process is similar to that of deforested wooded land: desertification.

Thus, the maintenance of rural population and continuity of traditional agricultural or forestry practices are key issues for sustainable development in these areas. In some cases, local industry, agri-tourism and rural recreation offer complementary income sources to farmers, but such options are not always viable in certain less favoured rural areas (Barbero 1993). In any case, it is necessary to find alternative uses for marginal land. Afforestation is considered one of the best solutions for dealing with abandonment of agriculture land: "afforestation of farmland encourages forms of countryside management that are more compatible with the environment, combating the greenhouse effect and absorbing carbon dioxide" (European Council 1999).

2. Land use and land cover in Spain

For a better understanding of the significance of the first National Programme "Afforestation of Agricultural Land" in Spain we will examine the context in which it has been developed, making some comments on the distribution of the main uses of land in Spain, and their evolution in recent years.

Data from agricultural statistics (MAPA 1997) in Tables 1a and 1b show how this evolution was from 1990 to 1996 for crop land and land under permanent meadows and pastures.

We have translated as *arable land* the first sub-category that, according to the MAPA "Anuario de Estadística Agraria, 1997" (Yearly Agricultural Statistics 1997), refers to all land with herbaceous crops under rotation. The third one, *Land under permanent crops*, refers to land used for crops occupying it for a long period of time, which do not have to be planted again for several years after each harvest (MAPA 1997). They are composed generally of woody crops such as fruit trees, olive trees, vineyards, citric plantations, etc.

In the Meadows and Pastures classification, *Permanent Meadows* means grassland used permanently for herbaceous forage *in situ*, even in case of harvesting. If there are trees or shrubs, the coverage rate is below 5% of the area for trees and below 20% for shrubs, forage being always the most important use. *Pastures* refers to the same use but in drier areas and there is not any kind of harvesting (MAPA 1997).

Rates of change in Tables 1 and 2 show that there is a small but continuous decreasing in crop land, mainly in arable crops and permanent crops without irrigation (irrigated area has increased). The decrease in fallow is probably due to growing intensification of agricultural practices. Meadows and Pastures are almost stable.

Forest land has slightly increased during the last years: 2.7% from 1980 to 1993 (FAO 1998). But it is difficult to establish how many hectares have changed from agricultural land to forest land, because many farms, some times with good soils, for instance in areas situated in coastal zones, have abandoned agricultural practices due to urban and industrial expansion and tourism development.

In any case, it seems that there are more than one million hectares of agricultural land available for afforestation. But, in the land use distribution made by the Spanish agricultural statistics, we can find other categories, besides *crop land* and *forest land*, occupying a

Table 1a. Evolution of crop land uses in Spain (1990–1996), area in 1000 ha.

Year	Arable land		Fallow and unused land		Land under Permanent crops		Total		
	Dry	Irrig.	Dry	Irrig.	Dry	Irrig.	Dry	Irrig.	Total
1990	8 899	2 274	3 979	183	4 096	741	16 973	3 199	20 172
1991	8 958	2 245	3 855	200	4 082	748	16 895	3 193	20 089
1992	8 962	2 203	3 777	258	4 000	746	16 739	3 208	19 947
1993	8 542	2 198	3 949	292	3 927	749	16 417	3 239	19 657
1994	8 080	2 183	3 314	188	3 935	755	15 329	3 125	18 454
1995	8 116	2 159	3 561	210	3 899	809	15 575	3 178	18 753
1996	8 281	2 309	3 208	161	3 854	840	15 343	3 310	18 652
Rate of change (%)									
90-91	0.7	-1.3	-3.1	9.4	-0.3	0.9	-0.5	-0.2	-0.4
91-92	0.0	-1.9	-2.0	28.9	-2.0	-0.2	-0.9	0.5	-0.7
92-93	-4.7	-0.2	4.5	13.1	-1.8	0.3	-1.9	1.0	-1.5
93-94	-5.4	-0.7	-16.0	-35.8	0.2	0.8	-6.6	-3.5	-6.1
94-95	0.5	-1.1	7.4	12.0	-0.9	7.2	1.6	1.7	1.6
95-96	2.0	7.0	-9.9	-23.5	-1.2	3.8	-1.5	4.1	-0.5
90-96	-6.9	1.5	-19.4	-12.3	-5.9	13.2	-9.6	3.5	-7.5

Source: MAPA 1997

Table 1b. Evolution of land under permanent meadows and pastures (1990–1996), area in 1000 ha.

Year	Permanent meadows		Pastures
	Dry	Irrigated	
1990	1186	204	5368
1991	1136	195	5107
1992	1125	195	5151.4
1993	1111	197	5188
1994	1115	359	6098
1995	1146	353	5507
1996	1095	293	5579
Rate of change (%)			
90-91	-4.2	-4.6	-4.9
91-92	-0.9	0.2	0.9
92-93	-1.3	0.8	0.7
93-94	0.4	82.1	17.6
94-95	2.8	-1.5	-9.7
95-96	-4.5	-17.1	1.3
90-96	-0.1	0.4	0.0

Source: MAPA 1997

significant area in the country: they are called “Erial a pastos” and “Espartizal” (*Stipa tenacissima* as main species). In both cases they could be classified as non- wooded land, occupied by herbs or scrub and only accidentally used as forage by livestock. Their area amounts to over four million hectares.

Table 2. Main tree species of Spanish forests, area (1000 ha).

Species	Dominant	Co-dominant	Total
Conifer			
Pinus pinaster	1058	626	1684
Pinus halepensis	1365	135	1500
Pinus sylvestris	840	370	1210
Pinus nigra	525	338	863
Pinus pinea	223	147	370
Juniperus thurifera	124	83	207
Pinus uncinata	75	0	75
Pinus canariensis	72	0	72
Broadleaved			
Quercus ilex	1473	503	1976
Fagus sylvatica	343	105	448
Quercus pyrenaica	313	68	381
Quercus suber	117	256	373
Quercus faginea	88	181	269
Castanea sativa	102	111	213
Quercus robur/Q. Petrae	38	171	209
Olea europea	17	58	75

Source: MIMAM, 2000

The Second National Forest Inventory (1996) assessment estimates “closed forest” area in Spain to be 10.7 million ha although this figure includes forest systems with at least 20% crown coverage of trees. Open forests, with crown coverage between 10% and 20%, not including *Dehesa* systems, occupy 3.2 million ha. The rest are areas classified as other wooded land, containing woody vegetation (including widely spaced trees), shrubs, scrub and forest fallow. Table 2 shows the main tree species of Spanish forests.

While *P. pinaster*, *P. halepensis* and *Q. ilex* (green oak) occupy the biggest area, a wide range of types of vegetation can be found across the Península Ibérica (The Canary Islands belong to macaronesian region), depending on hydrological and geographic conditions: from the arid areas with trees such as *P. halepensis*, *Juniperus thurifera*, *Tetraclinis articulata* (araar), or shrubs such as *Q. coccifera* (kèrmes oak) and *Juniperus phoenicia* to the northern and western humid Atlantic coasts with broadleaved species such as *Q. robur* or *Fagus sylvatica* and fast-growing species, such as *P. radiata*, eucalyptus or *P. pinaster*, plantations.

Far from the influence of the seas we can find, for instance, in the west and southern part of the Peninsula, the *dehesas*, a mixture of crop, pasture and tree land with *Q. ilex* and *Q. suber* (cork oak) or in the central *Meseta* high plains, sandy soils with *P. pinea*. In inland mountains, with a higher rainfall, forests are composed by *P. pinaster*, *P. nigra*, *P. sylvestris* or *P. uncinata*, depending their distribution on the altitude of the stands. The Mediterranean shrub systems known as *manchas* or *garrigas* (the French *maquis*) are composed of species of *Quercus*, *Olea* or *Ceratonia genera*.

After the Civil War, over a forty years period, more than three million hectares of degraded land were reforested using mainly pine species. But, in recent years, the rate of restored area per year decreased substantially due, among other circumstances, to the lack of available land.

3. The Spanish programme "Afforestation of Agricultural Land"

In view of the situation described previously, the Council Regulation (EEC) No 2080/92 establishing a Community aid scheme for forestry measures in agriculture meant an important contribution to restore many degraded areas and provide valid options to farmers for their abandoned land. So the Spanish Programme objectives comprised not only those of the Council Regulation (accompanying the changes to be introduced under the common market organisation rules, environmental issues, combating greenhouse effect, etc.) but others included both in a national forest strategy to expand forest land and in a social context (Barbero and Gómez Jover 1993).

The Spanish Programme under this scheme was submitted to the European Communities in 1992. Regulation 2080/92 was transposed to the Spanish rules through Royal Decree No 378/93 in March 1993, repealed later, in 1996, by Royal Decree No 152/96 that presented some economic amendments adopted by the European Commission in 1999. But the application of these rules had to be adapted to the new structure of the Spanish State: after the Spanish Constitution of 1978, the Central Government began a process of transference of part of its administrative and political powers to the Autonomous Governments of the seventeen regions in which the country was divided. Forest policy was among the powers fully assumed by the so-called "autonomies".

The National Programme was designed as a framework comprising, among others, the following basic elements: the different types of eligible actions, eligible farmers and other natural or legal person, maximum amounts for aids in each case, and the established priorities. Each autonomous community designed its own regional programme within this framework. The Central Government could finance 50% of the cost of these regional programmes through its own funds, provided that such programmes were included in the National Programme, or they could be co-financed by the European Community.

For every programme the rate of the European Community co-financing through the Guarantee Section of the European Agricultural Guidance and Guarantee Fund (EAGGF) was 75% for regions covered by objective 1 and 50% for the other regions.

It was considered that *agricultural land* was any kind of land having had agricultural use in the last ten years and being available to be forested. The programme comprised a wide range of types of eligible agricultural land:

- Arable land
- Fallow and other unused land
- Traditional orchards
- Woody crops: fruit trees, vineyard, olive trees, etc.
- Permanent meadows
- Pastures
- Cork oak stands
- Open forest and *dehesa*
- Other non-wooded land.

The aid scheme comprised:

- Aid for afforestation costs
- An annual premium per hectare forested to cover maintenance cost in the first five years
- An annual premium per hectare to cover losses of income resulting from afforestation of agricultural land
- Investment aids for the improvement of woodlands providing them with shelterbelts, fire-breaks, waterpoints, fences and forest roads, and for the improvement of cork oak stands.

The species to be planted were grouped following three different criteria or targets:

- Species planted for long term (longer than 25 years) timber production (native pines, cedar, spruce, fir, etc.) (Appendix 1)
- Tree or shrub species planted for restoring or creating permanent forest stands (fir, white poplar, beech, elm, green oak, cork oak, etc.) (Appendix 2)
- Native tree or shrub species of particular interest in certain areas because of its timber quality, being endemic, endangered, etc. (araar, certain junipers, cherry tree, chestnut tree, walnut tree, etc.) (Appendix 3)

Higher rates of grants were paid for those species included in Appendix 3 and each regional programme could change species from one group to another or to add new species following its own regional or local characteristics or peculiarities, for example, a number of autonomous governments included grants for fast – growing species plantations not listed in the Appendices. The regional programmes determined levels of aids taking as a basis parameters such as:

- Slopes
- Types of soils to be forested
- Size of the farm and the extent of the area to be forested per year
- Minimum size of the area to be forested by individual or associated owners.

There have been two zone programmes with more detailed elements. The territorial distribution of the Central Administration funds was based on the following criteria:

- Utilised Agricultural Area
- Agricultural employment and agricultural production Indicators
- Erosion Index
- Inverse of average agricultural productivity per hectare / UAA ratio.

Regional programmes under the national programme were implemented by means of bi-lateral agreements between Autonomous Governments and the Central Administration.

4. Implementation of national and regional programmes

It was necessary to defer the application of the measures up to the 1994 planting season to solve the complicated process of transferring Central Administration funds to the autonomous communities' budgets. In addition, results throughout 1994 and 1995 were very poor, mainly due to the harsh drought suffered in the country in the 1990–1995 period and also due to the lack of both specialised enterprises, nurseries, etc. and farmers willing to undertake such fundamental changes in their traditional practices. The expiry date for the programme was fixed for 1998 and later extended to 1999.

Nevertheless, at the end of 1997, the situation improved, as Tables 3, 4 and 5 show. The average costs for the different measures were as follows (MAPA 1998):

- Afforestation: 210 000 ptas/ha (1 262.13 Euros)
- Maintenance in the first five years: 28 160 ptas/ha/year (169.25 Euros)
- Annual premium to cover losses of income: 16 281 ptas/ha/year (97.85 Euros)
- Improvement of cork oak stands: 160 000 ptas/ha (961.62 Euros)

The total area afforested in Spain made up 46% of the total area afforested across Europe under Regulation 2080/92 (European Commission 1999). Spain also registered the highest

Table 3. Forested area by Dec, 31, 1997 (hectares).

Species	ha	total	total
Broadleaved			
Slow growing species (creating permanent stands)			
Quercus suber	37 790		
Quercus ilex	91 751		
Q. suber x Q. ilex	12 698		
Other broadleaved species	51 000		
Total, slow – growing species		193 239	
Fast growing species, cultivated in the short term (15–25 years)			
Eucalyptus	5200		
Populus	1152		
Other fast growing species	0		
Total fast growing broadleaved species		6352	
Total broadleaved species			199 591
Conifers			
Total slow growing conifers (felling cycle longer than 25 years)		94 758	
Total fast growing conifers, cultivated in short term (15–25 years)		26 287	
Total conifers			121 045
Mixed (broadleaved and conifers)			
Total mixed broadleaved and conifers			9106
Other tree and shrub species			
Total, other tree and shrub species			644
Total forested area			330 386

Source: MAPA 1998

Table 4. Improvements in existing woodlands.

Renovation and improvement of cork oak stands (hectare)	69 458
Woodland improvement (hectare)	76 690
Firebreaks (hectare)	3038
Waterpoints (Unit)	643
Forest roads (Kilometre)	3289

Source MAPA 1998

Table 5. Forested agricultural land types and areas.

	%	Hectares
Arable land	17.56	58 031
Fallow and other unoccupied land	13.47	44 495
Familiar orchards	0.01	49
Permanent crops	6.7	22 123
Permanent meadows	0.37	1 218
Pastures	15.18	50 153
Cork oak stands	0.01	31
Open forest and “dehesas”	11.23	37 092
Non wooded land	35.47	117 193
Total	100	330 385

Source: MAPA 1998

Table 6. Financing rates in the different regions.

Region or Autonomous Community (AC) type	MAPA – AACC – EAGGF	AACC – EAGGF
Objective 1	12.5% – 12.5% – 75.0%	25% – 75%
Out of Objective	25.0% – 25.0% – 25.0%	50% – 50%
Navarra and País Vasco	0% – 0% – 0%	50% – 50%
Canarias, Cantabria, Cataluña, Murcia, La Rioja and Comunidad Valenciana	12.5% – 12.5% – 75%	0% – 0%

Source: MAPA 1998

Table 7. Total national programme investments and areas (Dec 31, 1999) (million ptas).

AREA (ha)	EAGGF		MAPA		AACC		TOTAL	
	Ptas	Euros	Ptas	Euros	Ptas	Euros	Ptas	Euros
488 130	101 369	609.240	12 146	73 000	25 499	153 252	139 014	835 491

Source: MAPA 1999

number of eligible owners, more than 25 000, in the EU. Only 637 afforestation schemes were made on public property estates. Most of the forested farms were privately owned and small in size (8–9 hectares) (European Commission 1999).

From 1997 to 1999, the afforested area in Spain increased by 157 138 hectares so that the total investments and forested areas of the National Programme up to 15-10-99 are as shown in Table 7.

From 1999 to 2000, more than 100 000 hectares are expected to be forested from pledges already adopted by the autonomous communities, so that, at the end of 2000, the Programme will reach more than half a million hectares.

5. Conclusions

The implementation of the aid scheme under Regulation (EEC) No 2080/92 in the EU has not fulfilled some of the initial purposes as a measure to accompany the changes introduced by the reform of the CAP in 1992. For instance, its effects on agricultural production surpluses are very modest. From a territorial point of view, the forested areas have scarcely changed the total amount of European Utilised Agricultural Area or that of the forest area.

In Spain the numerous and small forested plots constitute a patchwork that introduces diversity in some rural landscapes but, in some cases, disturbs the traditional livestock grazing or creates new fire risks. It is necessary to encourage more co-operation between landowners through associations.

Other problems that have arisen involve the co-ordination and monitoring of the development of the regional programmes and, perhaps, the need to revise the agreements with the autonomous governments.

On the other hand, there have been positive effects on afforestation techniques, greenhouse cultivation methods, seeds selection and seed genetic improvement etc. as well as an increase in the environmental integration of Spanish agriculture.

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Afforestation in Britain: Opportunities and Obstacles, Strategies and Targets

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Abstract

Over 70% of the existing forests of Britain are the result of afforestation, derived from a consistent policy of afforestation during the 20th century, albeit with evolving justifications. The striking variety of forest types created is reviewed, with an indication of the associated costs and grants. Recent moves to discretionary grants will achieve greater value for public money but may undermine the control over afforestation effected via grants. Agenda 2000 reforms will open up several opportunities, but there are also a wide range of political, economic and silvicultural challenges to overcome. New forestry strategies are being prepared, based on wide public consultation, and the setting of targets based on objectives rather than activities is discussed.

Keywords: afforestation; woodland creation; strategies; consultation; incentives

1. Introduction to the forest resource in Britain

Forestry in Britain in the 20th century has been dominated by afforestation. However, in the longer time frame this is a very recent and limited phenomenon since deforestation has been a dominant feature of the previous five millennia. Britain was already largely deforested by 1100 AD (Rackham 1976) and by 1900 woodland only covered around 5% of the land area. The vast areas of wet upland moors and smaller areas of lowland heathland were created and sustained by centuries of extensive grazing. In terms of soil fertility and structural diversity, they are seriously degraded ecosystems, but ironically they are now highly valued on the grounds of their biodiversity, landscape and cultural heritage. Somewhat unusually, in Britain it is afforestation rather than deforestation that has been the source of controversy.

By the end of the twentieth century afforestation had brought the area of forest to 2.4 mill. ha, meaning that the forest cover had been doubled to 10%. The major part of this expansion

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occurred between 1950 and 1990, and was with non-native conifers. This has resulted in a forest resource that is very different to that which existed at the start of the century. Approximately 71% of the current forest area is the result of afforestation, most of which has been by planting, and more than two-thirds is under 50 years old. Only 26% of the area comprises native species, and only half of this is on sites that have been continuously wooded – woodlands that are now termed 'Ancient & Semi-natural' (Kirby and Spencer 1992; see Figure1). The combination of millennia of deforestation, and a century of converting semi-natural woodland to plantations, mean that only around 1.6% of the original forest survives as semi-natural woodland, and virtually all of this has been significantly altered in structure and/ or composition by past utilisation.

Just over one third of the area is currently owned or managed by the state Forestry Commission, and the majority of the area is concentrated in the upland areas in the north and west of the country (Forestry Commission 1982). The forest area is highly fragmented, particularly in the lowlands where there are very few woodlands greater than 500 ha in extent. The other crucial contextual feature of British forestry is the fact that we have a population of 55 million, giving more than 20 people per hectare of forest. Given that most of the forest lies is the least populated upland areas, the population pressure on the lowland forests is thus very high indeed.

Figure 1. Plantation, semi-natural and 'ancient' woodland areas in GB. Areas in kha, also expressed as percentages of total forest area (2.423 mill. ha).

2. Policy objectives and instruments

The expansion of the forest area through afforestation has been a consistent objective of forest policy from the first statement of forest policy in 1919 until the present day (Pringle 1994). However, the reasons or justification for such afforestation have changed over that period, as can be seen from the emphasis given in successive policy statements over the century:

1919 The creation of a 'strategic reserve' of timber to allow the country to be self-supporting for a three year war period
1972 Reduction in the very high costs of timber imports
1987 Utilisation of surplus agricultural land
1991 Provision of multiple benefits from diverse woodlands

The policy instruments used over this period to promote afforestation include the following:

- the ability to use expenditure on forestry to reduce tax liability on other income and exemption from income tax on timber sales
- planting grants from the Forestry Commission
- annual payments under the EC Common Agricultural Policy (Regulation 2080/92)
- 'top up' grants paid by quasi-government bodies in specific locations e.g. National Parks and Lottery Funding

In practice it is the tax incentives that have been the main driver for commercial plantations, until this was withdrawn suddenly in 1988.

Afforestation is considered 'permitted development' under the planning and development regulations and the only legal control over planting is a requirement under the EC Directive on Environmental Impact Assessment for 'large scale' afforestation projects to have an EA carried out. However, in practice effective control has been achieved through the conditions and consultation procedures associated with grant aid. Although it has always been possible for landowners to go ahead with controversial afforestation without grant aid, in practice this has been very rare. Afforestation in Britain provides an interesting example of a positive incentive also acting as an effective regulatory tool.

3. Types of forest created

The annual rate of afforestation achieved by these instruments has been between 10,000 and 30,000 ha per annum for the last few decades (see Figure 2).

The late 1980s saw a dramatic change in afforestation in Britain, with a change from predominantly commercial plantations in the uplands, to woodlands planted primarily for non-commercial reasons – either small woods in the lowlands or large tracts of native pinewood in Scotland. This change has been accompanied by a scaling down of afforestation, with total annual figures falling to between 15,000 ha and 20,000 ha per annum throughout the 1990s. Some of the most significant 'blips' in the annual rate have occurred immediately after significant changes in incentive rates, which reveals the importance of confidence in the industry, which in turn depends on consistency in such policies.

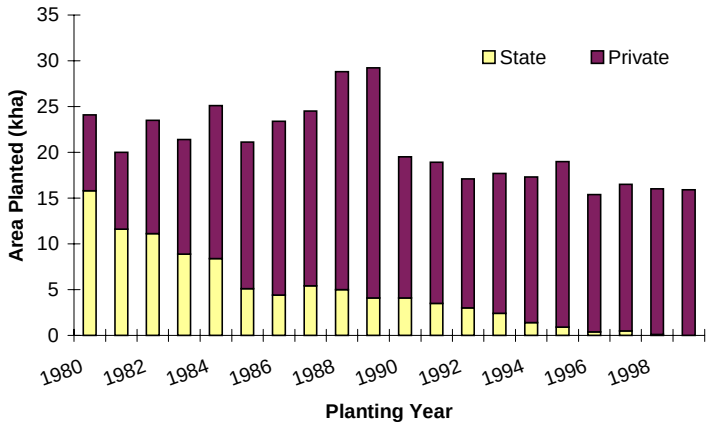

Figure 2. Annual area afforested in Britain 1950–1998. Sources: Forest Industry Handbook1998, (Forest Industry Council GB 1999); Forestry Commission Annual Report 1998/9 (FC 1999); Forestry Facts & Figures 1998/9, (Forestry Commission 1999).

The types of forest created are strikingly diverse, and this is best shown by describing various typical forest types (see Table 1).

Data is not available yet which would allow estimates of the area of each of these different broad types of forest to be made. The best indication of the different types of woodland being planted is an analysis of the different types of grant being paid (see Box 1).

A picture of current planting activity is not complete without some indication of the costs and levels of grant paid. These will be different for every situation, but to give a general indication two typical scenarios are shown in the Table 2.

These figures show that the cost of planting in larger scale upland conifer plantations will typically be half that for broadleaves in the lowlands, where weeds and pests present more of a challenge. The value of Annual Premium payments can also be seen to be dominant on

Table 1. Typical forest types produced by afforestation measures.

Forest type	Species	Typical size	Distribution	Ownership
Extensive conifer plantations	*Picea sitchensis*	50–300	Uplands, N & W	Investors, private estates
Diverse conifer plantations	*Larix spp, Pseudotsuga menziesii, Picea abies*	10–50	Marginal pasture land, upland margins	Private estates, retiring farmers, investors
Amenity broadleaved woods and shooting coverts	Mixed broadleaves, mostly native, with a few conifers	<10 ha, and often <2 ha	Lowlands, especially England, improved land	Farmers, 'hobby' farmers, private estates (for game)
New native pinewoods and extensive native forest	*Pinus sylvatica*, some native broadleaves	50–200 ha	Scotland, and more rarely broadleaved woods in lowlands	Conservation trusts, private estates
'Community forests'	Mixed native broadleaves	<10 ha	Urban fringe, derelict land	Local authorities, property developers, industry

Box 1. Breakdown of current afforestation by grant type.

- 60% native species (mostly broadleaves) and 40% coniferous
- 86% by planting and 14% by natural regeneration (i.e. colonisation)
- 65% receiving Annual Premium payments (both improved and unimproved land)
- 38% receiving Better Land Supplement (i.e. improved pasture or arable)
- 20% in areas targeted for specific priorities, especially Community forests
- 6% with free public access provided

Note: The area percentages relate to 1998/9 planting season, when the total area planted was 14,500 ha. Source of data: Forestry Commission Grants & Licences Division.

Table 2. Funding and costs of two generalised afforestation scenarios (Euro/hectare).

Operation	Lowland	Upland
Planting	-4200	-2100
Woodland Grant Scheme (WGS) planting grant	3200	1500
Annual Premium payments	7500	1500
Net total (over 15 years)	6500	900
Value of land – pre-planting	10,000	3300
Value of land – post-planting	5000	1600

Box 2. Examples of criteria to be used in awarding discretionary afforestation grants in England.

- Proximity to a town or city, or located within an area identified for economic regeneration
- The extent of public access
- Contribution to national biodiversity priority species or habitats
- Active engagement of local people in the design or management
- Size, with more points for larger woods, or ones that link or extend existing woods
- Use of locally native species

improved land, and converts a net cost situation into a substantial positive cash flow over the first 15 years. The value of land is indicated to give the overall investment picture, and it must be remembered that the value of the land will often halve as soon as it is planted, reflecting the low medium-term income potential of woodland compared with farmland.

4. Opportunities

The sudden change in nature of afforestation, and the scaling down of both total area planted and average planted unit, which occurred in the late 1980s was seen by many as terminal decline for the afforestation industry. However, there are several new developments and trends which may bring opportunities for woodland creation:

- An increase in ‘hobby farming’ – with land being bought for primarily amenity purposes, and free from a requirement to produce an annual income.
- Land currently bearing bracken (*Pteridium aquilinum*) – which is marginal for extensive grazing, costly to improve for agricultural purposes and of only limited value for biodiversity.
- Regeneration of ‘derelict’ land on the urban fringe – where woodland creation has now proved itself to be a cost-effective and popular component of environmental and hence economic rehabilitation (e.g. Community Forests and the National Forest).
- Carbon sesquestration – which although the UK Government is placing greatest emphasis on emissions reduction, there is still considerable interest in tree planting by the utilities and other high fossil fuel using industries such as vehicle manufacturers (Cannel 1999).

There are some other opportunities arising specifically from the Agenda 2000 reform of the EC support scheme, although there are also some reservations about most of these:

- Incorporation in the Rural Development Regulation should give better integration with other measures, particularly agri-environment schemes. However, the delay in getting the Rural Development Plans approved has however created a hiatus in planting at present, and a loss of momentum.
- There is potential for increased funding for Rural Development, but forestry will need to compete directly with agri-environment schemes at a national level.
- Agenda 2000 reforms are unlikely to reverse the recent decline in livestock grazing enterprises, and so further 'restructuring' of the industry and changes in land ownership is likely. This may be disastrous for the livestock sector, and may bring environmental losses, but it should also result in some land becoming available for planting.
- The reforms, combined with falling food commodity prices, has resulted in a loss of confidence in agriculture which could encourage even some arable farmers to diversify into forestry.

5. Obstacles

Apart from the specific problems mentioned above there are some other widespread obstacles which are currently limiting afforestation, or will threaten newly created woodlands:

- The decline in agricultural income has not – yet – resulted in a comparable reduction in land values, and so the capital investment is still high, and the fall in capital value on planting is still substantial.
- Timber prices have fallen almost as much as agricultural prices, reducing predicted returns on investment and delaying the date at which a net income will be generated to at least 40 years for conifer crops.
- There is still a dearth of markets for low-grade and medium-sized hardwood timber (i.e. under 40 cm diameter and/or bent and/or with large knots), meaning most broadleaved crops will not produce a net income until at least 60–80 years after planting.
- There are significant areas, particularly in the lowlands, which are considered to be of potential archaeological interest and where there would be objections to planting.
- The levels of incentives needed to persuade farmers to convert to woodland, particularly with public access, are so high that they are getting to be difficult to justify politically.
- Most species of deer are spreading rapidly, and populations are reaching high levels, making expensive fencing or protection necessary in almost all areas.
- Grey squirrels look likely to devastate most oak, sycamore and beech plantings when they are 20–40 years old.

6. Strategies

Devolution, to give the component countries – and possibly even regions – of Britain more autonomy, is affecting forestry along with other aspects of Government. Although the Forestry Commission remains a GB body, funding is devolved to the component countries. A separate Woodland Strategy for England was published in 1998 (Forestry Commission (England) 1998), and similar strategies are currently being prepared for Wales and Scotland.

The England strategy is concerned primarily with woodland creation, and arose from an extensive consultation exercise (Countryside Commission & Forestry Commission 1996, 1997). It has identified four key priorities for new woodland:

- Rural development, including employment creation and timber production
- Environmental restoration of derelict areas, especially on the urban fringe
- Recreation and public amenity access
- Environmental protection and enhancement.

It expresses a significant shift of emphasis away from afforestation to supply timber and towards the creation of forests to provide environmental benefits for this densely populated part of Britain.

The consultation paper for the Scottish Forestry Strategy (Forestry Commission, Scotland 1999) is structured around three key questions:

- Do you agree with the concept of multi-purpose forestry?
- What mix of benefits do you want from forests?
- What principles should guide forest expansion?

The Wales Forest Strategy (Forestry Commission, Wales 2000) consultation paper takes a different approach, offering consultees four different scenarios, which can be summarised as follows:

1. *Market forces* – minimal public subsidy and investment in state forests, with market forces driving afforestation and woodland management, and as a result only modest levels of public benefits provided
2. *Integrated rural economy* – promoting jobs in rural areas and forging close integration with farming and local enterprises
3. *Environmental enhancement* – only promoting forestry which is based on the use of native species, and relying on associated leisure industries to provide rural employment
4. *Status quo* – some afforestation and restructuring to produce multi-purpose forests, but some plantations being abandoned or removed as being unproductive and unattractive.

These consultations involve inputs from hundreds of consultees, both verbal and written, and to demonstrate transparency a summary of the responses received is produced (e.g. Forestry Commission (Scotland) 2000). Future afforestation will thus be guided by a consensus of interested organisations and with a degree of public support which has never been there before. Once these three Strategies have been produced, the FC plans to combine them to form a National Forest Programme for Britain.

7. Achieving afforestation aims through discretionary grants

An interesting recent development is that afforestation grants, including the annual premium payments under the Rural Development Regulation, will in future only be available in England on a discretionary basis (Forestry Commission 2000). Each application will be scored according to how much it contributes to delivering the objectives of the England Forestry Strategy. Points are awarded according to criteria directly related to one or more of these objectives (see examples in Box 2).

Only those applications achieving a score above a certain minimum will be guaranteed a grant. Those below this level, but still above a minimum value, may be successful depending on the level of applications each year. There will thus be applications each year that comply

with all the Forestry Commission Guidelines and UK Forestry Standard (Forestry Commission 1998) but which do not deliver sufficient public benefits to merit grant aid.

This discretionary approach ensures good value for money for pubic expenditure. However, it does mean that Government could lose some control since unsuccessful applicants may proceed with planting anyway, and will then not be obliged to comply with the Government's Forestry Standard. Reducing the availability of grants inevitably reduces the level of control achieved through them. It would seem likely that in upland situations, where the level of annual payments is much lower, that planting without grant would be more likely. If the FC introduced the discretionary grants in Scotland and Wales they may therefore also need to introduce planting licences, or alternatively reduce the area thresholds above which an Environmental Impact Assessment would be required.

8. Targets

British forestry was driven by planting targets throughout the 20th century, and the successive targets set by Government are listed in Box 3. The annual rates of planting have been used as the key indicator of activity and confidence in the industry.

The ambitious targets – or as they were termed "aspirational" figures – set in 1996 were not adopted by the new Labour government in 1997, and it is notable that the new Forestry Strategy does not give any explicit figures. So at present the only targets are those arising from the Biodiversity Action Plans and these only relate to one specific type of woodland. It remains to be seen whether the other strategies include quantitative targets, or whether they are followed up by shorter term targets as set out in the Forestry Commissions Corporate Plan for England (2000).

One problem with the setting of targets is that the information on the existing woodland resource in Britain is not as complete or up to date as one might expect. The last complete census was done in 1979–1982 (Forestry Commission 1982). A new national inventory of woodlands and trees is in preparation (Wright D 1998 and Smith 1999) and this will be published for the whole country in 2001.

There is, in any case, a move away from targets based on activity (i.e. area planted) and towards targets based on achievement of objectives. This would suggest the following types of target might be useful:

- numbers of people visiting woodland
- expenditure by visitors to woodland, and hence employment indirectly associated with woodland

Box 3. Successive Afforestation Targets adopted by the Forestry Commission

1919	To create 2 mill. ha of productive forest, by reforestation and afforestation
1943	To afforest around 750,000 ha over the next 25 years
1985	To plant 33,000 ha per annum
1996	To double the area of woodland in England and achieve a 50% increase in Wales by 2050
1998	Increase the area of each native woodland habitat type by 10% by 2015

- employment directly associated with planting, forest management and timber harvesting and processing
- increases in populations of key species or areas of key habitats
- increase in property values and inward investment in economic regeneration areas which can be attributed to environmental improvement.

Such targets are not in place yet for afforestation, and some may be difficult to define. However, one of the Government's 'Headline Indicators of Sustainable Development' (DETR 1999) is directly relevant. This is an index of changes in breeding bird populations, based on 139 breeding birds, 41 of which are primarily woodland. This is ideal as a broad indicator since it integrates a wide range of woodland habitat quantity and quality indicators. It is also readily understood and appreciated by the public.

One of the areas of greatest uncertainty is the employment indirectly related to woodland creation. Surveys have shown that around 350 m day visits are made to forests in the UK each year (SCPR 1997). Furthermore, the same surveys suggest that an average of over Euro 5.00 is spent for every such visit, including fuel cost, thus giving a total expenditure of over Euro 1600 m. This is a staggeringly large sum compared with the total value of timber leaving British forests each year which is in the order of £ 150 m (Forest Industry Council GB 1999). It demonstrates dramatically the high amenity value of forests in this country and justifies the emphasis put on people and environment in the emerging plans for future afforestation in Britain.

Conclusions

This paper shows that there are number of fundamental changes in the way in which afforestation is being planned and achieved in Britain – with even the term *afforestation* being dropped in favour of *woodland creation.* The most notable of these changes are as follows:

- Linking – and limiting – public subsidy clearly to the provision of specific public benefits
- Placing particular emphasis on provision of public access to private woodland
- Afforestation plans and strategies based on wide public consultation and consensus
- Setting targets based on objectives and benefits (e.g. employment or visitor numbers) rather than on activity (i.e. area of woodland planted)
- Devolving or decentralising the planning of afforestation, and allowing greater geographical variation and targeting
- Sustaining local distinctiveness, diversity and identity, in terms of cultural heritage, wildlife, land use patterns and landscapes
- Increasing the emphasis on integrating forestry into local and rural economies
- Increasing recognition of the role that woodlands can play in sustaining leisure enterprises and associated employment in rural areas
- Increasing use of low intensity methods of forest creation – such as natural regeneration notably in Scottish Pinewoods – to create extensive forests

Somewhat ironically one other issue which is likely to get greater attention in Britain over the coming years is the need for deforestation. Many of the forests created by over-ambitious afforestation in the second half of the 20th century have proved to be a silvicultural, economic or environmental failure. At present there is a presumption that they will be replaced when felled, but there could be major environmental benefits in restoring them to other semi-natural habitats. Perhaps a deforestation strategy is now needed to match the ones for afforestation.

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Approaches of Afforestation Planning

Physical Planning for Forestry in Ireland

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Abstract

The legislation relation to physical planning for forestry in Ireland is changing rapidly. Environmental, socio-economic and landscape issues are receiving increasing attention. In order to comply with new international protocols and EU regulations relating to sustainable forest management, sensitive habitats, biodiversity etc. the government is producing a large number of documents. It has issued a Strategic Plan for the development of the Forestry Sector. It is in the process of developing a National Standard for Forestry which will encompass all the requirements (Indicators and Criteria) of Kyoto and Helsinki etc. In order to implement the National Forestry Standard the Forest Service is developing a Code of Best Forestry Practice and is revising or developing new "Guidelines" on water, archaeological sites, landscape, harvesting and biodiversity. The Forest Service is also drafting a new Forestry Act, which will replace outdated legislation.

Keywords: physical planning, forestry, environment, indicative forest strategies, sustainable forest management

Introduction

Unlike most other European countries much of the development of Irish forestry has been undertaken by the State. In the period 1922–80 while there was always some private planting this was only a tiny fraction of the State effort. In the period 1974 to 1984 the State planted an averaged of 8,038 hectares while the private sector averaged 265 hectares (Review Group on Forestry 1985). However, there was a complete reversal of this pattern in the following 10 years with the private sector averaging 7,984 hectares while the state sector averaged 6,381 hectares. These averaged figures do not tell the whole story as the figures for 1995 were 6,400 and 17,300 for the State and private sectors respectively (Forest Service 1996a). Some 74.6% of Irish forestry is now state owned (COFORD 1994).

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The main reasons for the State actively developing forestry in the Irish situation were: to build up our forest reserves; to act as a strategic source of timber; to develop underutilised land areas and to provide some form of social support to the more marginal regions of the country (Cameron 1951). However, because of the predominant place of agriculture in rural Ireland during much of this period, State forestry was deliberately limited to the most marginal of soils. It was actual Government policy to restrict the Forest Service's planting programme to the most marginal sites. These sites could only support conifers and even among the conifers choice was limited to the most tolerant species, Sitka spruce and Lodgepole pine (Bulfin 1987a; Bulfin 1987b; Farrell and Boyle 1991). The result of this policy was that forestry was in most cases confined to soils with very low forestry potential.

There are certain features that must be taken into account in developing legislation dealing with the planning of Irish forestry. Chief of these is the poverty of native tree species – especially conifers. There are only two native conifers and both of these are non-commercial. Most Irish forests, whether broadleaved or conifer, are of plantation origin. Almost all state forests were planted on the most marginal of sites. A further point about these plantations was that many of them were on environmentally sensitive sites. There was a distinct lack of awareness of environmental issues during much of this early State forestry period.

There are three major Government Acts, which form the legislative basis for forestry in Ireland. Many other Acts also impinge on forestry as well as the necessity to comply with EU regulations. All of the forestry Acts are out of date and are about to be replaced by a new comprehensive Forestry Act, which is currently being drafted. There was very little legislation relating to physical planning contained within these Acts. There is little point in looking at this legislation, as it will tell us very little about either the current situation or future developments. From the Forest Service's point of view there was little need for legislation, during the early period of State afforestation, as almost all the planting was being carried out by the State through the Forest Service. In order to deal with rapidly changing circumstances, forestry development during this period was basically governed by a series of rules and regulations issued by the Forest Service. In most cases these regulations were for its own internal use as the level of private planting was minute.

Strategy document

In preparation for the drafting of the new Act a strategic plan for the future of forestry was prepared by the Forest Service entitled "Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland" (Forest Service 1996a). One of the key policy decisions is that the Government planned to increase the national area under forestry from the then current 8% to 17%. This would involve the planting of 700,000 hectares over the following 30 years. With this target in mind the overall aim of the Strategy Document is

> *" to develop Forestry to a scale and in a manner which maximises its contribution to national economic and social well being in a sustainable basis and which is compatible with the protection of the environment".*

Thus, the Government's plan for the development of the forestry sector is based on the principles of sustainable forest management that will be incorporated into the National Forestry Standard and all the environmental commitments that Ireland has signed: Rio, Helsinki etc. The Strategy Document outlines government policy and the initiatives it intends to take to implement it. The Code of Best Forestry Practice (Forest Service 1999) and the various Guidelines are designed to give practical directions for implementation on the ground.

The new Act will give legislative underpinning to many of the policy proposals that appeared in the Forest Service's Strategy Document. This comprehensive document contains the Forest Service's policy proposals for the future and provides the framework for the new legislation. The Strategy Document deals with all aspects of Irish forestry "from seed to sawdust". The approach of the Strategy Document is to deal with the different aspects of the forest industry in separate chapters. Thus there are chapters on Species, Forest Management, Sawmilling etc. Each chapter briefly: outlines the current situation; discusses policy considerations; then defines a brief policy statement and finally lists a number of strategic actions that will be undertaken. A feature of the document is the number of chapters, which deal with physical planning or have sections, which impact on the environment.

As the whole point of this Workshop is to deal with the practice relating to new afforestation, this paper is confined to the ideas, concepts, policy considerations and initiatives, which are coming from the Forest Service's Strategic Plan. The specific implementing of the policy chapters that relate to physical planning will be examined. An indication of what the Forest Service is putting in place to implement these planning requirements will be given.

Forest Inventory and Planning System (FIPS)

Concept of FIPS

The chapter in the Strategy Document entitled "Inventory and Planning" is the main chapter that deals with physical planning. There is also considerable emphasis put on making an assessment of what has already been planted in the private sector. The Forest Service intends to control all future planning, and management of forestry, from a national point-of-view, through the setting up of a "Forest Inventory and Planning System" (FIPS). The FIPS system will be computer based and will be the major IT control system of the Forest Service for the future. The system will use database and GIS technology at its core.

In outlining their policy considerations for the inventory and planning area the Forest Service indicated that among the requirements for the FIPS were:

1. an integrated database with a wide range of spatial datasets both environmental, heritage and socio-economic
2. that all aspects of FIPS be linked and integrated
3. that it be capable of regular update – particularly on the inventory side
4. that it have the capacity of providing limited access for outside bodies and stakeholders
5. that it improve the response times of the Forest Service to its clients

The Strategic Action by the Forest Service to implement the policy considerations outlined above is stated as:

> *"The Department will design and set up a Forest Inventory and Planning System (FIPS) which will incorporate GIS techniques and be amenable to regular review".*

Code of best forestry practice

In order to develop the FIPS fully the Forest Service is now preparing its "Code of Best Forestry Practice" (Forest Service 1999). While the Strategy Document details the policy proposals of the Forest Service the Code gives more specific detail on all the practical aspects

of good forestry practice. The Code itself sets out to:

> *"Develop sustainable forestry for national and social benefit compatible with the environment: in particular to ensure that those environmental, economic and social forest values (identified by the Code) are recognised in the context of criteria for sustainable forest management and that adverse impacts associated with particular forest operations can be monitored, avoided or remedied."*

The Code then gives a list of specific operational objectives:

- Aquatic areas are safeguarded and water quality is maintained.
- Biodiversity is enhanced and protected.
- Heritage areas, archaeological sites and artefacts within forest sites are identified and protected.
- Areas of conservation (special, rare and endangered habitats) and areas of scientific importance are identified and protected.
- Visual amenities (private and public) and landscapes of importance are maintained and enhanced.
- The impact of forest operations off site, on people and the environment is minimised.
- Recreational potential is identified and developed and forest operations are carried out in a compatible way with these activities.
- Forest sites are conserved.
- Forest health and vitality is maintained through protection against disease and pests.
- Forest operations are carried out safely.
- Forest productivity is maintained through good silvicultural practice.
- Forestry operations do not damage plantations or woodlands.
- Forestry operations are efficient and cost effective.
- Legislation is complied with.

When finalised, this 300-page document will be the most comprehensive expression of the Forest Service's intentions on all aspects of forestry practice including planning and the environment. The fact that items are listed above does not mean that they have not been protected up to now. In some cases the rules and regulations, which have been in force, will remain the same, in others they will be amended and in the remaining areas new regulations will be created. It is likely that not all the items in the code will be placed into any new Act. Rather the new legislation will enshrine the aspirations of the Government in the preamble; detail the Government's powers in any particular area in the Act itself and enable the drafting of regulations by the Forest Service to deal with specific items. The legislation will apply to all involved in forestry. The Code is to be used independently of how forestry operations are funded. Very few people are likely to plant land without availing of the grant system. Thus, the fact that the State funds forestry through the grant and premium scheme in Ireland has brought an additional measure of regulation and enforcement, particularly to afforestation.

The Forest Service, even before the new Act becomes law, has begun to implement the Strategy Document's policies by beginning the development of the three major items in the FIPS programme. The FIPS system has three major components, the Forest Inventory, the Grants and Premium Administration System (GPAS) and a Forest Planning module (Fogarty et al. 1999).

Forest inventory

The State forests were privatised in 1989 and are run as a private company under the name Coillte. The government is the sole shareholder of the company. Coillte has a very

comprehensive and detailed GIS based inventory of its forests, which currently amount to some 75% approximately of the total forested land in Ireland. However, in the private sector little is known about the location of the new private forests. This is especially true of the new farm forests, which are small and widely dispersed (Bulfin 1999b). The Forest Service has instituted an inventory of all new private forests planted since 1980. They will then combine this information with corresponding data from Coillte's inventory to provide a national inventory. This inventory will provide the basic location, species, productivity, and forecasting data to meet the statistical requirements of the Government at regional national and EU level. Questions regarding the cumulative impact of successive approvals for afforestation will either be dealt with by combining data from both the Inventory and the Planning modules. As the whole IT programme will be one integrated system such developments will be automatically flagged through the system.

Grants and Premiums (GPAS)

The original Government legislation contained very little on physical planning for forestry. However, the Forest Service has gradually developed and introduced rules and regulations, which cover many aspects of physical and environmental planning. In the years from 1946 to 1972 – the year of Ireland's accession to the EU – this was mostly for the Forest Service's own self regulation. Increasingly from 1972 onwards these regulations would have been in response to EU directives, mostly relating to the environment. From 1980 onwards – the date of the first EU assisted grants for private forestry in Ireland – these regulations were also binding on the expanding private forestry sector.

An excellent example of how Forest Service policy is implemented through financial incentives is demonstrated in the rules and regulations that have been introduced in relation to the administration of the Grants and Premiums. These grants and premiums now support and promote all new afforestation. Since 1980 the Forest Service has used the Grants and Premiums system to persuade and direct private forestry to the type of land which it wishes to see planted. In the 1970s there was just one level of planting grant payment and average annual planting was around 230 hectares (Bulfin and Connolly 1986). From 1980 onward (with EU assistance in the attempt to develop private forestry) the grant scheme became more complex. Once an annual payment scheme (Premium Scheme) was introduced as well as the new planting grant payments in 1987 the supports for private forestry became ever more complex (Forest Service 1997).

Table 1 indicates the current position. There are a number of site and physical planning requirements either explicit or implicit in the structure of these grants. In setting these grants the Government is outlining its preferences but is very conscious of both the (very strong) rights to private property enshrined in the constitution and of the rights of individuals to utilise (or, perhaps, not use) their land as they wish. The important policy preferences implied are:

1. There is a minimum Yield Class below which planting will not be grant aided.
2. There is a preference shown for enclosed land over unenclosed land. (Enclosed land is any land, no matter how marginal, which has been fenced (hedges, earth banks or stone walls) for any type of agricultural production.)
3. Premium payments are higher for non-disadvantaged land. This would be in compliance with EU policy requirements under the CAP.
4. Species diversity is promoted by higher grants for diverse conifers and for broadleaves.
5. Farmers receive higher payments than non-farmers do – this again is CAP policy as the intention is to support farmers and to take land out of agriculture.

Table 1. Variation in rates of Planting Grant and annual Premium payments by land category.

New premium rates "Farmers" Land category Premium rate Euro/ha Unenclosed Land 186					
Enclosed and Improved Land	Conifers			Broadleaves	
	Non-diverse	20% diverse	40% diverse	Ash/ sycamore	Oak/ beech
More severely handicapped	224	269	282	320	339
Less severely handicapped	275	307	320	365	384
Non-disadvantaged	320	346	371	403	435
				Euro/ha	
In addition Sites >6 ha				12.8	
In addition Sites >12 ha				25.6	
"Non-farmers"				Euro/ha	
Unenclosed land				115	
Enclosed conifers				147	
Enclosed broadleaves				173	

In the accompanying document outlining the grants and premiums under the heading "What land is suitable?" it is stated: "Land on which a plantation is to be established must be capable of producing a commercial crop of wood". This requirement in itself is an environmental protection as much or the environmental sensitive lands are of low forestry productivity.

The Forest Service, through its requirements for grant approval, currently sets the target for a "commercial crop". This is based on the productivity of the site measured as Yield Class expressed as cubic metres per hectare per annum. The minimum productivity that is acceptable to the Forest Service is Yield Class (YC) 14 for non-diverse conifer i.e. Sitka spruce and Lodgepole pine.

The average YC for Sitka spruce planted by the State up to 1994 was YC 16 (COFORD 1994). At the moment the estimated average YC being grant aided is averaging YC 18, which indicates that the quality of the land being planted is improving. Setting a minimum YC of 14 almost automatically excludes many of the areas that were being planted by the Forest Service itself up until the mid 1980s – a complete reversal of earlier policy. It is clearly seen that the Forest Service has had for many years a *de facto* set of physical planning parameters, which must be met, if not *de jure* planning legislation.

Planning

It is the planning element of the Strategy Document that is the main focus of attention for this paper. The Forest Service in its assessment of the current situation as it existed in Ireland (at the time of drafting the Strategy Document in 1994–5) indicated that it was aware that annual private afforestation was proceeding at a rate varying between 15,800 hectares in 1990 to 23,400 hectares in 1995. The figure of 23,400 hectares is 0.34% of the land area of the Republic. This represents – by any standards – a very substantial programme.

However, various environmental problems were arising in relation to the afforestation programme, which were causing grave concern. Many of these problems were being caused

by the need to comply with both emerging national and EU law. A number of analysis and reports had been undertaken looking at the impact of forestry on the environment and at the socio-economic policies of the Forest Service (water: Allott 1997; Du Quesne 1990; Farrell et al. 1997; Giller et al. 1997; Kelly-Quinn et al. 1997; general environment and landscape: An Taisce 1990; Du Quesne 1993; Gilmore 1998; Heritage Council, 1999; rural welfare: Bulfin 1993; Bulfin 1994; Clinch 1999; Farm Forestry Forum 1996b; Kearney and O'Connor 1993; Ni Dhubhain 1994).

The Forest Service indicated the direction that it intended to take when it stated that

> *"GIS based techniques, forest survey and analysis by remote sensing (satellites and aerial photography) of such features as land types, forests, river catchments etc have been developing and improving in various sectors in recent years"*.

The Forest Service itself had no current IT expertise so it had been funding a number of IT initiatives and surveys by outside agencies such as the universities, private companies, Coillte and Teagasc.

The main management tool on the planning side will be undertaken through the structure of an Indicative Forest Strategy (IFS). The concept of an Indicative Forest Strategy was developed by Goodstadt, a planner, as part of an overall structural plan for the Strathclyde Regional Council of Scotland (Strathclyde Regional Council 1988). Goodstadt presented a paper on "Indicative Forest Strategies – the Scottish Experience" at a conference in Ireland in 1990 (Goodstadt 1991) and also at an EU Workshop in Brussels in 1991 (Goodstadt 1993) Since that time increasing interest has been taken in the concept in Ireland.

In a major initiative, towards the development of a national Indicative Forest Strategy the Forest Service funded a "pilot project relating to the development of an Indicative Forest Strategy, which merges environmental, infrastructural and other geographic data for the purpose guiding successful afforestation in County Clare". This study was carried out, using a GIS platform, by a team at Teagasc, Kinsealy between 1993 and 1995 (Bulfin et al. 1995). It showed that – even at that time – when there were relatively few spatial digital datasets in existence in Ireland, that such an approach to planning had a lot to offer. During the course of the study it became abundantly clear that, while the concept of an IFS, as used in Scotland, as a planner's prescriptive tool fulfilled the needs of planners, the process had far more potential in the hands of foresters. It was obvious that the Indicative Forest Strategy approach had immense potential as a dynamic, interactive and flexible tool. It can be used for the planning, modelling and long-term management of the development of forestry. It also became clear that, depending on the quality of the datasets, the IFS approach could be equally effective at local, regional or national scale.

The concept of developing an Indicative Forest Strategy has now become the forest-planning module of FIPS. In preparation for this Teagasc is developing the three basic digital datasets of an IFS. These are a national Forest Soils Classification, a Forestry Productivity Index and a Windthrow Hazard Classification (Bulfin 1999a). The Strategy Document indicates that Forest Service policy is to:

> *"Develop a comprehensive inventory and planning system to provide forest resource, geographical and environmental data for management, control and planning purposes"*.

While the Scottish Indicative Forest Strategies were undertaken by planners seeking to draw forestry into the planning process, it was always the intention of this author that any Irish Indicative Forest Strategy should be undertaken by foresters. There are a number of reasons why this approach is proposed. In listing these it must be clearly stated that Ireland has had the advantage of learning from the Scottish experience. Table 2 lists the differences between the Scottish Indicative Forest Strategy and the IFS within FIPS as it is now developing.

Table 2. Comparison between Scottish IFS and proposed Irish Indicative Forest Strategy under FIPS.

Scotland	Ireland
Developed by planners	Developed by foresters
Concerned with afforestation	Includes all aspects of physical and socio-economic planning
Little species information	Species based recommendations
Based on exclusion or constraints	Based on inclusion but with constraints
Prescriptive map little discussion	Decision Support System for Forest Service
Static	Dynamic and Interactive
Revised at fixed intervals	Additional datasets at any time
Constraints of equal value	Weighted constraints
Regionally based on 6 regions	Unified National base
Difficult to assess cumulative effect	Cumulative effect will be continuously monitored

The ideal of the IFS as envisioned for Ireland is of an interactive and stimulating process, which evokes an interactive interest in the questions that are arising rather than having a prescriptive approach that is rigidly applied.

An Indicative Forest Strategy should contain a comprehensive range of datasets in the following areas: forestry, agriculture, environment, heritage concerns, demography, infrastructure and planning. An IFS can be used for many different purposes depending on the range of datasets that are incorporated. The most immediate use will be to direct the day-to-day management of new forestry and in checking its compliance with the guidelines. Secondly, it can check the cumulative impact of many individual plantings by private planters. However, in the longer run the most important impact of an IFS will be in modelling the impacts of possible future afforestation policies to check their impact before such policies are considered for implementation.

The greater the range of datasets incorporated into the IFS the more comprehensive will it be in the nature and completeness of the answers that can be provided. The IFS must be designed to take these datasets and to place them into a rule based model that can assist with the balanced development of forestry. The most destructive use of the datasets in an IFS would be just to use them to assess compliance with the guidelines. Such an *ad hoc* approach could lead to considerable environmental problems. The whole purpose of an IFS is to provide a comprehensive integrated planned framework within which each individual afforestation application can be assessed. The essence of the Irish approach to the IFS concept (and in this it concurs with the Scottish approach) is that how an individual afforestation application fits into the overall IFS plan is more important than assessing whether it complies with all the Guidelines. Naturally compliance with the guidelines is essential but it is compliance with the overall planning strategy that is most important

The tenor and direction of an Indicative Forest Strategy will be determined by whether it is undertaken by the forest authority, a planning authority, the afforesting agency or by a neutral organisation. In Ireland the Indicative Forest Strategy is aimed particularly towards new planting on land , which has not been afforested in recent history. This means that the land base for new forestry is essentially coming from the agricultural sector. This land use change has many and complex consequences for rural welfare. However due to the flexible nature of the proposed system it will be possible to incorporate other forestry management operations such as thinning, felling and reforestation into the IFS process in the future.

The Indicative Forest Strategy will consider both afforestation and forest management operations and the impacts that they can have on both the landscape and the environment. A

fully developed IFS based on GIS puts the necessary information to make such decisions in the hands of the decision-makers. Another vital use of the IFS will be the monitoring of other forestry management operations and the possible risk that they could have on the environment.

It seems likely that most aspects of the IFS, but particularly the environmental aspects, will be developed within a framework based geographically on water catchments. This will enable the system to consider the potential of individual applications while still remaining, as emphasised above, focused on the cumulative and the larger scale planning issues at county, regional and national level.

Aims of the IFS

The aims of this proposed National Indicative Forestry Strategy are to:

- develop an IFS from a neutral perspective (Teagasc has considerable expertise in rural land use planning studies but is neither a planning Authority nor the Forest Service);
- incorporate all relevant available datasets and make provision for the incorporation of new datasets;
- design a series of rules to structure datasets that can assist the FS with decision making;
- place (on screen) as much information as possible about a region into the hands of the policy/decision makers;
- enable any individual afforestation or other forestry operation to be assessed against a series of scientific based coverages and landuse information;
- establish a broad assessment of the opportunities for forestry in the context of land use and rural welfare taking into account soil and site potential and economic, social, demographic and environmental factors;
- identify the degree of sensitivity (or possible cause of conflict) of an area, county or region to forestry development – sensitivities and potential which will be influenced by the nature and type of the afforestation proposed and the particular site characteristics of that area;
- provide a basis for identifying areas where forestry may be positively promoted;
- identify constraints, which could reduce the possibility of afforestation;
- give expression to national policy in terms of its potential for any region;
- prevent a mismatch between proposed policy targets and their capability of being implemented with the land resources and the socio-economic situation; and
- assist in clarifying the investment potential and the environmental constraints for the investor.

Conclusions

Irish legislation in relation to forestry is developing rapidly. The new forestry Act together with a National Forestry Standard and the Code of Forestry Practice will put in place a framework for the development of forestry within the context of the principles of sustainable forest management. The vehicle for the management of this policy is the Forest Inventory and Planning System which is a comprehensive computerised management system covering Grant Applications (GPAS), the inventory and planning through an Indicative Forest Strategy (IFS).

There will be a number of benefits to having a clearly defined Indicative Forestry Strategy. The policy objectives of the Forest Service will be more clearly defined. The effect of

differing policy options can be modeled and investigated. The importance or value of each dataset, whether environmental, socio-economic of forestry interest, can be weighted. The decision making process is made more efficient and effective. Once policy objectives have been identified then their local, regional and national implementation can be determined. Land-use conflicts may be reduced or solved by reference to the spatial and environmental information contained in the database. In this context all stakeholders will have access to the scientific data. It is envisaged that this will lead to a more stable environmental and commercial climate and a balanced and proactive approach to forestry development.

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Towards a Holistic and Balanced Forest Landscape Strategy in Ireland

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Abstract

The Irish Forest Service has initiated development of a GIS (geographical information system), entitled the Forest Inventory and Planning System (FIPS), to ensure proper forestry planning as well as the availability of information to all interested parties. The landscape component of FIPS is being developed by the authors. The paper presents an outline of the theoretical basis for this in the form of a model for an indicative approach to forest landscapes. This model primarily concerns county based strategies for specific landscape character areas. These strategies incorporate reference to guidelines developed for national generic landscape types. Landscape character assessment is, therefore, presented as the foundation on which the model is constructed. The three main determinants of the strategies are then examined, namely forest type capabilities, landscape enhancement potential and landscape values with their sensitivities. The first two of these provide the basis for a proactive approach to forestry while the third component introduces the constraining or qualifying influence.

Keywords: forest landscape planning and design; forestry guidelines and strategies; landscape assessment; forestry capabilities, landscape aesthetic character enhancement potential and landscape values with sensitivities and constraints

Introduction

"Our profession needs a proactive, environmentally responsible, economically reasonable approach to regulatory proposals... Foresters must take the lead in regulation if they are to be land managers and stewards, not just technicians controlled by other citizens, professions and politicians." (Cubbage 1991)

Norbert Weber (ed.)
NEWFOR – New Forests for Europe: Afforestation at the Turn of the Century
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Forestry, especially large scale commercial plantations, can have a significant adverse impact in terms of, for example, landscape aesthetics, environment and culture. Increasing public concern over the effects of forestry cannot be ignored by either policy makers or practitioners. Appreciation seems limited among the public and even many foresters in Ireland of the potential for landscape enhancement by forests. In order to optimise their affects on the landscape, therefore, more clearly defined strategies and guidelines specifically for forestry are needed which attempt to lead positively towards the realisation of this potential.

The question prompting the above quotation is the degree to which legislation should be introduced and strict controls imposed in order to ensure sound and balanced forest landscape strategies. In considering the effectiveness of legislation for the US, Cubbage (1991) points out that it can range from being 'a toothless model law' likely to be ignored to a rigorous model likely to restrict the necessary freedom for adaptation to individual conditions.

The need to develop an approach in regard to forest landscape planning and design in Ireland is highlighted by the emphasis of recent key policy statements, legislative changes and guideline recommendations concerning forestry and the environment, including the national strategic plan of the Forest Service (Department of Agriculture, Food and Forestry 1996) and the 'Forestry Development – Consultation Draft of Guidelines for Local Authorities' (Irish Government 1997) by the Department of the Environment (DoE). Three key considerations established in the latter document were the need to identify sensitive areas with respect to forestry, the necessity of producing an indicative forestry strategy for each county and the intention of the DoE to introduce more flexible control enabling planning permission to be required for afforestation projects not requiring an environmental impact assessment.

The danger with the above call from the DoE is that each local authority would proceed to develop forestry strategies independently without a common methodology or procedure. To ensure a rational and nationally effective approach, a structure is necessary comprising a single methodological basis. The criteria by which analysis is carried out and standards by which evaluation and decisions are made should be applied nationwide, while making due allowance for regional variations, be they aesthetic, biophysical, social, infrastructural or economic. To become effective in practice, the distinct roles played by the Forest Service and local authorities and their relationship in forestry development must also be clearly defined and balanced (ERM 1998).

The process of creating such tools has already been initiated by the Irish Forest Service in their development of the forest inventory and planning system, known as FIPS. They are currently funding the production of a GIS based national forestry inventory and county-by-county indication of species potential by Teagasc in the project entitled 'Forest Soils Classification and Productivity Study' (Bulfin 2000). A related project but focused on forest landscape planning and design is the subject of this paper and comprises the development of the landscape component of FIPS (McCormack et al. 1998). This is a pilot study involving part of four counties in Ireland, namely Cork, Leitrim, Mayo and Wicklow.

An Irish Approach to Forest Landscape

Much material pertaining to forest landscape planning and design has been published internationally over the past ten years. A review of this literature has already been carried out by the authors including a commentary, functioning as a scaffold, so to speak, for the construction of a model for strategic forest landscape planning and design as well as guidelines (McCormack et al. 1998). With respect to strategies, the review included indicative forestry strategies (IFS's) produced in the UK and also landscape assessments

which can provide the necessary methodological foundation. Material pertaining to guidelines was more limited to design, and included guidelines, training manuals, handbooks, codes of best practice, forestry standards and public surveys.

In developing a tool for forest planning and design, based upon that review, key recommendations were listed as the basis for an Irish approach. These were as follows:

1. Develop a methodology for assessment, forest planning and design which is common to all local authorities throughout the nation, so ensuring consistency of approach and compatibility of results;
2. Provide a GIS compatible system and framework that ensures transparency of policy and decision making which is accessible to all actor groups as well as strategies and guidelines as media for consultation with and education of relevant professionals and interested parties;
3. Produce a comprehensive set of criteria and factors as practical tools for forestry planning and design;
4. Establish a hierarchical approach to landscape assessment, planning and design such that guidance provided for generic landscape character types is directly related to geographically specific landscape character areas;
5. Identify landscape character areas based on systematic and thorough assessment in order to provide the understanding required for planning and design;
6. Ensure comprehensive integration of the science and art of forestry by involving the pragmatic determinants of forestry capabilities while exploring the enhancement potential of different landscape character areas;
7. Aim for balance between proactive drive, encouraging commercial forestry, and constraint, recognising different values and their respective sensitivities;
8. Strategies and guidelines to be indicative and performance based, not predictive;
9. Be realistic by contending with typical as well as difficult problems; and
10. Provide a vehicle for the creation of visions of future forest landscapes concerning not only afforestation, but also the possibility of improving in the future existing forests in sensitive locations to meet new aesthetic standards, for example, through restructuring.

The ultimate goal in regard to sound forest landscape planning, design and management in the research pilot study for FIPS is to produce recommendations for landscape character areas in each county. This is achieved through a tripartite methodology, presented initially as a simple model (Figure 1). This model incorporates and is constructed on a foundation of landscape character. Landscape character is established based on visual distinctiveness and identity through a continuity of similar characteristics. It reflects typical landscape conditions that are primarily, though not exclusively, physio-visual, resulting from landform and landcover. Landform concerns the spatial and formal arrangement of those landscape components that are primarily a natural product of geomorphologic history. Landcover is concerned with the more detailed constituent parts as manifested on the surface and includes landuse (including historical), surface pattern, vegetation, settlement pattern and structures, whether natural, cultural or a combination of both.

Two levels of landscape categorisation regarding character are involved in the assessment process, namely landscape character areas and landscape character types. *Landscape character areas* pertain to geographically specific locations comprising unity of physical elements and/or spatial enclosure and/or image. *Landscape character types*, concerning typological categories, are generic.

The object of producing forest landscape strategies pertains to landscape character areas determined by a process of integrative assessment, comprising the following three levels of understanding (Figure 2):

- physical content and cultural expression of the landscape
- perceived visual enclosure and integrity of surface pattern
- common associations and image.

The simple model is presented then in greater complexity as a complete model (Figure 3). It is structured in two parts comprising guidelines and strategies, respectively. It also outlines the basic relationships between the following three determinants of the strategies:

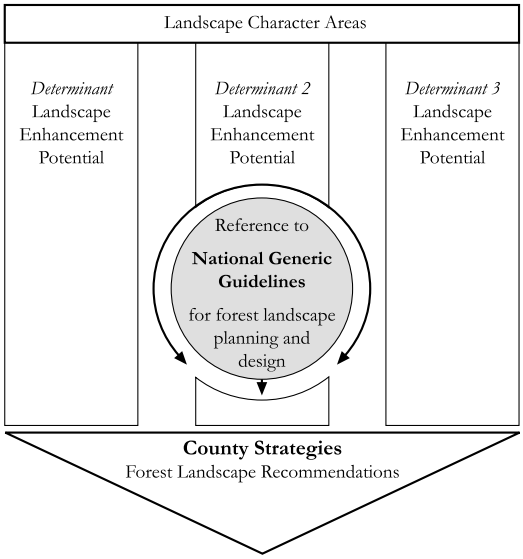

Figure 1. Simplified model for forest landscape planning and design.

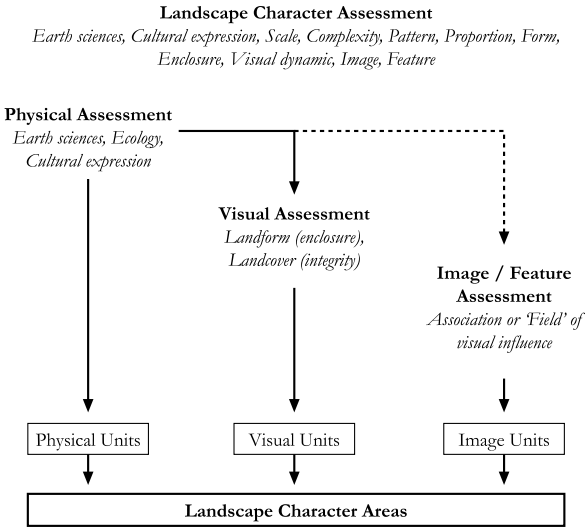

Figure 2. Model for identification of landscape character areas.

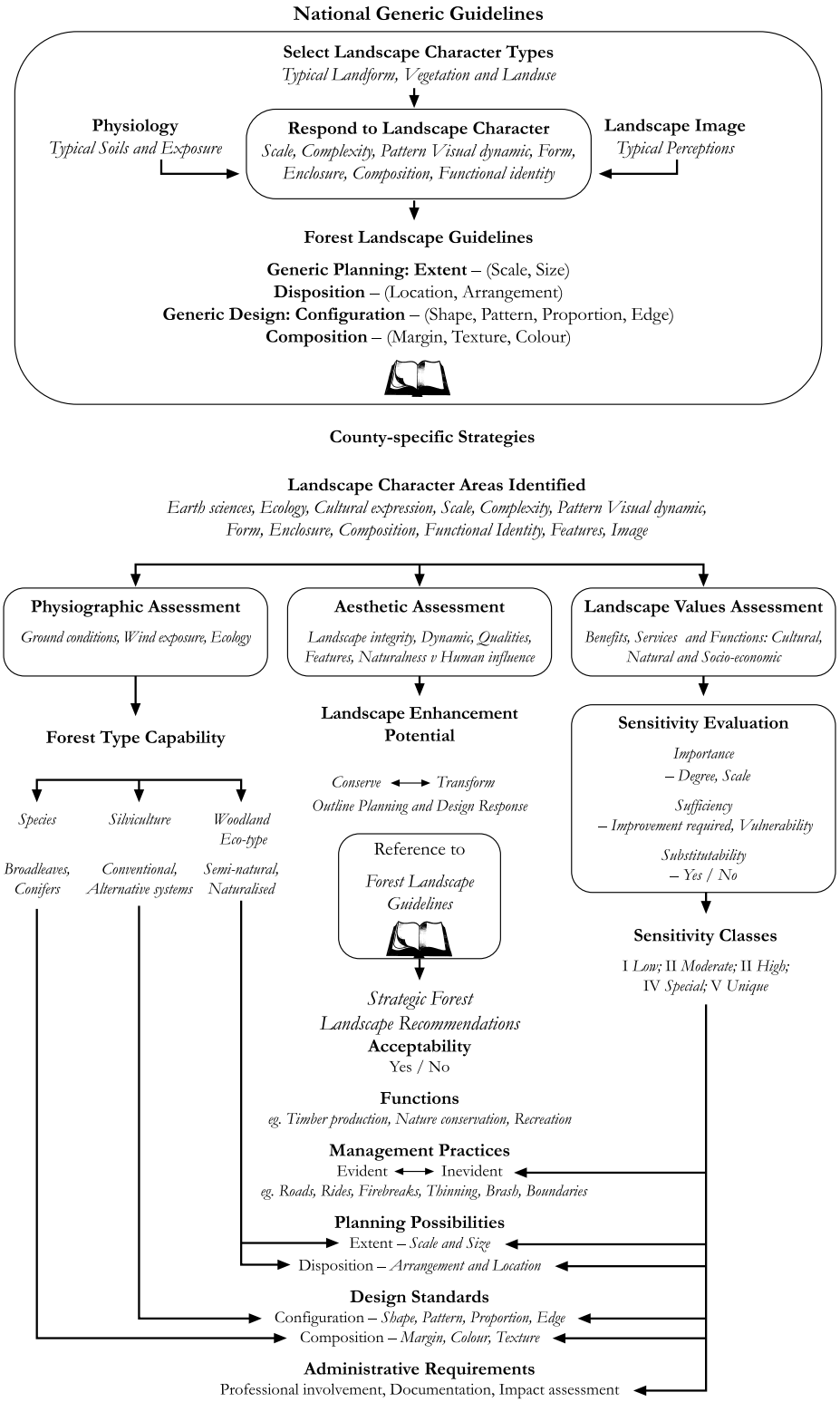

Figure 3. Model for approach to forest landscape.

- landscape physiography to scientifically establish forestry capabilities
- landscape aesthetic character to determine enhancement potential
- sensitivity of various landscape values, indicating constraints and qualifications

The first two of these determinants provide the proactive vision of landscape alteration and development by forests while the different kinds of landscape values, considering the degree of their sensitivity, introduce the braking action, qualifying the acceptability and type of forestry appropriate to a given location. The key to ensuring a proactive approach is to temporarily postpone consideration of landscape sensitivity and focus initially upon landscape character and its potential for enhancement. This separation is important, for instead of considering forestry for a given landscape on a *posteriori* basis or as a result of an initial landscape assessment deeming various values of sufficiently low sensitivity, it considers it on an *a priori* basis whereby its potential for landscape character enhancement is prioritised.

As indicated in the review referred to above (McCormack et al. 1998), such a clear acceptance of the potential of forestry for landscape enhancement would be a departure from the current approach to landscape assessment and planning. In this regard it is useful to distinguish between the character and quality of landscape.

These are not the same and not necessarily equal. A change in character results from alteration in appearance, but this is not synonymous with lower aesthetic quality. The inevitability of change in the landscape necessitates consideration of character integrity, whether similar to that existing or substantially different. Regardless of such change, it is important to ensure that quality is at least sustained if not enhanced, and this is especially critical where the creation of a different landscape is being considered.

The first part of the complete model includes a depiction of a methodology for forest landscape planning and design *guidelines* to be developed generically at a national level. The second part comprises a methodology for forest landscape *strategic* planning and design pertaining to specific landscapes, such as at a county scale.

Production of strategies depends upon these forest landscape planning and design guidelines as an indication of preferred solutions. While the three determinants listed above are relevant to both parts of the model, only landscape enhancement potential is of primary concern for the landscape guidelines, the other two determinants being considered generally and typically. For this reason the paper will focus upon the second, more complex, part of the model concerning the production of forest landscape planning and design strategies. The model establishes the respective autonomy of each of its three main determinants, orchestrating when and how they interrelate to achieve balanced forest landscape planning and design strategies for landscape character areas.

Character Area Identification

Landscape character areas provide the bases for forest landscape planning, management and design. The very process of assessment, however, is vital to the establishment of a thorough understanding of the landscape involved.

Landscape Character Assessment

Landscape assessment should reflect the complexity of human understanding of the rural environment. The assessment process can correspond to the following three stages or levels of understanding, moving from the quantitative to the qualitative (Figure 2):

- Stage 1 – Physical Units
- Stage 2 – Visual Units
- Stage 3 – Image Units

Stage 1: Physical Units

The first stage of character assessment concerns physical features and components which result from the combination of earth sciences, ecology and landuse, comprising for example, elevation, landuse, vegetation, geology, climate, soils, field pattern, settlement pattern and structures. The combination of these components is expressed in both landform and landcover which are thus used as the two primary indicators of physical distinction of landscape *physical units*.

A desk study, involving a plan-based overview, provides the basic data for a Stage 1 breakdown of the landscape. This comprises assemblage of all available information, including, for example, contoured Ordnance Survey (O. S.) maps, such as those at a scale of 1:50,000, to identify landform and hydrological pattern, satellite images, such as LANDSAT, and/or aerial photographs to identify landcover types and other terrestrial studies such as geology, soils, ecology, habitats, landuse and cultural geography.

Landform indicates such categories as mountains, uplands and foothills, lowlands and planes. Landcover is focused on vegetation and landuse pattern and covers such categories as heather peatland, pasture farmland, forestry, traditional field enclosure or agricultural practices and settlements. Thus, for example, mountain (landform) and heather peatland (landcover) combine as mountain moorland, while rolling hills and farmland are identified as rolling farmland.

Stage 2: Visual Units

The second stage of landscape character assessment establishes *visual units* based on field work to determine the extent of landscape that is actually visually perceived. As people are typically located on the ground and not in the air, viewing extent is often determined by such containing landform as mountains, hills and escarpments. A valley is a classic example of such containment. Thus landform emerges again here to determine areas of landscape as visually perceived wholes. Landcover can further this perception of cohesive wholeness where an integrated combination of distinct landcover pattern, such as that comprising a rocky crest descending to mountain peatland first and then marginal scrubland which, in turn, changes to a mosaic of fertile farmland.

As boundaries between visual units typically run along ridge lines this assessment is more relevant in areas of greater topographic undulation. The establishment of these units is important for it is within visually perceived enclosures or partial enclosures that forest development takes place and against which its compatibility is evaluated. While these units can be anticipated as a desk study, they can only properly be established out in the field where two experts carry out the assessment together.

A factual and interpretative description is produced using such visual assessment criteria as scale, form, pattern, complexity, enclosure, visual dynamic, composition and the sense of naturalism. This provides an important basis for recommendations in regard to forest landscape planning and design.

Stage 3: Identification of Image Units

A sense of unity in an area can be engendered in ways other than physical differences or visual enclosure. Key factors for consideration here are spatially dominant features and common image which, in turn may be reflected in strong cultural links and functional identity. Although uncommon, where an extensive area is somehow identifiable under some of these factors *image unit* is established.

A sense of unity throughout an area can exist due to the apprehension or image held by the general public at large based on a strong cultural association, whether due to myth, historic event or function. The landscape affected may comprise an area as a blanket, it may be determined by the visibility of a central feature or extend linearly along routes. Alternatively, in certain landscapes a physical feature, whether natural or cultural, may be of such dominance that it acts as a major focal point over an extensive area. In such cases a visual 'field' results from the spatial dominance of that feature and the perceptual association of the surrounding landscape with that feature. Thus an image or place identity may be mentally apprehended as a result which is distinct from what is otherwise based on physical differences or visual enclosure. In this case feature and context form a single unit. Although spatially dominant features are not common, it is important to recognise this phenomenon where it exists.

The fieldwork at Stage 2 will provide the opportunity of identifying such landscape features should they exist. As this concerns a nationally regarded landscape image or feature of obvious and extensive spatial influence the assessors are likely to be aware in advance of its existence. Despite the difficulty in mapping such areas, some graphic recognition is important where a popular image or feature exists which somehow influences the landscape character as understood. In certain instances key words appropriately located on maps may be sufficient. Keywords can also be used with symbols such as arrows or dotted circles.

Categorisation of Landscape Character Areas

The three levels of assessment described above provide the basis for the categorisation of landscape character areas. This requires an integrative and interpretative approach in regard to the following factual characteristics derived from the earth sciences (Stage 1); visually perceived spatial structure relative to landform and landcover (Stage 2) and mentally apprehended unity derived from visual focus and spatial dominance as well as from image and association (Stage 3).

Three Determinants for Forest Landscape Strategies

Having established the foundation of landscape character areas for each county the next step is to systematically carry out the tripartite assessment in order to produce the indicative county forestry strategies. Although distinct in application and purpose, much of the information gathered during the process of landscape character identification is again useful in carrying out the assessment of these three determinants. This process, starts with the physical environment in the first determinant, it then it broadens to consider the sensitivity of relevant environmental values. Thus, the proposed model gradually unfolds, being consummated in the production of strategic forestry recommendations concerning the acceptability of forests, planning, design and management implications and administrative requirements.

Determinant 1: Physiographic Assessment for Forestry Capabilities
The capabilities of a landscape for forestry are primarily dependent on physiographic factors of landscape which are objectively determined and scientifically assessed. As far as building the FIPS framework is concerned, this component is the subject of the current work by Teagasc (Bulfin 2000). This work comprises a forestry inventory and soils classification for the purpose

of indicating species possibilities. The model proposed by the authors, however, anticipates for the future a more holistic assessment taking landform and vegetation as prim ary indicators of exposure and soils in order to determine the species, silviculture and woodland eco-type for which the land is capable. Realisation of this more complete determinant in the model will only be possible with trial and experience over the forthcoming years.

Although the scientific assessment is currently being carried out in its limited form independently of the landscape research, the landscape character areas already established could provide a framework, so maintaining the methodological consistency indicated in the model. The landscape pilot study under discussion here commenced approximately one year after the commencement of the soils project by Teagasc and thus operated relatively independently. As the final soils classification had not been produced the species possibilities was not available at the time of completion of the landscape research project.

According to the model this physiographic assessment would extend beyond the objectives set for the study by Teagasc. The assessment would result in a breakdown of landscape character areas into zones of capability for different forest species and silvicultural systems. This would include species not only for commercial production, but also for biodiversity. Silvicultural systems would comprise the 'classical' systems of clearcutting, group selection, shelterwood, strip system, single tree selection, agro-forestry, short rotation coppice and combinations of these as well as more ecologically sympathetic systems such as native and semi-native woodlands and the mimicking of natural disturbances.

Where forestry capabilities have not been realised with existing forests, the zones will also have implications for restocking. The provision by forestry capability zones of the option to reconsider species in existing forests is a major opportunity to improve forest landscapes in terms of ecological and visual integrity in Ireland during the coming decades.

Determinant 2: Landscape Aesthetic Character Assessment for Enhancement Potential

Complementary to the scientific capabilities for forestry in a given landscape is the potential for alteration and aesthetic enhancement of landscape character by forests.

This potential is identified during the assessment process. Recommendations in regard to enhancement are facilitated by reference to, and adaptation of, forest landscape guidelines. These should not be regarded as prescriptive, for flexibility of choice is important both as a matter of principle and for practicality. Accordingly, each geographically specific landscape character area established for the FIPS project is identified with one or more generic landscape character types in the guidelines as appropriate in order to facilitate cross-reference for guidance. These guidelines, as indicated in the model, are being currently developed for the forest Service by the authors in parallel with the strategic assessment for FIPS in a five-part suite of guidelines covering landscape, biodiversity, water quality, archaeology and harvesting.

The landscape character descriptions produced in the character assessment provided the basis for developing an appropriate response. Particularly useful for planning and design recommendations were the interpretation of landscape in regard to sense of enclosure, visual dynamic, complexity and naturalness.

Indication of the potential for landscape enhancement by forestry is expressed in landscape spatial planning and design terms. Fundamental from a planning perspective is the capacity of landscape types to absorb forestry without loss of character integrity. Alternatively, the possibility of changing the existing landscape character by forest cover to produce a new character was also considered. As part of the assessment process for the strategy an indication of a number of enhancement possibilities are made for each landscape character area expressed by the criteria of forest landscape *planning* in terms of *extent*, involving the factors of *scale*, *size*, and *disposition*, involving the factors of *arrangement* and *location* of forests

within the visible landscape. Given the primary function of FIPS as a planning tool, the factors under extent and disposition were of foremost importance. These, thus, provided a structure for specific, though indicative, recommendations for each of the landscape character areas identified. These are presented in tabular form under scale, size, location and arrangement.

Complementing a strategic approach to forest landscape planning is the *design* of individual forests, concerning the degree of contextual integration as well as whether the forest is natural or human-influenced in design expression. An indication of enhancement possibilities are made through reference to the forest landscape guidelines for each landscape character area expressed not only by the above planning criteria, but also in respect of design criteria comprising *configuration* and *composition*. Configuration covers the design factors of *shape*, *pattern*, *proportion* and *edge*, while composition covers *margin*, *texture* and *colour*.

The forestry planning and design criteria and their factors are defined elsewhere by the authors (McCormack et al. 1998). They are the tools in the forest planning and design process for responding to landscape character and determining design expression. Recommendations provided in the guidelines, unlike those in the FIPS project, are generic and are intended to be adapted to landscape specific locations. Finer qualification would also be made depending on the sensitivity of the area, as will be discussed under model determinant 3 in the next section (Table 1 and Table 2).

Determinant 3: Landscape Values and Sensitivity Assessment: qualification and constraint
Landscape assessment is not simply about the identification and categorisation of character areas. Consideration of values and their sensitivity to change provides a more complete picture of what might be termed the "whole environmental system" in terms of sustainability, that is how this can be maintained within broad limits while adapting to change without loss of integrity (CAG and LUC 1997). As part of the assessment process involves environmental

Table 1. Determination of the Importance of a Value

Degree	Level			
	International	National	Regional	Local
Major Importance Moderate Importance Minor Importance	High Importance	←	→	Low Importance

Table 2. Determination of the Sufficiency of a Value

	Vulnerability / Threat		
Improvement Required	High Vulnerability	Moderate Vulnerability	Low Vulnerability
Much improvement Moderate improvement Low improvement	Low Sufficiency	←	→ High Sufficiency

sustainability, it relies upon the establishment of thresholds or the limits of carrying capacity beyond which a given value is critically unrecoverable.

If we are to realistically seek ways of encouraging well designed forests we need not only a sound basis for developing alternative forest landscape scenarios, but also a means of constraining or qualifying these alternatives. An attempt was made, therefore, to identify landscape values pertaining to forestry, and then have these evaluated regarding the degree of sensitivity to indicate the need for planning and design constraints regarding the use of species, silviculture and management. The methodology developed was adapted from the Environmental Capital Approach (CAG and LUC 1997) that has been evolving over recent years in the UK. In essence, the approach recognises the need to simultaneously address a host of factors which affect environmental resources with respect to sustainability. It attempts to broaden the basis of assessment to consider, not simply the *what* of landscape, but also the *why*, *how*, *how much*, and *to whom* . This entails a focus, not so much on the physical resources of things and places, but more on the qualities, attributes and characteristics of these resources as understood through the benefits, services and functions they provide in regard to environmental sustainability.

These benefits, services and functions are called values in the FIPS research. The shift of focus away from the resources and towards their values allows for evaluation and consideration of the substitutability of these resources. Incorporation of substitutability is key in attempting to overcome any conservative conservation-oriented ethos. It ensures flexibility in allowing a balanced and reasoned proactive openness to development on the grounds of gains and losses of, for example, values considered from the local scale to the global.

There is considerable scope for methodological investigation, development and adaptation in regard to forestry. Thus the research work for FIPS attempted to explore the practical application and usefulness of this approach for forest landscape planning, design and management.

The main purpose of identifying values is for evaluation with respect to sensitivity. This evaluation provides the basis for consideration of the acceptability of alteration or complete loss of each value. This results in the production of landscape sensitivity classes which can then be applied to the relevant landscape character areas as part of the decision making process.

The following list of values can be grouped under culture, environment and socio-economics.

Identification of Landscape Values

It would be important to address each kind of value and its degree of sensitivity in order to determine how the forestry strategy for each county can move towards environmental sustainability. Furthermore, distinction would need to be made between two values poles, namely those that suggest constraint, *conservation values,* and those that are proactive for development, *enhancement values.* The former set tend, though not exclusively, to be associated with cultural landscape and natural resources while the latter more with socio-economic resources. This distinction would become critical in the following process of sensitivity evaluation.

Assessment of Landscape Sensitivity: Focus Groups

The sensitivity of a landscape is the measure of its ability to accommodate change or intervention without suffering unacceptable or detrimental loss or alteration. The sensitivity

of a landscape will vary, therefore, according to, for example, the degree and level of importance which is attached to any single value or combinations of values which are attributed to that landscape. Sensitivity is also a function of whether there is enough of that value to meet present and anticipated future needs and also of the possibility of the resource that gives rise to the value being substituted by something which provides the same benefits and functions.

Focus group meetings were held in each of the four counties involving both local land users and experts from a range of relevant fields. In one case this meeting was complemented by a second involving artists from different disciplines. Each meeting comprised a field trip held during the morning as a means of stimulating insight and dialogue. The afternoon was spent introducing the FIPS landscape research project along with a range of graphic simulations depicting different planning and design options in various landscape character areas. As the landscapes that were selected were visually related to other landscapes character areas and most were unknown as specific locations to the participants, they also were effectively types. These were discussed, initially by small groups of from three to five people, and then by the entire group.

The concept of and methodology for values and sensitivity were then introduced and the participants requested to take home a work pack for response and return. This work pack comprised a map of the county for marking in respect of relevant values, a list of values as a prompt allowing for further additions and a series of five questions referring to the areas that they would mark on the map that attempted to establish the sensitivity of the value.

These questions were concerned with each value in regard to its importance, sufficiency and substitutability. An attempt is currently being made to develop a systematic methodology of evaluation using matrices. This needs to be further tested and refined through application across a broad range of environmental conditions and values. The numeric rating used in these matrices is merely indicative of how the process might work. Furthermore, the interrelationship between conservation values, and development values would require more consideration than was possible during the research period. The matrices concerning importance, sufficiency and substitutability proposed below are likely to be relevant to the conservation values only. These three criteria are elaborated as follows:

Importance

Degree of importance, whether low, medium or high. Indicators of the degree of importance of a value include its quality, integrity, popularity, representitiveness, rarity, distinctiveness, existence value, sense of public ownership and cultural meaning and association.

Level of importance, whether local, regional, national or international. Indicators of this include volume and kind of use by people and also infrastructure.

The matrix shown in Table 1 is being used as a means of establishing an overall rating of importance.

Sufficiency

A key consideration in the evaluation process is whether there is now or will be in the future enough of each value, that is the benefits provided in respect of quality and quantity. This is not always so easy to establish, but the process can be assisted by identifying the current situation as well as trends such as a threat and whether there is a need for improvement. Key indicators of sufficiency are as follows:

- Determine whether the area with respect to the value concerned is vulnerable or under threat in quality and / or quantity
- Consider whether the value of a landscape can be enhanced or improved in quality and / or quantity

The matrix presented in Table 2 is being used as a means of establishing an overall rating of sufficiency.

Substitutability
Estimate the possibility for substituting the resource by another which provides the same benefits and functions, whether at the same location or elsewhere.

Three examples are given concerning different levels where substitution could be achieved for the loss of a value:

Example 1
Loss: Felling a forest without regeneration or replanting could result in the loss of a recreational amenity at a local level.
Substitution: A wasteland in the locality could be developed and planted as an amenity woodland for the local community.

Example 2
Loss: Planting an extensive area of forest on peatland could be deemed to destroy an ecologically sensitive area which might be of national importance.
Substitution: The forestry developer could liaise with the local authorities and purchase an area of ancient woodland or a fragile wetland ecosystem that would then be safeguarded by a preservation order.

Example 3
Loss: Felling a forest without regeneration or replanting would result in the loss of a carbon sequestration at a global level.
Substitution: Increased planting or the erection of a windfarm elsewhere would help to overcome the problem of carbon emissions and, thus, redress the balance.

Determination of the Sensitivity Class for a Value

Classification of the landscape in terms of sensitivity provides the basis for consideration of constraints on forestry development in the strategies. In order to classify the landscape the sensitivity of each value must be determined. This is achieved by incorporating the results of the evaluation of importance and sufficiency along with the possibility of substitutability into a third matrix (Table 3). This final assessment can be used to indicate to which one of five sensitivity classes the value could belong. The combination of a range of values should provide an overall sensitivity class.

While each landscape character identified in the FIPS project will be evaluated in respect of sensitivity regarding landscape aesthetics, this overall integrative classification has yet to be examined and developed for FIPS. It is not certain at this point whether these classes will be adopted by the Forest Service for sensitivity classification as a whole. The Department of the Environment and Local Government, however, have indicated interest in adopting such a classification in respect of different kinds of development. These classes are summarised as follows:

Class I Low Sensitivity: *Commercial*
Class II Moderate Sensitivity: *Commercial*
Class III High Sensitivity: *Commercial*
Class IV Special Landscape: *Conservation*
Class V Unique Landscape: *Retention*

Strategic Forest Landscape Planning and Design Recommendations: interrelating the three determinants

The process and results of assessing values regarding sensitivity is intended to qualify the scientific possibilities for forestry and the enhancement potential, both of which were established independently. The interaction of the three determinants in the model is indicated in the lower portion of the main model (Figure 3). The five sensitivity classes will be referred to for each landscape character area in the FIPS research project. The sensitivity classes indicate the acceptability of change by forestry. They also have implications for the main functions of the forests, whether, for example, timber production, recreation or nature conservation. Forestry management practices will also be determined systematically as a result of this integrative process involving the three components of the model (Table 4). The extent of forestry appropriate to a given landscape character area will be influenced by the sensitivity classes, along with design configuration and composition (Table 5). Finally, administrative requirement, concerning the kind and detail of documents to be submitted to the Forest Service and planning authorities will become more critical with increased sensitivity (Table 6).

Conclusion

Planning, design and management constraints from a commercial timber production point of view are likely to entail a certain loss in forest cover or management efficiency at site level, especially when compared to conventional practice. But at the scale of the broader landscape a net gain by overall increased forest cover can result from greater acceptability of forestry by the public because of landscape enhancement and improved recreational opportunities.

The complete model (Figure 3), while not necessarily representing the FIPS process as an entire system, is to some extent indicative of how this process might work. This is possible as the model attempts to provide a structure that is integrative and balanced by combining the proactive influence of the science of forestry and the aesthetics of forest landscape with constraints introduced by values and their respective sensitivities. Rather than suggest the application of blanket guidelines or requirements, it opts for grading according to sensitivity classification.

The model provides a framework that allows for transparency of the decision making process as well as for consultation between all interested parties. The use of such common reference material as guidelines as well as the assessment results of the three model determinants should facilitate the entire forestry planning system, ie. FIPS. This requires that resulting strategies are indicative of performance and are not rigid prescriptions, serving for consultation and providing a starting point for ultimate compromise by parties concerned.

Planning, design and management constraints from a commercial timber production point of view are likely to entail a certain loss in forest cover or management efficiency at site level, especially when compared to conventional practice. But at the scale of the broader landscape a net gain by overall increased forest cover can result from greater acceptability of forestry by the public because of landscape enhancement and improved recreational opportunities.

The process of evaluation sensitivity and the integration of the results in respect of different values requires considerably more trial than was possible in the timeframe and scope of this project. Firstly, the most effective mechanism for establishing values and sensitivity needs to be clarified. Focus Groups provide a useful opportunity for dialogue and exchange of

Table 3. Determination of the Sensitivity Class for a Value

Substitution: Importance	Possible Sufficiency			Not Possible Sufficiency		
	Low Suffic.	Moderate Suffic.	High Suffic.	Low Suffic.	Moderate Suffic.	High Suffic.
High Importance	3			5		
Moderate Importance						
Low Importance			1			3

Table 4. Forestry Management Practices in response to Landscape Character and Sensitivity.

Management Practice Relationship to immediate context		***Evident***		***Inevident***	
Shape and Edge	***Roads***	Straight	Curvilinear	Curvilinear and diffuse	
	Rides				
	Fire breaks				
Surface	***Thinning***	Regular lines	Irregular lines and single trees	Single tree selection	
	Brash	Scattered	Windrows	Burnt / chipped	Removed
	Boulders	Visible		Not visible	
	Boundary zone	Distinct		Indistinct	

Table 5. Forestry Planning and Design Alternatives in response to Landscape Character and Sensitivity

Planning Relationship to macro context		***Apparent limited cover***		***Apparent extensive cover***	
Extent *Character integrity*	***Scale***	Low	Moderate	High	
	Size	Small	Medium	Large	
Disposition *Character articulation*	***Arrangement***	Scattered	Scattered / Clustered	Clustered	
	Location	Lower ground	Mid-slope	Upper ground	
Design Relationship to immediate context		***Human-influenced***		***Naturalistic***	
Configuration *Spatial structure including silviculture*	***Shape***	Rectangular	Rectangular-curvilinear	Curvilinear	Interlocking
	Pattern	Uniform	Occasional clearings	Frequent clearings	Parkland
	Proportion	Not corresponding to context		Corresponding to context	
	Edge	Solid / dense	Open	Diffuse	
Composition *Species structure*	***Margin***	Coniferous	Broadleaf	Mixed	Scrub included
	Colour	Homogenous	Peppered	Mottled drifts	Deciduous species included
	Texture	Dense	Fine variation	Coarse variation (drifts)	Graduated drifts

different and often opposing views. This leads to more balanced results and hopefully consensus with a sense of "ownership" of the final recommendations. However, it would be important to ensure that key people were not only invited, but did actually participate. Secondly, the process of evaluation sensitivity needs to be tried over many counties with different conditions and values in order to refine it and to test the viability of the matrices for

Table 6. Suggested Administrative Requirements for Sensitivity Classes.

	Class I	Class II	Class III	Class IV	Class V
Description	Low sensitivity	Moderate sensitivity	High sensitivity	Special landscape	Unique landscape
Objectives	Commercial	Commercial	Commercial / visual amenity	Amenity Ecology Culture Social interconnection	As existing
Professional involvement	Forester with some training in landscape principles	Forester adequately trained in landscape principles	Forester adequately trained plus landscape expert	Forester plus ecologist / amenity expert	Not relevant
Graphic submission to Forest Service*	As per current standards with maps at min. 1:10,560	Maps at min. 1:10,560 and specific details for special locations at 1:2,500 as well as photographic overlay visual simulations from min. two VRP's depicting phases in rotation	Maps and plans detailed at 1:10,560–1:2,500 and photorealistic visual simulations from all VRP's† depicting phases in rotation	Maps / plans and sections detailed at 1:10,560–1:500 depicting ecological / amenity management plan	
Specification submitted to Forest Service*	List species and outline silvicultural & management systems proposed	Detailed description of species, silvicultural & management systems proposed	Detailed description of species, silvicultural & management systems proposed. Consideration of windthrow to be evident	Detailed ecological / amenity management plan	
Aesthetic assessment and justification submitted to Forest Service*	Not necessary	Outline landscape architectural assessment of and response to both site and context concerning all rotation phases	Detailed landscape architectural assessment of and response to site and context concerning all rotation phases	Not necessary	

* Note: Under existing legislation forestry proposal would be reviewed by the Forest Service as part of grant application approval as well as the Local Authorities in the following circumstances:
a If proposals are greater than 25 hectares (additionally, if development is greater than 70 hectares an environmental impact assessment will be required).
b If the development is located in an area deemed to be 'sensitive' by respective Local Authorities.
† VRP or viewshed reference point representing a key viewing area, such as a road or golf course.

processing valid sensitivity results, at least for conservation values. Thirdly, the feasibility of integrating the results for different values must be further developed, especially the relationship between the polar values concerning development opportunities and conservation.

Acknowledgements

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Comments on Primary Afforestation in Bavaria – Summary

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1. A darkening of the Bavarian landscape because of primary afforestations won't take place in the future

Following the introduction of the new funding rates for primary afforestations in Bavaria on January 1st, 1993, an enormous wave of primary afforestations has been predicted. The estimates reached up to an increase of 6 mill. ha of forests, just for the Federal Republic of Germany.

Older assessments for Bavaria on a site basis (Philipp 1987) resulted after all in 170.000–400.000 ha.

In fact, the primary afforestation in Bavaria increased decisively after the improved promotion schemes took effect (from scarcely 1.000 ha in 1988 up to about 2.500 ha in 1993), but this increase is extraneous with regard to the entire landscape, and this all the more because the actual number of afforestation is ranging again within the dimension of 500–600 ha / a (see Figure 1).

After the previous success, the increase of the forest area won't exceed 1% of the total country territory within the next 20 years.

Obviously, the adherence of the rural population to traditional land-use types and overall operational aspects play a more important role than short-term financial incentives based on single areas. Therefore there is no reason for concern from the viewpoint of land management.

This quantitative classification doesn't exclude, of course, that in specific cases some unpleasant developments might occur, mostly because areas may be concerned by afforestations, that shouldn't be converted into forests because of their value for nature conservation (see Figure 2).

Thus, effective concepts for primary afforestation are also necessary, even though the increase is only small in absolute terms.

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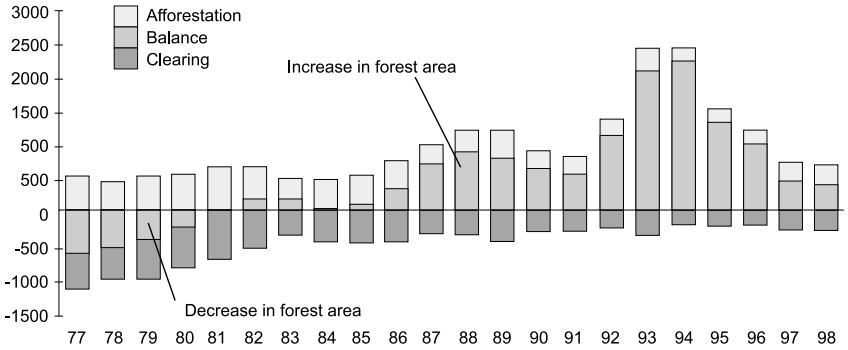


Figure 1. The Development of Afforestation in Bavaria 1977–1998. 1. Since 1981 the balance of the forest area development is positive. 2. The EC Reg. No 2080/92 caused an obvious increase in afforestations. 3. A "darkening" effect of the Bavarian landscape becauseof afforesting will not take place. The increase of forest areas in the next 20 years will sum up to a maximum of 1% of the existing forest areas. Waldflächenbilanz Bayern. Source: Forst-Info 11/99 der Bayer. Staatsforstverwaltung.

Figure 2. Despite the moderate increase of forest areas, in some cases afforestations can lead to ecologically and aesthetically unsatisfying results.

2. The agro-political and ecological objectives, pursued by EC-decree N° 2080/92 won't be attained

It has been the economic objective of the EC council, to exclude first of all valuable agricultural land permanently from production, by the help of the decree from 1992 (as a flanking measure for the agricultural reformation), which consisted of the annual compensation of income for the duration of 20 years as an essential component, to reduce the costs for subvention and market regulation.

This economic aim would have been ideally complemented by an ecological component. Theoretically, as a result of the reduced use of fertilisers and biocides, at least a relief of the resources soil and water would have been achieved by afforestation of intensely used arable soils.

Unfortunately the results show in practice, that such afforestations of valuable agricultural soils mark an exception and normally occur only in the cases of closing or dissolving entire enterprises, as it partially happens in the newly-formed German Länder.

3. The previous way of the planning of primary afforestations often was unsatisfactory

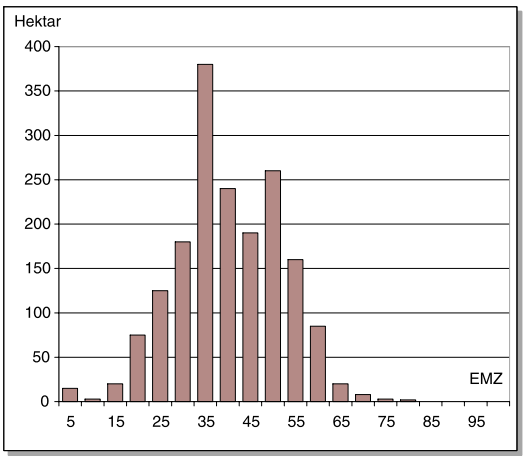
If areas scheduled for primary afforestation are located in agricultural areas used more or less intensely, encompassing sites endangered by erosion (e.g. sloped locations planted with maize), or if afforestation areas are to valorize poorly structured agricultural areas, difficulties occur. In these cases it has to be considered that propositions for primary afforestations won't be accepted by agricultural enterprises.

This is often the main reason why in the past, the planning for primary afforestation sites has in many cases been unsuccessful.

4. The primary afforestation planning can be improved

The corner stones of a better and more efficient handling of the afforestation problem are:

- a limitation on the absolutely necessary extent of planning.
- an improved co-ordination of the bearers of public concern by the development of landscape prototypes.
- participation of the concerned partners (communities, village representatives and landowners) right from the beginning.



- Afforestation of highly productive agricultural areas in order to relief the ecological loads by fertilizers and biocides
- Drecrease of the agricultural surplus will not be achieved.

Still, in the future just marginal sites are going on to be afforested.

The majority of initial afforestation areas shows soil quality values (EMZ) under 50. Precious sites with soil quality values over 65, in reality, have not been afforested at all. (Data from 1986 to 1994).

Figure 3. The agro-political objectives of the EC Reg. 2080/92.

- the consequent use of all opportunities offered by municipal landscape planning and simplified procedures following the law about the reallocation of land.

In this connection, the choice or the combination of the procedures, resp., are based upon the specific circumstances.

4.1 Limitation on the absolutely necessary extent of planning

The implementation of afforestation already appears to be difficult without a land-reallocation procedure. Therefore, it seems not reasonable to draw up extensive plans in regions where the pressure for afforestation is evidently low and where, e.g. the communal landscape-planning is not operational in the short run. In these cases, decisions on singular claims can and have to be made. However, this preference for the solving of afforestation problems by way of singular permission cases can't replace the development of a vision of the possible development of landscape, be it positive or negative. Therefore new instruments in form of models or prototypes (Leitbilder) are needed.

Better results won't be achieved if one follows the demand for total control: Afforestation sites e.g. can be defined in order to outline especially desirable and promoted forest increase and where – in the case of exemption areas – under no circumstances afforestations might take place. In between, a great part remains, where no specific, detailed statements will be made and for which the decisions have to be taken according to the singular permission procedure, i.e. every application has to be scrutinized separately.

Especially the exemption areas have to be limited to the absolutely necessary extent. Normally, these areas are clearly dedicated to nature conservation, e.g.:

- mapped biotopes;
- protected areas according to the Bavarian Law of Nature Protection (the so-called 13d-sites);
- areas of outstanding importance for nature conservation, listed in the Bavarian programmes for the protection of species and biotopes (ABSP).

4.2 Improved co-ordination of the bearers of public concern – mutual cooperation in elaboration/defining of natural environment-specific prototypes

The most important prerequisite for responsible dealing with the afforestation issue is, that planners (in the case of municipal landscape plans) or the bearers of public concern (in the context of singular case permissions) mutually develop an idea, how (up to which extent) a specific landscape can develop without the loss of its landscape-specific peculiarity (see Figure 4). If such prototypes exist, serious negative developments won't occur; mostly regardless of the fact, whether it is an issue of afforestation planning or singular case permissions.

The optimistic results, that originated from the mutual development of natural environment-specific landscape prototypes, underline the fact that it is, in fact, possible to elaborate acceptable solutions on-site (von Preen 1996).

4.3 Participation of the concerned partners right from the beginning

The models are also very well adapted to include those concerned: first of all they identify their actual situation by the help of graphical illustrations more easily than on maps and secondly, they learn why and where limitations or well-aimed promotions are necessary, or

Recommendation adapted to landscape prototypes

Criteria

1. Geomorphology
2. Landscape structure
3. Common landuse types
4. especial Types of Biotopes
5. Risks

Recommendations

E.g.: Prototype for the landscape unit "Rhön"

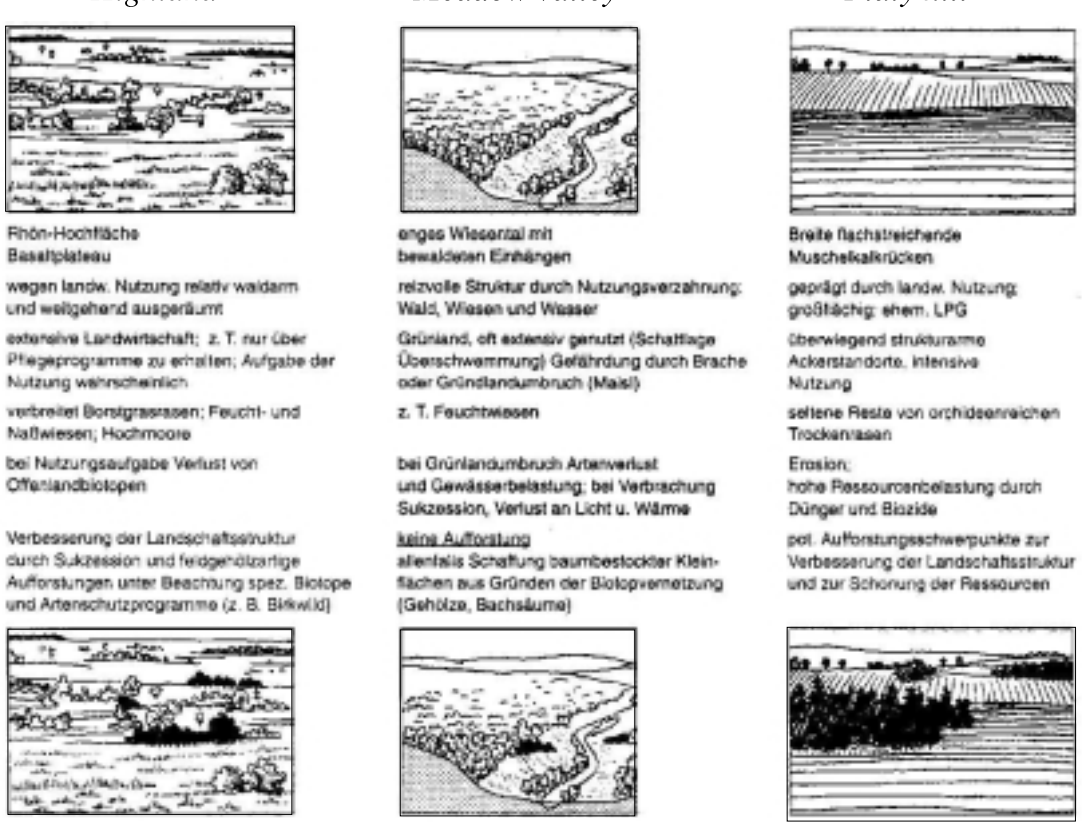


Figure 4. Prototypes in the landscape unit “Rhön”.

possible and all this at a time, where everything is still open. The prototypes consciously regard the principle and not each thinkable singular case. They base on the experience, that a reasonable development is only possible with the acceptance of those concerned and not against them and that it has to be the objective of a modern nature conservation policy to convince the citizen and esp. the land-owner for nature conservation and to refrain from prohibitions whereever possible.

This is perhaps the most important and most difficult process in the planning procedure, that discussions with those concerned have to take place in time, although with regard to the danger that the planning has to be modified or changed. It should be remembered that planning also, in some cases even exclusively (e.g. in municipal planning), is principally intented in favour of the local population living in that area (see Figure 5).

4.4 The consequent use of all opportunities offered by the municipal landscape planning and simplified procedures according to the law about the reallocation of land

The municipal landscape plan is widely accepted by the bearers of public concern as a very well adapted instrument for afforestation planning. In this context, it is important, that the elaboration of models and development objectives for the village or for parts of the municipal area (homogenous landscape segments) is the task of landscape planning.

This includes also, besides others, the percentage of forest cover, as well as a corresponding development forecasting, in which besides nature scientific criteria also social and political scales (e.g. agro-political questions or aspects of nature conservation policy) have to be included.

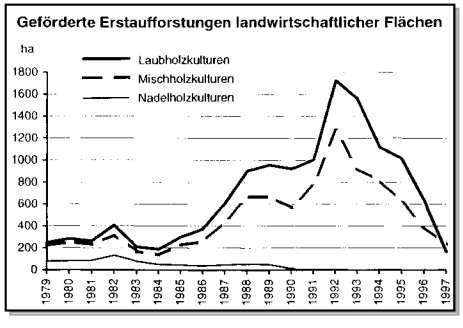
Case studies as an extra preliminary stage can also be necessary in the context of the realignment of the environment. Especially the simplified procedures according to the law of reallocation of land enjoy a growing importance in these cases, where a great amount of requests for afforestations under difficult conditions (splitting-up, great concurrence of afforestation requests with nature conservation objectives) have to be treated correctly. Here, it is necessary to treat these instruments with a greater flexibility.

5. Concerning the afforestation planning in detail

To sum up, it can be stated that a decisive amount of use of deciduous trees exists, whereupon of the genuine deciduous trees mostly the high value broadleaved-variants (“Edellaubholz”) including maple, ash, lime-tree, black cherry (elm) and mountain ash were successful.

Figure 5. How to improve the planning-process for Afforestation?

Guidelines for the silvicultural management



Bestockungsziel	Pflanzensortiment	Mischung	Pflanzabstände	Hinweise
Eiche (Ei) Winterlinde (WLi) Hainbuche (Hbu)	Ei 2/0 30-50 WLi 2/0, 1/1, 40-80 Hbu 2/0, 1/1, 40-60	Reihenmischung Eiche ca. 5000-8000 Stück/ha Winterlinde/Hainbuche ca. 2000 Stück/ha	Ei 1 x 1,5 bis 2 x 1 WiLi 2 x 2 bis 4x2 Hbu 2 x 2 bis 4x2	Traubeneiche im Hügelland, Stieleiche in den Niederungen/Auwald
Bergahorn (Bah) Esche (Es) Winterlinde (Wli)	Bah 1/0 (2/0) 40-60 Es 1/0 (2/0) 40-60 Wli 2/0, 40-80	Reihenmischung Insgesamt 4450-3300 Stück/ha	Jeweils (1,5 x 1,5) bis 2 x 1,5	
Vogelkirsche (VoKi) Winterlinde (Wli) Schwarznuß (SNu)	VoKi 1/0 30-50 Wli 2/0 40-60 SNu 2/0 (1/ 2) 40-80	Reihenmischung 2500- 3300 Stück/ha	VoKi 2 x 1,5 WLi 4 x 2 SNu 4 x 1,5	Gute Standortvoraussetzung Keine Späfrostlage
Fichte (Fi) Birke (Bi) Aspe (Asp)	Fi 1/1-2/2 (2-4 jährig), 30-60 Bi 1/0, 30/60 Asp 2/0; 40/80	In der Regel Reihenmischung, Verteilung der Aspen locker über die Fläche	Fi 2 x 1,5 bis 3 x 1 Bi 3 x 3 bis 4 x 2 Asp 5 x 5	In der Regel ohne Zaun möglich
Fichte (Fi) Roterle (RErl)	Fi 1/1-2/2, 30 – 60 RErl 2/0, 1/1, 50 - 80	Reihenmischung, Beimischung auf Zeit, ev. Gruppenmischung	Fi 2 x 1,5 RErl 3 x 3 Erle: ca. 1100 Stück/ha	Beimischung auf nassem Boden, Frostschutz, Stickstoffanreicherung
Kiefer (Kie) Hainbuche (Hbu) Buche (Bu)	Kie 2/0 (1/1) 2-jährig, 30-50 HBu 2/0, 40-60 Bu 2/0; 30-50	Reihenmischung Kie 5000/8000 Stück/ha dazu ca. 1000 Stück/ha Hbu/Bu	Kie 2 x 1 Bis 2 x 0,6 Bu/Hbu 4 x 4	Nur arme Standorte
Douglasie (Dougl) Erle (Erl) Birke (Bi) Aspe (Asp)	Dougl 2/0-1/2, 40-70 Erl 2/0,1/1 40-80 Bi 1/0, 30-60 Asp 2/0; 40-80	Gruppenmischung kleine Schirmstellung des Laubholzes	Dougl 3 x 1,5 (ca. 2000 Stück/ha) Laubholz 3 x 3 1000 Stück/ha	Douglasie in sich rein, Kleinbestände 0,5-2 ha dazwischen Laubholz, lichter Schirm
Europäische Lärche (Elä) Buche (Bu)	ELä 1/1, 1/2, 2-3jährig 30-60 Bu 2/0 (1/2) 2-3jährig 30-50	Lärche einzeln ca. 2000 Stück/ha Buche in Reihen, evtl. auch gruppen- und horstweise	ELä 3 x 2 Bu 1 x 1,5	Hinweis: Fegeschutz Als Mischbaumart ca. 2000-2500 Stück/ha

Figure 6. Considerations for the detailed planning of afforestations.

At a corresponding height of the plant (sapling: between 70 and 120 cm), according to our experiences, chemical weed regulation is redundant also on previous agricultural soils.

Besides that, oak-rich stand-types with lime-tree, hornbeam and (some) beech led to positive results, whereas pure or leading beech stand types like they are often postulated (for they often correspond to the potential natural vegetation) imply a high risk when used in primary afforestation: excessive grass growth, late frost and mice under special circumstances reduce the success of the plantation decisively. Therefore beech gets better introduced later by the means of underplanting.

For short-rotation deciduous stand-types, black cherry, walnut, wild service tree and lime tree are recommended.

If coniferous species (spruce / pine) should be used, then the mixture of tree species should contain at least 30% deciduous trees, whereas in the case of afforestations without fencing esp. the soft deciduous tree species that are rarely grazed have proven its worth like birch, aspen and alder (see Figure 6).

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Assessing and Monitoring of Afforestation

Afforestation and Remote Sensing

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Abstract

In the strategic use of remote sensing for the afforestation purposes the focus is on regional to continental levels with equivalent mapping scales from 1:50 000 to 1:5 million. Generic remote sensing methods can be applied for land cover mapping and land cover change mapping with a special reference to afforestation. The operative use has a local perspective with an equivalent mapping scale of approximately 1:5 000. Specific remote sensing tools for afforestation purposes are needed for the operative use.

Two recent European projects are given as examples on the strategic use of remote sensing. The projects showed that at the European scale forests can be mapped to coarse categories with rather high an accuracy. The operative use of remote sensing in afforestation actions includes three dimensional landscape simulations using high resolution data from satellite or from airborne instruments. It also includes monitoring of the vegetative succession after the afforestation measures.

Both at the strategic and operative level the afforestation community could participate in the development of the remote sensing methodologies to make them better serve the afforestation needs.

1. Introduction

Remote sensing has been used thus far in afforestation activities to a limited extent. The reasons to this have been the local nature of afforestation measures but likely also the fact that the afforestation and remote sensing communities have been very different. Afforestation activities have been carried out by the silvicultural community whereas remote sensing has been a concern of the forest management community or of more technological actors.

However, remote sensing could help both the strategic and operative afforestation measures. In the strategic use of remote sensing the focus is on regional to continental levels with equivalent mapping scales from 1:50 000 to 1:5 million. Remote sensing is applied as a tool for land cover mapping and land cover change mapping with a special reference to

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afforestation. The operative use has a local perspective with an equivalent mapping scale of approximately 1:5000. Specific remote sensing tools for afforestation purposes are needed for the operative use.

2. Strategic information

The starting point in the planning of the afforestation measures at the regional level is locating and characterizing the existing forests and other land cover types such as abandoned agricultural fields. The land cover mapping for afforestation purposes is most reasonable to do together with other land cover mapping activities. For instance, in the European CORINE (Coordination of Information on the Environment) 2000 mapping, the afforestation issues could be taken into consideration. Recently, two European-wide projects on forest mapping have been carried out, the FMERS (Forest Monitoring in Europe with Remote Sensing – JRC/CEO Contract no. 13105-97-07) project (Häme et al 1998, Häme et al. 2000a) and the pan-European forest mapping project (Häme et al. 2000b, Kennedy et al. 2000 – JRC/SAI Contract no. 13911-1998-04 F1ED ISP FI). Worldwide, forest mapping using images with approximately one kilometer resolution has been studied extensively (Eidenshink, 1992, Häusler et al. 1993, Townshend 1994, Malingreau and Belward 1994, Cihlar et al. 1996, Lambin and Erlich 1996, Häme et al. 1997).

2.1 FMERS

The objective of the FMERS study was to develop and implement *methodologies* for the provision of *standardised geo-referenced information* and *statistical information* to describe the forests and other wooded land in Europe using optical and microwave space borne remotely sensed data. The target variables were forest and other wooded land as well as proportions of major tree species groupings. The new 10% crown cover limit between forest and other wooded land defined by FAO was utilised in this study. In addition to the forest cover classes, which were adjusted to the FAO nomenclature, an extra class ‘temporarily unstocked’ was defined. This class included mainly forest regeneration areas.

The study was divided into two stages: 1) the Pilot Study in which the methodologies were developed and compared at six representative study sites across Europe and; 2) the Regional Mapping that demonstrated forest cover mapping in two large areas in Europe.

Pilot study

The six study sites of the Pilot Study were located as follows: two in the Mediterranean zone, two in the Temperate forest, one in the Alpine region, and one in the Boreal forest. The image data included altogether 65 satellite images. The ground resolution ranged from 10 meters of SPOT images to approximately 200 meters of IRS-WiFS images.

Five different approaches in image interpretation were tested. The so-called unsupervised clustering appeared to be the most appropriate. In this method, an image is classified into spectrally homogeneous categories automatically without using any ground reference data. These categories were labeled into informative classes using ground reference data.

The principal ground data, of which one third were used for the labeling of the spectral classes and two thirds for the validating the classification results, were collected along

transects. The transects were parallel or perpendicular strips with a width of 20 metres. Local forestry experts for each of the six sites located the transects on the forestry maps or aerial photography, and recorded the values of the target classes along the transects. The total length of the transects was 1868 kilometres.

The percentages of correctly classified observations varied from 65% for the WiFS classification in England to 94% for the SAR (Synthetic Aperture Radar) classification using fifteen images in Finland (Figure 1). It should be noted, however, that only two classes were discriminated using the SAR data in Finland, i.e. 'forest' and 'other land'. This increases virtually the performance figures of the SAR classifications compared to optical ones, in cases when three target classes were discriminated in the optical classifications. In general, SAR data were less effective in forest discrimination than the optical data. In mountainous sites of France and Italy the radar data did not give acceptable results. Kappa statistics were also computed to characterize the classification performance. The Kappa values were sometimes low and illogical, which partly reflected problems in the ground reference data.

The performance for tree species discrimination was on average poorer than the performance for cover type classification. This was predictable because the tree species proportions were estimated using a classification procedure although they are continuous variables.

The accuracy of the position of borders between forest cover types was estimated by accepting different shifts in the location of the borders in the image classifications from the 'true' location in the ground data. The borderline detection succeeded well using the high resolution (30 meter resolution) data if the borders were clear on the ground (Finland and Poland). The medium resolution data were too coarse to exactly map the location of the forest borders, although the overall accuracy of the map could be high.

In the boreal zone the classification of forests succeeded well and discrimination of the regeneration areas (temporarily unstocked land) from the agricultural lands was satisfactory. Already the 200-meter image data produced rather accurate forest maps.

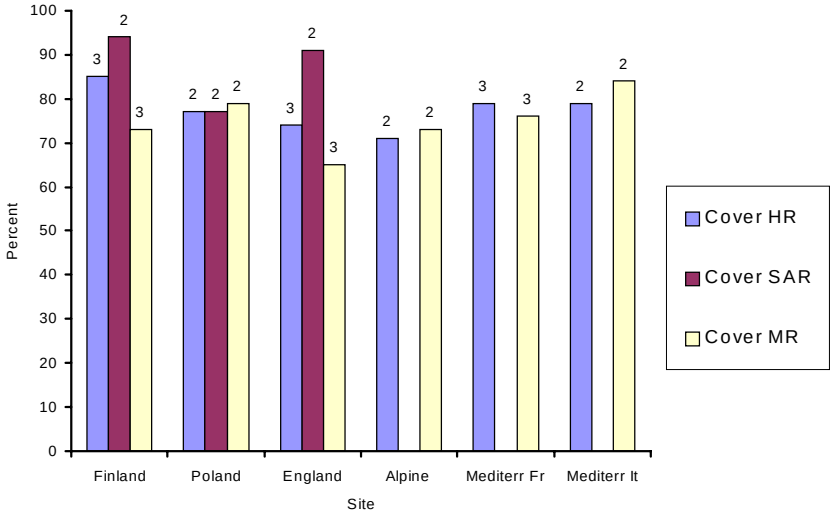


Figure 1. Performance of the classification of forest cover as estimated using the percentage of correctly classified observations. The number above the bar shows how many classes have been validated. HR – High Resolution; MR – Medium Resolution.

Of the sites in the Temperate zone the Polish site had rather a clear forest patch structure whereas the forest patches at the English site were small and dispersed. The classification performances in Poland were similar to those in the boreal zone but poorer in England, particularly when the medium resolution data were used. The Polish and English sites may represent the extremes of the European temperate forests in terms of uniformity. If the same level of accuracy in forest mapping is required across the whole zone, a higher resolution satellite data should be used on areas with a dispersed forest structure.

The appropriate resolution of the satellite image can be roughly estimated by comparing the area of three by three pixels of a satellite image to the size of a typical forested area. With the IRS WiFS data, the three by three pixel area is 32 hectares, with Landsat MSS (Multi-Spectral Scanner) 6 hectares, and with Landsat TM (Thematic Mapper) 0.8 hectares. If for instance, the typical forested area size is 10 hectares, Landsat MSS would be an appropriate instrument for forest mapping.

In the Alpine region shadows decreased the classification accuracy. In the Regional Mapping stage of FMERS, the classification results in the Alpine zone were better than those in the Pilot Study stage.

The complex landscape of the Mediterranean area produced problems not only in image interpretation, but also in classifying the forests on the ground. The FAO nomenclature with the ten-percent limit for crown cover and five metre length for actual forests caused the border between ‘forest’ and ‘other wooded land’ to be located in the middle of the Mediterranean ‘macchia’ vegetation.

The Mediterranean forests, concentrated on relatively isolated areas, are not as dispersed as the park-type forests in England, for instance. Therefore even the 200-meter data may be appropriate for forest mapping at a regional level. Shadows on mountainous areas decrease the classification performance but not as much as in the Alpine zone.

Regional mapping

In the Regional Mapping stage, forest and tree species maps were made from two large regions in Europe, reaching from Southern Italy to Central Finland. Two image mosaics were compiled from individual images with 200-meter ground resolution. One mosaic covered a major part of southern Europe and another was located in northern Europe. No images with higher ground resolution were used.

The image mosaics were classified in a stratified manner. The geographic stratification clearly improved the results because the ecological variability was better taken into consideration. Not only the variability in the natural conditions but also the radiometric problems of the sensor and inadequate information on the atmospheric conditions in the reflectance computation stage are factors that can increase the effectiveness of the stratification.

No specific ground data were used but the classes were labeled manually using their spectral reflectance values and all other available data (Figures 2 and 3). Despite the subjectivity in the class labeling, the result was surprisingly similar to the official forestry statistics (EUROSTAT 1998) (Figure 4).

2.2 Pan-European forest mapping

The objective of the pan-European forest mapping study was to develop a method for producing a European raster database that includes a forest proportion estimate for each

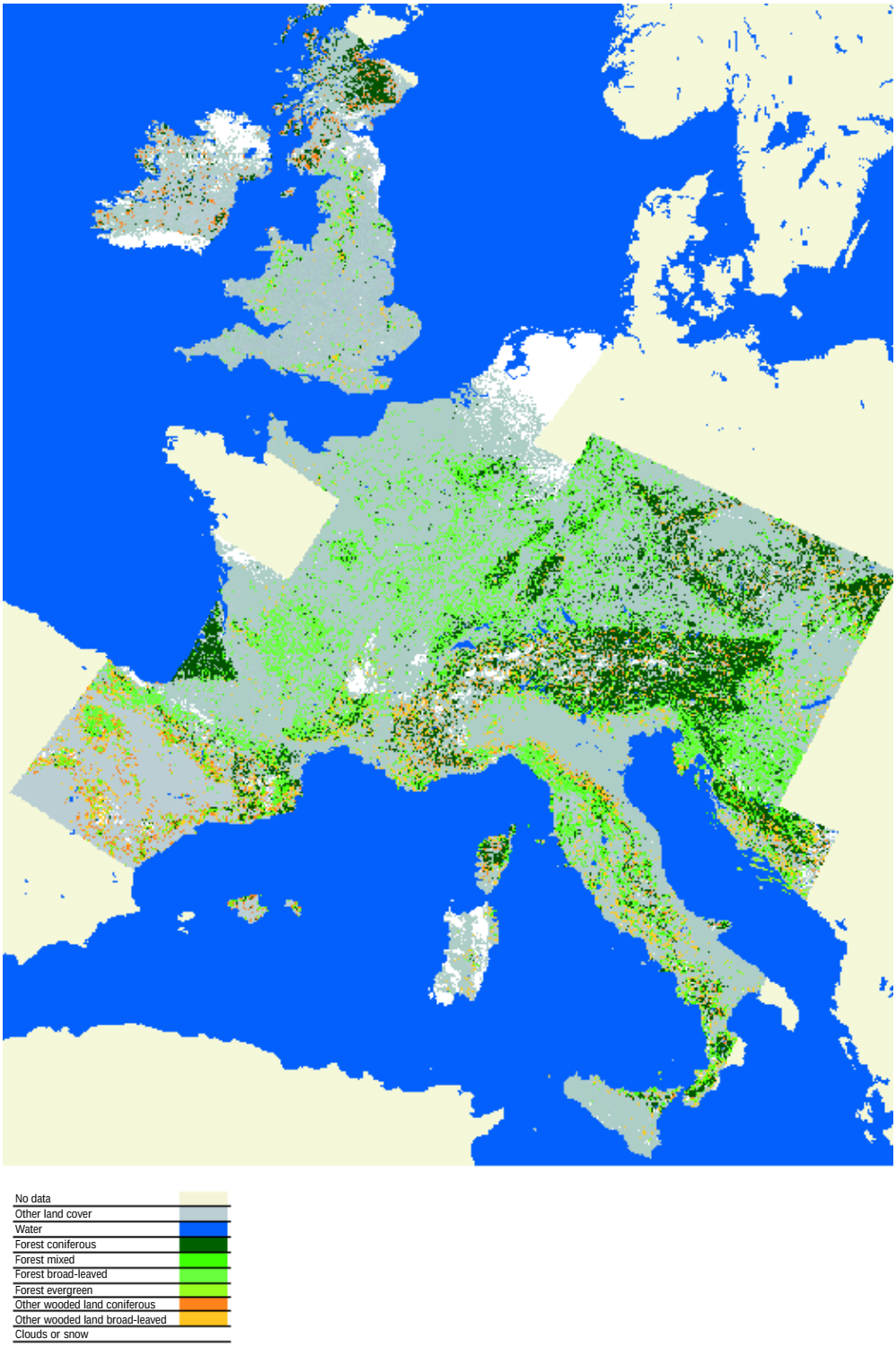
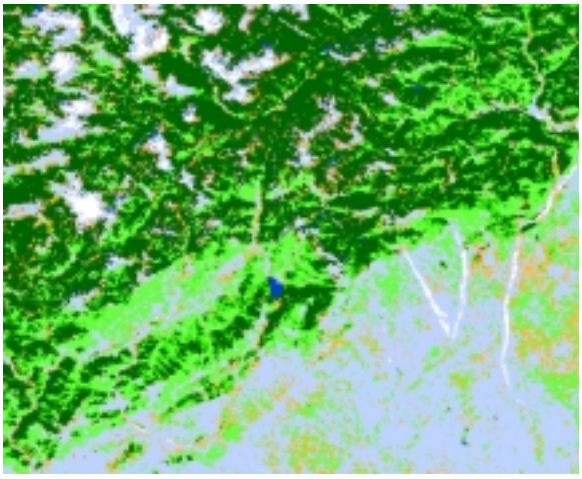
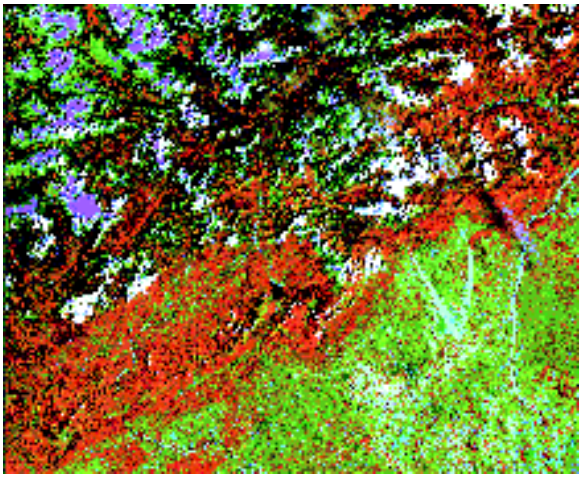


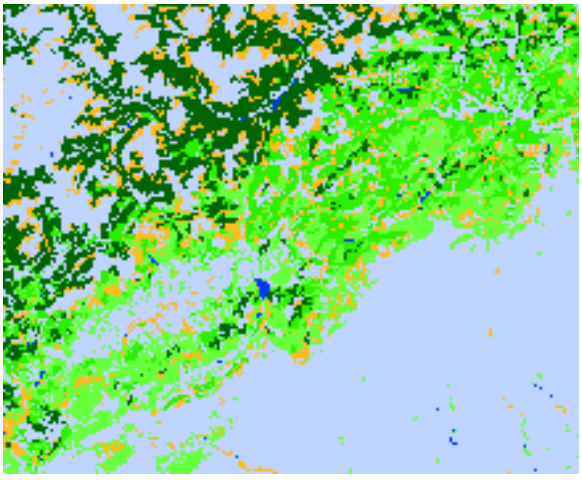
Figure 2. WiFS mosaic classification result – southern Europe.



WiFS classification



Landsat TM



CORINE Land Cover

Figure 3. A detail of the WiFS classification, Landsat TM image, and CORINE land cover map from the Southern edge of Italian Alps North of Venice. Area size approximately 115 km by 90 km.

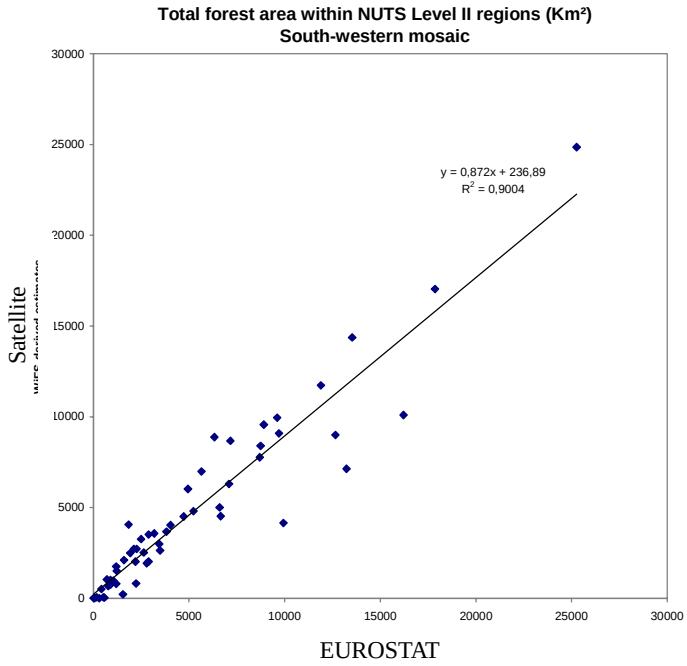


Figure 4. Forest area in the EUROSTAT statistics and in the satellite image interpretation by NUTS II level regions. Southern Europe.

pixel. The database could also be called forest probability database because the value of the pixel tells the probability that a randomly selected point within a pixel falls in forest. Imagery from the AVHRR (Advanced Very High Resolution Radiometer) instrument of NOAA (National Oceanic and Atmospheric Administration) satellites was selected as satellite data. AVHRR imagery data were the only satellite data source that was economically possible to use at the pan-European extent. The resolution of the AVHRR instrument is 1.1 kilometers directly under the satellite (at nadir), and weakens towards the image edges.

An image mosaic of 49 individual calibrated images was compiled and the per pixel forest area was estimated (Figure 5). For the estimation, the mosaic was divided into two geographic strata. The CORINE Land Cover data represented the ground data in the estimation procedure.

The AVHRR forest area estimates showed rather good an agreement with the CORINE data and with the official forest statistics. In the twelve countries shown in Figure 6, the forest percentage in the AVHRR-originated map was 4.2 percentage units lower than that in the official statistics. The underestimation compared to the FAO statistics was 6.0 percentage units. The underestimation was 1.8% compared to the CORINE data.

The most serious underestimation of forest area may have occurred in France. The reason to this is still somewhat unclear. Another error was an overestimation of the forest area in the arctic zone and in Ireland, Scotland, and Island. A successful estimation of Irish and Scottish moorlands would require a very detailed geographic stratification. The area-weighted root mean square errors (RMSE) for country-wise forest percentage, and regional forest percentage for France and Germany were computed. The country-wise RMSE for twelve European Union countries was 4.6 percentage units, for regions in France 8.8, and in Germany 3.9 percentage units.

Figure 5. Forest proportion map of Europe.

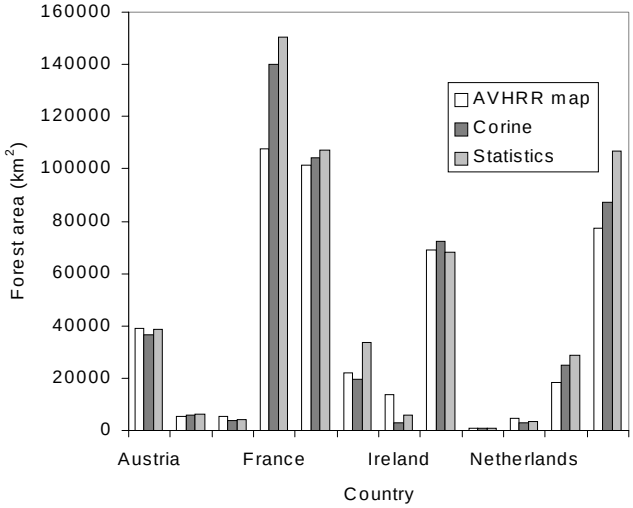


Figure 6. Forest area in the forest pan European AVHRR map, CORINE land cover map, and EUROSTAT statistics.

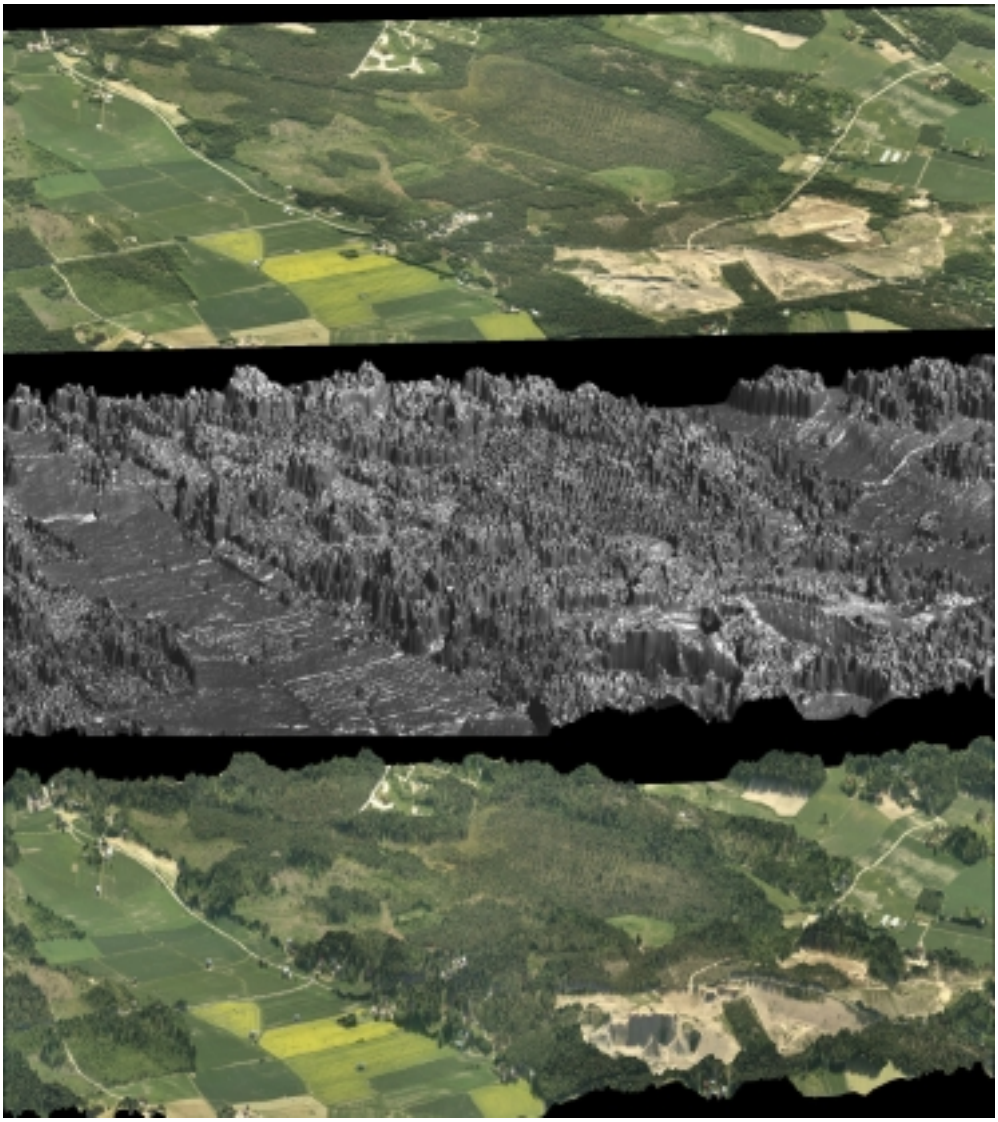


Figure 7. An ortho-image mosaic, a digital elevation model, and their combination. The images have been automatically generated from 75 individual airborne CCD-camera images.

3. Operative information

The use of remote sensing to aid operative afforestation activities can be divided into pre- and post-afforestation actions. A pre-afforestation use could be generation of a virtual three-dimensional landscape. Tools are being developed to automatically compute an image mosaic in the orthogonal (map) projection and a digital elevation model from airborne digital CCD-camera images (Holm et al. 1996). This method is applicable also for other digital images with a stereographic coverage. The three-dimensional landscapes can be used to plan the afforestation actions in the field. Using simulation, the result of the vegetative succession years after the afforestation can be demonstrated.

Change detection techniques are applicable to monitor the successfulness of the afforestation. These techniques use images that have been acquired before the afforestation and some years after it (Häme et al. 1998b). The change detection analysis can be automated, which makes it possible to monitor wide geographic areas with a limited amount of work. The scale of automatic change analysis can vary from local to continental (Figure 8).

4. Conclusions

The FMERS and pan-European forest mapping projects showed that European forest can be mapped to coarse categories with rather high an accuracy. Such mapping should well serve also the afforestation purposes particularly if the afforestation issues are taken into consideration in the planning stage. If afforestation needs require discrimination of some classes that have small area coverage, the standard land cover mapping procedures may be too coarse to fulfil the needs. In such case the mapping process could be hierarchical. For instance, the overall land cover mapping is done using data with 200-meter resolution, whereas in the mapping on critical areas 30-meter or even one-meter data are used.

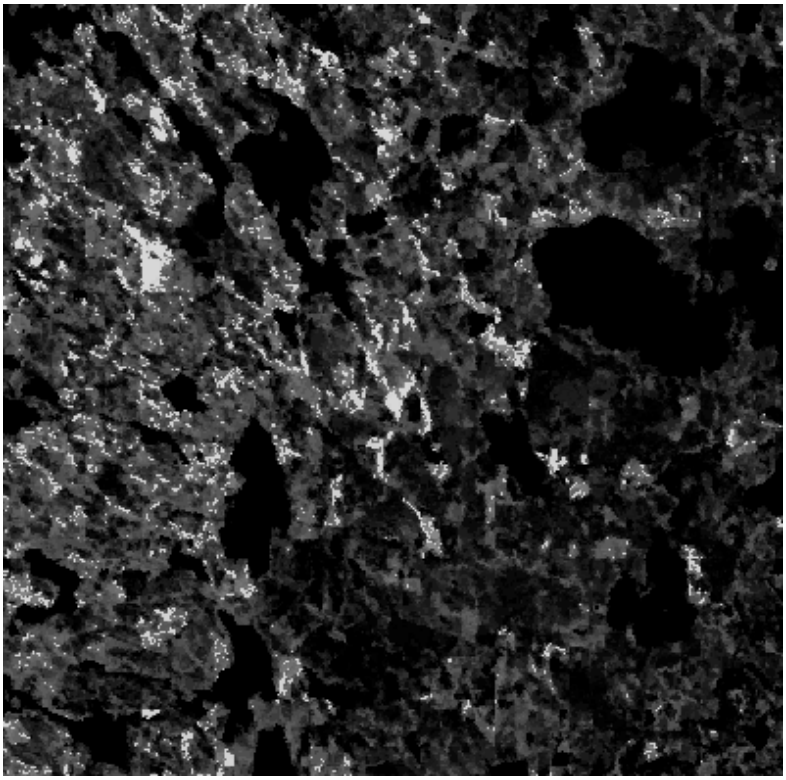


Figure 8. Bright areas show a rapid vegetative succession in a forested area in Southern Finland between 1996–1998. Area approximately 10 km by 10 km. Satellite data from Landsat Thematic Mapper with 30-meter resolution.

The best results were achieved in forest / non forest discrimination, and the most difficult category was the mixed forests in the tree species discrimination. Reliable interpretation of the tree species proportions at a pixel level is unlikely since the pixel size is too large compared to the tree size. A problem with the satellite image classifications is that their performance is difficult to estimate in statistical terms. There are no means to estimate the size of the bias if the mapping is done using only satellite data. Comparison of the satellite image-based results with the official statistics indicated that the satellite-origin forest maps somewhat underestimate forest cover. The reasons to this are still unknown particularly as it comes to the pan-European map, because the procedure involving ground reference data should have been unbiased.

The major bottlenecks and unresolved problems are in the interface between the satellite images and other data sources. The most critical problems may be rather practical than scientific. The acquisition of satellite data with high quality and resolution of approximately 200 meters has been somewhat problematic. However, this problem is being resolved after the launch of the MODIS instrument late 1999. As it comes to the satellite data, applicable for operative afforestation needs, the IKONOS satellite already provides imagery with one-meter resolution. Other similar satellites will be launched soon. At the local level aerial image acquisition – using digital cameras to an increasing extent – will have a role also in the future.

None of the satellite and airborne image mapping methods described above was specifically developed to serve afforestation purposes. At the strategic level, generic remote sensing approaches may serve the afforestation needs better than at the operative level. However, both at the strategic and operative level the afforestation community could participate in the development of the remote sensing methodologies to make them better serve the afforestation needs.

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Impacts of Afforestation on the Scenic Value of Rural Countryside

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Abstract

The paper sums up the results of the recent research work dealing with amenity valuation of rural landscapes in Finland. The different approaches to scenic values to forest planning include visual preference studies, preference modelling, visualisation and socio-economic studies. The results show that in many cases afforestation reduces landscape amenity values. The scenic beauty of landscape decreased with increasing intensity of afforestation, but regional differences were also found. Furthermore, in the contingent valuation survey the open landscape is shown to be of importance as a quality in the countryside from which people receive considerable benefits measured in monetary terms. The results stress the need for environmentally informed agricultural policy in rural areas and the need for efficient tools for incorporating non-priced landscape amenities into forest and land-use planning.

Keywords: contingent valuation, landscape planning, landscape preferences, preference models, visualisation

1. Introduction

Countryside is no longer only a place of residence and for production but increasingly also an environment for recreation and tourism. In other words, the countryside is changing from being a place of production into a place of consumption (Oksa and Rannikko 1996). Hence, also an increasing share of the value of agriculture is expected to come from the production of public commodities such as landscape (Tyrväinen et al. 1999). Since many landscape amenities emerge as a joint product of rural land use and management decisions, agricultural and forestry policies have an impact on the quality of the rural environment, especially on the quality of landscape. An example of this has been the means of reducing agricultural overproduction through afforestation, which easily causes remarkable changes in the rural

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landscape. In consequence, this solution to decrease overproduction also plays a central role in the provision of landscape amenity benefits (Tyrväinen et al. 1999).

In the Common Agricultural Policy (CAP) of the European Union, the impacts of afforestation on landscape have been seen mainly positive because it is thought to increase for example landscape diversity. However, in Finland with only 7% of agricultural land, forests are the dominant feature of the landscape. Until now afforestation has mainly taken place in Eastern and in Central Finland, where the total field area is already small and the importance of forestry is considerable (Hynönen and Hytönen 1998). Especially on those areas the most critical environmental consequence of afforestation is the visual impact. Furthermore, in Finland afforestation has been concentrated on marginal, non productive fields or on the fields of older farmers who would have given up agricultural production in any case and, thus, the impacts on agricultural production has so far been minor.

According to the preliminary results of an ongoing study (Tilli and Toivonen 2000) of Pellervo Economic Research Station (PTT) in Finland there is as much as 97 000 ha of potentially available agricultural fields for afforestation on the active farms. The number is based on the interview of about 1100 landowners carried out in November 1999. In the same study it was found that 58% of landowners did not have any intention to afforest their agricultural land, and only 21% could think about afforestation – mainly due to economic reasons. The main driving force was seen to be economic interest for subsidies and an opportunity to change non-productive field areas to more productive forestry. On the contrary, those farmers who did not intend to afforest their land had mainly emotional reasons. One of the most important reason was that afforestation will have negative visual impacts on the rural environment.

Although landscape conservation and management may be regarded as a strategic objective, they are less successfully put into practise on reforestation of set aside land. One of the main reasons is that at present there are not adequate and efficient tools for measuring and integrating landscape values in land-use planning. The different approaches that include scenic values in forest planning include visual preference studies, preference modelling, visualization and socio-economic studies (Figure 1). Measuring and valuing intangible countryside products, and comparing them in a way that is commensurate with the financial costs, returns and profits of agriculture, forestry and other productive activities in the

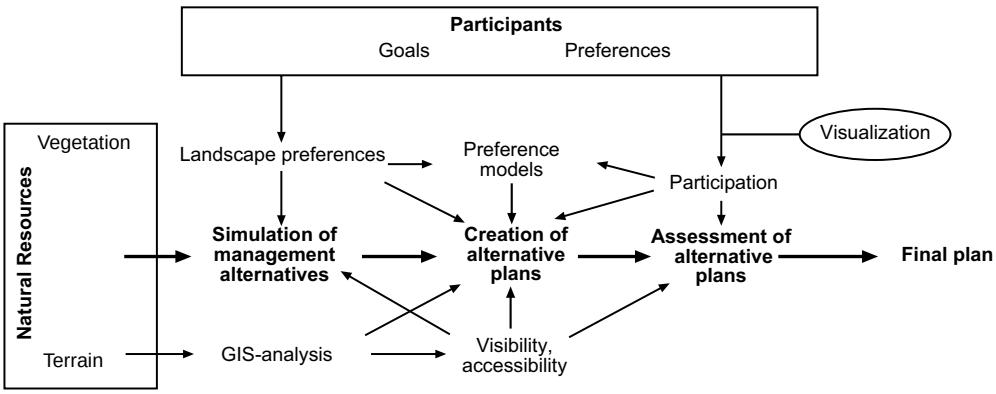

Figure 1. Different approaches to integrate scenic values to forest planning (adapted from Nousiainen et al. 1999).

countryside can provide information for allocation of resources and appropriate formulation of government regulatory policies (Garrod and Willis 1993).

In our studies focusing on landscape impacts of field afforestation we have tried to find ways to estimate scenic beauty of rural landscape and its value among other benefits of countryside. One of the key tasks was to discover acceptable values for environmental benefits to compensate for marketable production and to evaluate the impacts of the new policy with extensive afforestation program launched 1995 in Finland. At that time the goal was to reforest approximately 90 000 ha of set aside land, which was about 3% of the total agricultural land area (Kuhmonen and Nerg 1995). The main aims were to:

1. study landscape values attached to open agricultural environments versus afforested areas in different landscapes and different social environments. The methodologies used were analytical hierarchy process-method (AHP), and in the visualisation of landscape changes by means of digital image editing techniques and computer graphics;
2. incorporate amenity values of rural landscape into land-use planning both at a farm and a regional scale. The possibilities of combining preferences of private landowner and other interest groups by using regression models of scenic beauty preferences were studied;
3. study the socio-economic impacts of landscape changes by applying contingent valuation method (CVM) in order to measure people's willingness to pay for open rural landscape.

The studies were conducted in three Finnish provinces: Southern Ostrobothnia, Central Finland, and North Karelia. The province of Southern Ostrobothnia is one of the most important agricultural areas of Finland. In contrast, in Central Finland and North Karelia the importance of agriculture is significantly lower, and these provinces are increasingly dependent on their forest resources. The proportion of the total land area devoted to agriculture is 19% in Southern Ostrobothnia, while in Central Finland it is 7% and in North Karelia only 6.5%.

2. Visual impact of afforestation

Afforestation will have long-term visual impacts on landscape which are experienced directly by the public (e.g. McCormack and O'Leary 1993); it hides the agricultural landscape of farmhouses and other traditional land marks or hides important elements of local landscape such as lakes or hills behind forest cover. Traditional landscapes and places might become unrecognisable even for local inhabitants. The public is often highly concerned about a landscape that is an essential part of the everyday life. Despite the possibility of adapting to the relatively slow change in the landscape caused by afforestation compared to, for example, clear-cuttings in forestry, the visual change from field to forest may often be experienced as a threat (Tahvanainen et al. 1996). There are many studies that assess scenic beauty in the scientific literature but most have been done in forested regions and pertain to forest management (e.g. Savolainen and Kellomäki 1981; Schroeder and Daniel 1981; Brown and Daniel 1986; Pukkala et al. 1988; Jensen 1993). Contrary to this, only a few studies have focused on the agricultural landscape (e.g. Ronningen 1993; Cook and Cable 1995).

We studied the visual impact of afforestation in three rural areas. The impact of gradual afforestation was evaluated by private non-industrial forest and agricultural landowners, potential recreationists and professionals of land-use planning (Tahvanainen et al. 1996). The three study areas were located in (1) Eastern, (2) Central, and (3) Western Finland, which differed from each other as regards to visual landscape, cultural background and economical welfare. Common to

these areas was the high pressure of field afforestation. In each area scenic beauty of local landscapes were assessed using slides, which were produced from original panoramic photographs by digital image editing. Three different afforestation alternatives were produced from each original picture. They represented the scenarios with afforestation of one third and two thirds of the original field area and also with total afforestation. The idea of using manipulated photographs originated from the fact that in determining the contribution of a particular change, in this case amount of afforestation, to visual preference one has to control other variables such as viewpoint, perspective, light, colours and shades in the images. Scenic beauty was evaluated by using pairwise comparison technique as presented by Saaty (1980) and also by rating landscapes using a scale from 1 to 10.

In general, the scenic beauty of landscape decreased with increasing intensity of afforestation. Exceptions to this in Eastern and Central Finland were large, flat agricultural fields where slight afforestation had either neutral or positive effect on scenic beauty. In contrast, in Western Finland, where large, flat field areas are a typical landscape element, those scenes were also highly preferred.

The impact of afforestation on scenic beauty was experienced generally in the same way, but the intensity varied depending on the interest group. When compared to other groups, in evaluations of landowners there were only small variability on scenic beauty of different landscapes and afforestation alternatives. Furthermore, the attitudes of landowners towards the afforestation were also more positive than among recreationists and professionals. This can be due to landowners' economic dependency on the countryside and financial feedback of different land use alternatives (Tahvanainen et al. 1996). In addition, professionals of land-use planning had a more clear opinion about scenic beauty than other groups.

In conclusion, it can be said that the scenic beauty of very highly preferred landscapes or landscapes that originally had only a small amount of field area, decreased as a consequence of the afforestation. People also tended to rank familiar environments more highly than unfamiliar environments (see Cook and Cable 1995) and, thus, easily regard any kind of changes in familiar environment as negative. Moreover, usually the amount of afforestation is not as important as the placing of the afforestation area in the landscape. Afforestation will also be more successful in landscapes were the new feature would be of sufficient size so as not to dominate the scene. The results indicate that general rules can be found to assess scenic beauty of rural landscapes, but also emphasise the importance of proper landscape planning and design in forestation of fields. This also suggests that the landscape amenity preferences can be incorporated into management planning systems with other more tangible objectives (Tahvanainen et al. 1996).

3. Predicting visual landscape preferences

The management of environmental commodities such as amenity values has been limited partly because of the lack of information concerning their responses to management actions (e.g. Hull et al. 1987). One way to anticipate the scenic beauty impact of a specific management action is to represent the relationship between physical site characteristics and perceived scenic beauty in the form of a statistical model (Schroeder and Daniel 1981). In principle, these models would allow an objective estimation of the change in scenic beauty with, for instance, afforestation, regeneration, thinning or other management actions (e.g. Schroeder and Daniel 1981; Brown and Daniel 1986). Moreover, the scenic beauty indices are used to help to assess the scenic impact of proposed management action. The use of scenic beauty models can be seen as a suitable method for prediction of the scenic beauty for

routine management planning in ordinary rural areas. This, however, excludes the areas with special scenic values. Scenically important and visually sensitive areas need more detailed analysis adapted to each case than the models created for ordinary landscapes (Tahvanainen et al. 1996).

We have studied the possibilities of estimating the far view scenic beauty of rural landscapes and identifying those quantitative variables, based on simple inventory and map data, which were related to preferences (Tahvanainen and Tyrväinen 1998). The landscapes were selected to represent the variation of the most common agricultural scenes in the study area. Panoramic colour slides of each landscape, both original and manipulated were used to assess the scenic beauty. Biophysical characteristics were measured at each site using common standwise forest inventory techniques. The topographical variation was measured and the viewpoints and visible areas of fields, lakes and forests were defined. Furthermore the visible area was divided into three zones, each distance zone having its own characteristic predictors.

Studies in forested regions have shown that, for the most part, people prefer diversity in the landscape. Nevertheless, the preferences of local inhabitants tend to depend also on the original nature of the area. The models of our studies indicated that there are differences in landscape preferences between different interest groups, but that most predictors are the same for all groups. Typically from two to four different predictors in various forms were chosen for linear regression models. The models constructed for different areas differed from each other as well in predictors as in their relative importance. The most important predictors were lakes or other water areas, depth of the view and distance of the nearest forest edge (Tahvanainen and Tyrväinen 1998). As much as 74 to 91% of the variance of scenic preferences could be explained with regression models.

The results of our studies as well as the results of Bishop and Hulse (1994) indicate that it is possible to predict the far view scenic beauty of large rural areas with easily measurable characteristics. Scenic beauty preference models, especially if they are related to different interest groups, e.g. the general public, environmentalists or certain types of tourists, are useful tools to employ when planning the management actions of a farm (Tahvanainen and Tyrväinen 1998). Furthermore, models relating scenic beauty to biophysical features also make possible an estimation of the cost of preserving or enhancing scenic beauty in terms of management inputs and/or lost production of competing products (Brown 1987).

4. Attitudes towards afforestation

The opinions of farmers about afforestation as well as the opinions of other rural inhabitants and city dwellers were studied by a mail survey (Nousiainen et al. 1999). One third of the respondents owned more than 1 ha of fields (mean 11.1 ha). More than one fourth of those had afforested some of their fields during the past 10 years, and the average afforestation area was approximately 3 ha. Two thirds of the field owners were not interested in field afforestation, while only less than one fifth were interested (18.0%). The results were quite similar to more recent figures for the whole of Finland (Tilli and Toivonen 2000).

According to our studies, the most important reasons for deciding in favour of field afforestation by landowners were: low profitability of agriculture (16%); there was no one to carry on farming in the future (13%); economic interest for subsidies (12%); fields were not suitable for farming (12%); and poor location of the fields (11%). In North Karelia giving up farming was emphasised and in more productive areas in Central Finland the poor location of field was the most important reason for afforestation. Furthermore, the most important

reasons against afforestation were: good quality (16%); good location (15%) of the fields as well as insecure future (14%); and landscape values (12%). Younger respondents especially emphasised the importance of landscape.

In general, the quality of the present rural landscapes was considered to be fair (54%) or good (32%). However, most of the respondents (79%) thought that rural landscapes had changed during the preceding decade. The changes were considered as undesirable by 42% of them (Tyrväinen et al. 1999). The factors causing landscape changes included uncultivated fields (24%), afforestation (16%), road construction (16%), poor maintenance of buildings (badly renovated, unmaintained or decaying) as well as forestry. Those who lived in the countryside thought that the most important changing factor was field afforestation and unmanaged fields. In North Karelia and also in Central Finland afforestation, unmanaged fields, forestry and unmanaged buildings were considered to be the foremost influencing factors causing the landscape change.

More than half of the respondents thought that in general *the most important impacts of afforestation are positive*. The most positive effects were considered to be improved water quality (16%), decrease in overproduction (14%), and positive effects to climate change through carbon sequestration into new plantations (10%). In contrast, the disappearance of familiar cultural marks of land use was one of *the most significant negative effects of afforestation* as well as the threat of decreasing capability to adapt to possible future changes. Furthermore, less than half (45%) of the respondents in our study thought that field afforestation has in general mainly negative *impacts on the visual landscape* and less than one third (31%) of the respondents thought that the impact is positive. Farmers and other landowners as well as those who lived in the countryside had more negative attitudes than the others.

In general, fields are seen as an essential part of countryside which have an effect on attractiveness of countryside as a holiday resort and also on the prices of real estates. The most negative attitudes towards field afforestation and its future consequences was among farmers. The majority of respondents (88%) felt that rural landscape management would be beneficial for them, the most important reason being that other people and future generations would also be able to enjoy open cultural landscapes. Almost one third of the respondents, rural residents in particular, considered that public financial support in the form of subsidies was the best way to implement rural landscape management. In contrast urban residents preferred landscape management implemented by the landowners without public funding or changes in legislation.

Respondents were also asked the best way to use tax revenues to reduce surplus agricultural production. The most popular alternative was that agricultural production should be maintained in some form; organic farming and production of energy plants were the most popular alternatives, while environmental management and afforestation were rather less popular. However farmers favoured more afforestation and less organic farming than the other interest groups.

5. The monetary value of rural landscape

In this sub-study, the contingent valuation method (CVM) was applied to measure the monetary value of landscape change caused by afforestation program. In 1996 a CV mail survey was sent to residents in three Finnish provinces (a sample of 1350 people, response rate of 36%) where agriculture and forestry have a large economic significance. In each county half of the questionnaires were sent to urban residents chosen from the four biggest towns and half to rural residents (Tyrväinen et al. 1999).

In the study an information text was used to explain the goals of the afforestation program within the province, and to explain the different anticipated impacts of the action. The information text was combined with photographs produced by digital image-editing technique which illustrated typical examples of the landscape impacts of afforestation in each province. To reduce the possible bias of the geographical embedding, whereby a respondent values a landscape whose spatial attributes are different from those intended by the researcher, the respondents were asked to state their willingness to pay for landscape management or afforestation within their own province rather than in the whole country. Those respondents who considered the effects of afforestation on the landscape as positive, were only asked to state their WTP for afforestation in the province. The question was formulated as follows:

"Imagine that support would be stopped for afforestation at its present stage and all further funds to be used for afforestation would be collected directly from the residents of your province. How much at most would your household be prepared to pay in any year to promote afforestation during the next five years?"

In contrast, those respondents who considered the effects of afforestation to be negative were asked to express their WTP for preserving the current open landscape by active management within their own province. The question was:

"Imagine that landowners would receive no public funds in support of afforestation. Instead, the landowners would receive subsidies to preserve the landscape open by means of active management. Landscape management would be financed by tax revenues collected from the residents of your province. How much at most would your household be prepared to pay per year so that the open agricultural landscape could be preserved in its present state by means of landscape management?"

A payment-card presenting an array of potential sums from FIM 0 to 2000 per year (ECU 0–335) was used. Nearly half (45%) of the respondents considered the effects of afforestation on the landscape to be negative. Nearly half of those were willing to pay something for landscape management: 54% of urban respondents and 47% of rural respondents. Furthermore, those respondents who found the impact of afforestation to be positive (31%) were asked to define their WTP for it. More than one third, 40%, of urban respondents and 31% of country people, were willing to pay for afforestation. However, more than 20% of rural respondents were unwilling to pay anything for afforestation.

The results show that willingness to pay to preserve open landscape was higher than WTP for afforestation in all three provinces studied. The mean WTP for landscape management was FIM 270/year/household and FIM 127/year/household for afforestation. The highest WTP for afforestation was in Southern Ostrobothnia, were agriculture has the highest importance among the studied provinces.

The total amount of subsidies paid to farmers for afforestation at the time of the survey varied between FIM 16 900– 19 300/ha. The WTP for afforestation varied between FIM 295 – 682/yr/ha according to the province. If the total amount of paid subsidies is compared to the total estimated WTP for an afforestation program (5 years), the subsidy/WTP ratio varies roughly between 12.3 and 5.7. At the same time the subsidies for keeping landscapes open through active management were significantly lower, amounting to approximately FIM 3600/ year/ha in the study areas. The WTP for open landscapes varied between FIM 1460 – 1380 (ECU 292–276) per afforestation hectare in the different provinces. The subsidy/WTP ratio is clearly lower, 2.5 – 2.6, compared to the ratio in the case of afforestation. The calculations are presented in detail in Tyrväinen et al. (1999).

The WTP for afforestation of people living in North-Karelia and Central Finland amounted to less than half the sum which they were willing to pay for landscape management. These

two provinces have experienced large changes in their landscapes over the past few decades as a result of afforestation and set asides, and hence residents already have examples of how the landscape will change in the future. In contrast, the impact of previous afforestation has been fairly minor in the westernmost province Southern Ostrobothnia, which might be one reason for the highest WTP for afforestation.

In can be concluded that people in all three provinces were clearly willing to pay more for landscape management than for afforestation. Furthermore, rural people were more interested in paying for landscape management and had a more negative attitude towards afforestation. Urban residents probably find substitute areas for enjoying rural landscapes more easily than rural residents. The local people are tied to a particular landscape and have closer relationship to the particular location. They also prove to be more willing to pay to preserve the existing familiar landscape (Tyrväinen et al. 1999).

6. Conclusions

There is a growing awareness that agriculture also produces environmental amenity values that are not paid for through the ordinary prices of agricultural products, as they are, in a sense, a bi-products, external to the main effects of agricultural production (Ronningen 1993). Non-monetary countryside attributes can be viewed as commodities that are becoming scarce and for which people are prepared to pay (e.g. Garrod and Willis 1993) or at least for which they are prepared to renounce monetary goods to some extent. The use of scenic subsidies as a tool to conserve agricultural landscapes is growing in European countries and much of the upsurge in environmental concern has focused on intangibles such as scenic beauty (Daniel and Boster 1976; Schauman 1988). The European Union, including Finland, has committed itself to creating an environmental policy for agriculture adapted to general objectives in the Union (Council Regulations EC 2078/92). According to the new policy, the quality of the environment implicitly, including the visual appearance of the agricultural landscape has to be taken into account. Furthermore landscape is also seen unanimously as one attraction of travelling and as a factor affecting the economic value of rural property. A large proportion of tourist utility may depend on the landscape.

The study of Tahvanainen et al. (2000) of visual acceptability of agro-environmental protection scheme measures and some other possible future visions like non-productiveness of agriculture (afforestation, set aside, intensive recreational use or spreading out of an urban areas) indicate that attitudes are generally negative towards new land-use forms that change the traditional agricultural landscapes. Other studies of ours (e.g. Nousiainen et al. 1998) show similar results; the most important negative impacts on landscape are caused by afforestation, poorly maintained fields and construction of roads. However, throughout good land-use planning the negative impacts of land use changes can be minimised. In order to integrate landscape values into the normal planning process, efficient and inexpensive tools are needed. According to Hackett (1971), the objective of design activity in rural landscape is to bring together under landscape planning all separate elements of farming, afforestation and so forth, so that an orderly appearance may be given to the landscape.

In Finland afforestation, rather than having a positive impact, in many cases reduces landscape amenity values. However, evaluation depends on how unique people consider their environment to be. In cases where the existing landscape is considered to be good or excellent, the visual impact of afforestation and the changes in the benefits it offers may be large. If the value of the existing landscape is low, the changes caused by afforestation may not be remarkable. In our study, respondents who found the present landscape rather pleasant

were also ready to pay for it. Moreover, the results of CV-study have shown that the visual impact of afforestation is considerable and should be taken into account in defining national and regional afforestation policy as well as whole rural policy. In contrast to afforestation, the aggregate value of WTP for landscape management is notable when compared to present subsidies, a factor which has implications for agricultural policy-making (Tyrväinen et al. 1999). On the other hand, the visual quality of afforested fields seems clearly to be more desirable alternative compared to unmanaged fields set aside.

In the future, afforestation decisions of landowners are increasingly affected by the preferences of potential recreationists, particularly in areas where a growing part of the income is based on tourism. Because of varied income formation (forestry, agriculture, tourism, subsidies) landscape preferences of landowners also might be more flexible than the preferences of other groups. Because of the fact that afforestation can be a rather good alternative to secure subsistence for landowners, by for example government subsidies or better financial expectations in the long run, landscape preferences might also tend to move towards appropriateness. According to the results of Tilli and Toivonen (2000) and also the former results of Selby and Petäjistö (1994) economic considerations are dominating the field afforestation objections of farmers especially in the more productive southern parts of Finland, while emotional reasons play an important role in decision making in less productive areas. In North Karelian and Central Finland many Farmers have either already given up agriculture or plan to relinquish it in the foreseeable future. In areas such as these afforestation is often the most proficient way of making use of arable land.

Afforestation in practise is mainly concentrated on the remote field areas or areas that are not sufficiently suited to farming. Only 20% of active farmers thought there might be potential afforestation areas on their property. Yet, on active farms alone there are still 97 000 ha of potentially available fields for afforestation that need to be designed (Tilli and Toivonen 2000).

It is also important to notice that when asked people rank positive effects of field afforestation as more important than negative impacts. In the case study of ours (Nousiainen et al.1998) the visual structure of place of residence was a good predictor of amenity weights, i.e. inhabitants living in an open scene preferred distant-view scenes. This shows the importance of the familiar everyday landscape in the formation of preference. The relationship of urban and rural residents to the countryside and afforestation differed markedly. In the case of rural residents, changes in the landscape would affect their everyday living environment and means of livelihood. In contrast, urban dwellers often experience the countryside as visitors; they experience change in terms of visual changes in the landscape and they have a more distant relationship to the countryside.

The results of our study suggest that an environmentally informed agricultural policy is needed in the rural areas (cf. Selby and Petäjistö 1994). We found that many respondents preferred other forms of support for rural development such as extensive agriculture instead of afforestation. The results also imply that a larger proportion of present tax revenues allocated to agriculture should be directed to environmental matters (Tyrväinen et al. 1999). It is worth considering that landowners could be paid for the production of environmental benefits more in the future, since the production of environmental commodities may restrict the economic profitability of agriculture. The increasing demand for environmental benefits could also lead to support for a public policy protecting agricultural land rather than promoting afforestation. However, the land-use structure and natural conditions vary significantly within the members states in the EU and the agricultural policy should be flexible enough to reflect the regional conditions. Landscape management making use of tax revenues seems justified because landscape is considered important, and the products of landscape management are felt to be of use to most people.

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Spontaneous Afforestation of Fallows in Italy

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Abstract

Forest area in Italy has increased during the past 50 years, both through planned afforestation, accomplished mainly to relieve unemployment and as a soil conservation measure, and by secondary succession and invasion of trees on agricultural land abandoned following depopulation of rural areas. This second process is by far more important. The invasion of trees is a fast process in the northern part of the country and in some high altitude areas of the Apennines, but is slow in the south and at low altitudes, where shrubs invade fallow land and slow down trees establishment. New woods protect the soil and represent a potential source of timber; on the other hand rural areas suffer depopulation and land ownership is fragmented, so that economic impacts on wood market are negligible. Besides, scenic values of the landscape are altered and biodiversity is reduced.

Keywords: afforestation, secondary succession, Italy, depopulation

1. Introduction

The most relevant change in land use which has taken place in Italy during the last 50 years, from a quantitative point of view, is not the urbanization process, as is it usually assumed, but the increase of forest area in place of agricultural land. Forest area expansion is the result of planned afforestation carried out by man but, even more, by spontaneous afforestation of fallows.

Abandonment of agricultural cultivation and spontaneous afforestation started already during the 19th century, even on small areas, and were interrupted by a resumption of cultivation during wars or other critical periods. Archaeological remnants, ancient maps and forest soil profiles frequently testify a different distribution of forest cover and tilled land in the past. Statistical data cannot provide satisfactory information, whereas the analysis of some

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forest stands and soils can explain the origin of some woods (Guidi et al. 1994). Not only did secondary succession involve tilled land, meadows, and pastures, but also some land already occupied by tree stands with sparse cover: chestnut groves, cork oak stands, alpine meadows interspersed with larches.

This paper will discuss only the process, and its consequences, which have taken place in our recent past, that is the land abandonment which started approximately during the first half of the 19th century, increased during the second half and the 1920s and 1930s, and saw its most dramatic development during the 1950s and the 1960s. More specifically the paper is organized in five parts. In the first part quantitative data on forest area expansion are discussed, along with a presentation of the main results of the afforestation policy and of spontaneous afforestation of abandoned farmland. In the second part some typical case studies are illustrated. Consequences of forest extension on farmland and public perceptions of these issues are taken into consideration in the third and fourth parts. Finally management issues in spontaneously reforested areas and related forest policy issues are briefly discussed.

2. The dimension of forest area expansion

Italian forest land area is gradually and continuously increasing. According to the National Statistical Bureau (ISTAT), during the last 50 years forest area increased by 14.9% (i.e. from 5.4 to 6.8 mill. ha), and only during the last 10 years the increment was of 7.0% (Table 1).

This expansion is the overall result of a development of the Italian economy and of specific forest policies in areas that differ geographically, socially, and economically. For a better understanding of this development, it may be useful to keep in mind the extreme variability of Italian forestry (Colpi et al. 1999) due to the following factors:

Table 1. Forest area in Italy (1000 ha) between 1910 and 1997 (Source: ISTAT).

				Variation				
Year	High-forest	Coppice	Total	High-forest	Coppice	Total	1910 =100	Coppice Total
1910	1300	3264	4564	-	-	-	100.0	71.5%
1925	2000	3545	5545	53.8%	8.6%	21.5%	121.5	63.9%
1930	2002	3561	5563	0.1%	0.5%	0.3%	121.9	64.0%
1935	2148	3578	5726	7.3%	0.5%	2.9%	125.5	62.5%
1940	2295	3594	5889	6.8%	0.4%	2.8%	129.0	61.0%
1945	2338	3611	5949	1.9%	0.5%	1.0%	130.3	60.7%
1950	2186	3443	5629	-6.5%	-4.7%	-5.4%	123.3	61.2%
1955	2287	3474	5761	4.6%	0.9%	2.3%	126.2	60.3%
1960	2349	3477	5826	2.7%	0.1%	1.1%	127.7	59.7%
1965	2462	3627	6089	4.8%	4.3%	4.5%	133.4	59.6%
1970	2529	3633	6162	2.7%	0.2%	1.2%	135.0	59.0%
1975	2661	3645	6306	5.2%	0.3%	2.3%	138.2	57.8%
1980	2748	3615	6363	3.3%	-0.8%	0.9%	139.4	56.8%
1985	2897	3622	6519	5.4%	0.2%	2.5%	142.8	55.6%
1990	2925	3604	6529	1.0%	-0.5%	0.2%	143.1	55.2%
1997	2953	3884	6837	1.0%	7.8%	4.7%	149.8	56.8%

Note: the remarkable increase of forest land area in the 1910–25 period is due to the inclusion of new North-East regions in the Italian territory after World War I. The decrease of forest land area between 1945 and 1950 is due to reductions of the Italian territory after World War II.

- type of climates and woodland, varying from Alpine environments characterized by low temperatures and 3–5 months of snow cover, occupied by conifer woods similar to those of Central and Northern Europe, to Mediterranean vegetation with pines and maquis typical of hot, dry climates similar to those of Near East and North African countries;
- percentage of woodland coverage in the various regions, varying from the two extremes of Liguria (59.2% woodland) and Apulia (5.8%);
- intensity of forest management and productivity, considering that, although average annual removals are around 1 m^3/ha, the poplar plantations in the Po valley are (with n.a.i. over 20 m^3/ha/year) among the most productive fast growing plantations in Europe, even in monetary terms (Internal Rates of Return of 5–7%);
- different objectives of regional forest policies (see 2.1).

As in many other European countries, in Italy the overall woodland area has gradually increased as a result of two different causes: the afforestation programs and the natural expansion of forest vegetation on abandoned agricultural land, mainly in mountain and hilly areas. Given the lack of precise data, since ISTAT data are collected using criteria that have been modified slightly through time, these land use changes must be considered adopting a qualitative, rather than a quantitative approach.

2.1 Afforestation programs carried out in the last fifty years

In the post-war years afforestation programs targeted two social objectives: maintenance of employment opportunities in depressed mountain areas, and prevention of soil erosion (Pettenella 1993). The prevalence of the employment objective and the lack of involvement of private landowners had negative consequences on the organization of afforestation activities: little attention was paid to improve the afforestation techniques, in particular mechanization of planting operation (Lucci 1987) and tending (weeding, thinning, fire prevention etc.), with consequent degradation of the woodland due to the increased risks of forest fire, attacks by parasites and uncontrolled grazing.

In the 1970s afforestation policies were given a new stimulus with the promulgation of new financing mechanisms connected with the Special Development Policy for Southern Italy and the EC policy for rural areas (Romano 1986).

Act 125/1975 implemented the Special Program No. 24 in the so-called “Mezzogiorno” (Southern Italy and the islands) “to increase timber production, particularly by means of planting fast growing trees on land which is not suitably used”. In defining the program, it was planned to reforest 460,000 ha over the course of 25 years with an employment level of 32,000 workers per year. Only 98,000 ha have been actually planted. In many cases the afforestation work was heavily mechanized, with preference given to intensive site preparation treatment (brush clearing, complete downhill deep plowing and ripping). This high degree of mechanization rose several questions regarding the amount and forms of soil degradation (erosion, reduction of organic matter, upsetting microbiological activity, disruption of nutrient cycling, acidification, etc.) and their effects on water quality and long term productivity.

EC Regulation 269/79 dealt with financing of forestry investments (not only afforestation) in Mediterranean areas in Italy and France. Application of the Regulation allowed for 43,000 ha of afforestation. In the 1980s an average of 8,300 ha per year were afforested (3,500 ha with conifers, 2,100 ha with broadleaves and 2,700 ha with mixed species – ISTAT data). Assuming, optimistically, that all the interventions were successfully undertaken (i.e. with no damages from forest fires, grazing, etc.), it results that in the 1980 only half of the increase in forest land (see Table 1) occurred as a consequence of afforestation programs.

At the end of the 1980s, as a consequence of the Common Agricultural Policy reform, the financing of the set aside of agricultural areas supported, for the first time, the afforestation of fertile land in the Po valley and in other plain areas. Hybrid poplars and other high value broadleaves species were mainly used. With Regulation 2080/92 54,000 ha have been planted in five years (1994–98) and 99,000 ha have been officially admitted for plantation (INEA 1999). In the 1990s the annual increase of forest cover has been of 44,000 ha (as registered by the National Statistical Bureau); this means that the afforestation program financed by Reg. 2080/92 has been responsible of only one fourth of the increased forest land. In other terms, official statistics, even if they underestimate the natural afforestation process, show the minor role of afforestation investments as a cause of forest land increase.

2.2 Natural afforestation of marginal agricultural land

Italian forest land area has increased mainly as a result of secondary succession on fallows, that is as an indirect consequence of general economic development choices. It is useful to remember that 54% of the country is mountainous (above 700 m a.s.l. in the Alpine area, 600 m in the Apennines) and that since the first years after Italian unification (1861) it was clear that mountain territories represented a national problem of economic and social development (Gaspari 1992), as well as of geological stability and hydraulic regime. Nevertheless, between 1861 and 1890 approximately 2 mill. ha of forest land have been deforested (Sereni 1977). The large majority of the 18 million Italians who migrated abroad during the last 140 years (that is since the unification of the country) was formed by farmers of mountain territories. Besides, the so called “industrial boom” which took place during the 1950s in northern Italy in the area included between Genoa, Milan, and Turin, and later spread over large areas of the Po valley was based on a strong internal migration. The Common Agricultural Policy and the globalization of international agricultural markets contributed to the dichotomous development of the Italian economy, in which many marginal areas of the mountain territories have been more and more abandoned or extensively utilized, except where they have been favored by a tourist economy development or by the supply of some high-quality agricultural products (e.g. wine and fruits of labeled origin).

Therefore it is not surprising that the *CORINE Land Cover* survey for Italy, which is part of the EU project CORINE (*Coordination of Information on the Environment*), in 1996 estimated a forest area of 7.2 mill. ha (that is 0.4 mill. ha more than those declared by the Italian Statistical Bureau), and another 2.5 mill. ha of different types of shrubland, totaling 9.7 mill. ha (Table 2). CORINE is based on satellite images interpretation, whereas ISTAT updates periodically data collected on the ground. A precise comparison is not possible but CORINE inventory ascribes to forest land areas which ISTAT would not consider forest. More specifically the area classified as “evolving woody vegetation, both young forests on former non-forest land, and degraded stands” amounts to 1.6 mill. ha (Figure 1).

It is extremely hard to monitor these trends since the dynamics of forest cover is very active: every year new fallow land turns spontaneously to woodland, but also forest stands evolve toward pastures with scattered trees or other land cover types as a consequence of fires or excessive grazing. Sometimes young woodlots formed on tilled land are brought back again to agricultural land use, especially in hilly regions of northern and central Italy where vineyard cultivation has become very profitable in the last years. Recently, in the territory of Chianti (Tuscany), land tillage of abandoned land already wooded started again as a consequence of EU regulations offering financial support proportional to agricultural land actively farmed (Degli Antoni 1999). In tilling recently abandoned land farmers tend to use heavy machinery and no attention is paid to those traditional water management works

Table 2. Forest land in Italy (1000 ha) by different statistical sources.

	Nat.Stat.Bureau (1997)	CORINE Land Cover (1996)	Agricultural Census (1990)
Broadleaves	5203	4902	3728
Conifers	1439	1309	1105
Mixed forests	360	974	676
Total forests	7002	7285	5509
Shrubland	n.a.	2536	n.a.
Total forest land	n.a.	9821	n.a.

Figure 1. Transitional woodland/shrub area in Italy. (Source: CORINE Land Cover; data for Sicily not available).

(ditches, terraces, drainages etc.) previously built so that these infrastructures are damaged or destroyed and soil erosion is enhanced. This process takes place also in other regions.

The expansion of forest area contrasts an opposite trend: the reduction in the quantity of actively managed forests, as recorded by the Agricultural Census. The Census ignores land that is not exploited any more, but also land for which the owner or the manager are unknown (for example, fragmented plots not officially registered in the inheritance process). The forest area recorded in the Census shrinks year by year and nowadays is only 80.6 % of total forest area (Brun et al. 1998). This means that approximately 20% of forest area has no known owner (see Table 2).

As already mentioned, these afforestation processes do occur in most European countries (Mather 1992); the northern rim of the Mediterranean represents a border to it. Apparently

they reach the magnitude nowhere, both in absolute and relative values, they attain in Italy. On the southern rim of the Mediterranean, forest cover decreases as a consequence of fires and overgrazing and desertification prevails. In some Italian regions, nevertheless, contrasting dynamics coexist – that is expansion and reduction of the forest area – as in other southern European regions like parts of Spain and Crete (Di Pasquale and Mazzoleni 2000).

3. Case studies

Successional processes in abandoned farmland are very diversified and complex, and Italy represents an interesting field for research but also an ecological puzzle. Physical and historical factors are quite diversified and site specific (Colaone and Piussi 1975; Ghidotti and Piussi 2000; Guidi et al. 1990; Guidi and Piussi 1993a; Piussi 1992; Salbitano 1987). Some case studies may be useful to illustrate different aspects of the successional process of abandoned farmland: that one of mixed stands of Norway spruce (*Picea abies*), Swiss stone pine (*Pinus cembra*) and European larch (*Larix decidua*) have been analyzed in various parts of the Alps. These forests are located near the upper forest line, far below the potential forest line which has been lowered by the expansion of alpine pastures. Their dimensional and age structure, species composition and regeneration are extremely diverse on a local scale, apparently as a result of physical environmental factors as well as human action (Piussi 1994).

The timberline woods, only exceptionally utilized for local needs (fuelwood and building material for shepherds cabins), are predominantly young stands: the majority of trees originate from the second half of the past century but some individuals, which apparently survived during a period of high anthropic pressure, reach 4 or 5 centuries. The age structure reflects centuries of unabated exploitation, which culminated in the last century, and the spontaneous recolonization of derelict pastures and degraded woodlands.

The traditional practice of eradicating Swiss stone pine, which shaded the pastures, is reflected by the dominance of larch and spruce in bigger d.b.h. classes. Swiss stone pine now dominates the young generation and continues to colonize high altitude sites.

At lower altitudes in the Prealpine regions spontaneous afforestation started later, but favorable environmental conditions have caused a much faster change in the rural landscape. In this area land abandonment took place mainly starting in the late 1950s and the 1960s. Terraced fields and hay meadows no longer utilized were progressively invaded by various shrub and tree species; these frequently dominate the site. Ash (*Fraxinus excelsior*) and maple (*Acer pseudoplatanus*) are the dominant species on the most fertile sites, whereas hophornbeam (*Ostrya carpinifolia*) and manna ash (*Fraxinus ornus*) invade the poorest soils, usually on limestone parent material, in all Prealpine territories (Guidi et al. 1994; Fontana 1997; Aceto et al. 2000; Pelleri and Sulli 2000).

Besides these dominants species, several others take part in the secondary succession: some of these are exotic, like *Robinia pseudoacacia, Pinus nigra, Quercus borealis, Prunus serotina,* introduced in nearby land for reforestation purposes (Folliero 1985). *Robinia,* used for poles and fuelwood, is precious where chestnut (*Castanea sativa*) has been destroyed by pathogens.

Trees scattered through the meadows have been instrumental for dissemination: these were mainly ash, used as fodder tree, and shrubs like hazel (*Corylus avellana*) maintained for fuelwood, poles, fodder, shoots for the manufacturing of baskets, and to build hedges. Preferred sites, and usually the firsts to be occupied, were stone walls built to separate properties or to hold terraces, supposedly because of protection from mechanical damage and lack of competition (Guidi and Piussi 1993b).

Colonization took place gradually and lasted some years, sometimes decades. The chronological, spatial, and size structure is therefore irregular and nonuniform in different sites. After 40–50 years since the beginning of the colonization, new stands can reach 25–30 m of height (more frequently 10–20 m), and a basal area of 25–30 m² (Guidi et al. 1994).

The post-cultural succession developed also in abandoned chestnut groves, usually located on acidic soils developed on marl or sandstone parent material. The successional process has been described in several stands all over Italy, whenever farmers stop practicing traditional activities of maintenance of soil vegetation. Invasion by different coniferous (*Abies alba, Pinus sylvestris*) and deciduous species (oaks, alders, beech, ash, maple, black locust) has been facilitated by the decline of chestnuts attacked by *Cryphonectria parasitica, Phytophthora cambivora* and *P. cinnamomi* (Magini and Piussi 1966). The species density, as well as the areas invaded by woody vegetation, diminished at the higher elevations.

During the 1960s and 1970s, fires represented an obstacle to the development of succession; in fact, even if their number increased, as a consequence of the development of the road system, the higher mobility of people, and the intensive use of rural areas for recreation, the individual surface, as well as the total area, have strongly decreased. The ability of hardwood to resprout easily permitted a fast regrowth so the afforestation process did not stop. New woods were establishing themselves where old trees were totally absent.

Afforestation on the Northern Apennines is taking place at a slower pace. In the area of the Upper Sieve basin (Tuscany) (Torta 1999) the first species invading abandoned land are shrubs whose cover lasts some decades, whereas tree species establish a woodland cover only later. Climatic conditions typical of Mediterranean regions, especially the summer drought, seem to be responsible of this peculiar afforestation pattern, even if locally both soil conditions and human activities play a role. Presence of trees who can disseminate, wood edges, size of fallow land, wildlife activity are also important factors. Time necessary to establish a full forests cover is therefore much longer than that described for the Prealpine regions, and it seems also impossible to define a clear successional path. An analysis of landscape changes during the last 50 years in another area of the northern Apennines developed by Vos and Stortelder (1992) shows that “fine-grained arrangements of some functionally interdependent old agricultural landscapes is being gradually broken and replaced by a coarse pattern”. There is a striking and serious decrease in pattern diversity and in land unit types.

Whereas in the high Mediterranean mountains of central and southern Italy the afforestation process is somehow similar to that of the Alps (*Fagus sylvatica* invades Abruzzo pastures and in Calabria *Pinus nigra* occupies abandoned fields), at low altitudes spontaneous afforestation following fallow takes usually much longer periods of time. In Capri island (Campania region) abandoned farmland is invaded by shrubs: *Spartium junceum, Cistus incanus, Calicotome villosa, Euphorbia dendroides, Rosmarinus officinalis, Pistacia lentiscus* (Mazzoleni and Ricciardi 1990).

4. Consequences of farmland abandonment

The abandonment of the agricultural land, which leads to forest expansion, reflects a deep crisis of the mountain rural society. Farmers abandoning their land are usually the youngest and most active element of the population. As the average age of rural populations rises, natality declines, and economic activities in agriculture and forestry shrink. Not infrequently, the death of old farmers and the absenteeism of many landowners prevent a precise knowledge of property borders, engendering administrative and legal problems. Thus the

abandonment of the traditional land use patterns and the consequent spontaneous afforestation process have different socio-environmental and economic consequences. As it will be briefly considered in the following sections, these consequences are perceived in different ways and pose new problems to decision-makers involved in forest land use planning.

Economic problems have usually been the main agents of land abandonment even if local political and social circumstance have considerably affected depopulation trends, as can be noticed examining the population development of municipalities at the borders between Italy, Switzerland and Austria (Bätzing et al. 1996). One of the most significant component of the mountain economic development is the change of agricultural systems, with the collapse of traditional enterprises, such as farms, or communally administered systems for exploiting high altitude meadows or forests, coupled with the general trend of depopulation.

Depopulation is not simply a demographic process. Small hamlets get deserted, country roads, irrigation systems, and terraces are ruined, local knowledge of natural resources and their management is lost. Demographic and social changes trigger a process of landscape transformations: functional links between parts of the mountain territory situated at different altitudes, which developed for a better exploitation of local resources (e.g. land use structures connected to animal husbandry), vanish. Consequently, cultural values vanish too.

Table 3. Public perceptions of spontaneous afforestation process.

Stakeholder	Aspects taken into consideration	Consequent evaluation
Local (eldery) inhabitants	Landscape structure	Negative: loss of heritage values related to traditional land use pattern
Local (young, non farmers) inhabitants	Landscape structure	The “wild” environment may be perceived as a positive aspect
Local farmers	Farm productivity	Generally negative: loss of valuable Agricultural land but shrubland can become a fodder source
Tourists	Landscape quality (diversification)	Often negative, if forest coverage is too high and other land use forms are missed; non-wood forest products collectors may have, however, an opposite evaluation
Environmentalists	Species and ecosystems diversity and richness	Diverse evaluation: the loss of diversity may be compensated by an increased “naturality” of the environment
Local politicians	Employment and gross value production	Generally negative: conversion of agricultural land means labor extensivation and reduced land productivity
Forest workers and wood industry	Timber market	Positive: larger forest area® increased wood supply
People directly involved in fire fighting	Forest fire risk and related possible damages	Positive (if fires are a source of employment and public spending): unmanaged transitional forests are frequently interested by fire events
Urban citizens	Presence of untouched, natural environments	Positive: increased natural area represent a sort of compensation to the polluting, artificial urban environment

The invasion of trees on land formerly occupied by different types of herbaceous vegetation destroys some plant associations and consequently influences the local fauna. The afforestation becomes, therefore, a threat to biodiversity. Biodiversity existing prior to afforestation, concentrated on herbaceous species and fauna depending on it (but also on hedges and tree plantations and cultivation), is mainly the result of human activities. It is hard to evaluate its importance: we know very little about the influence of selection or the introduction of crop species adapted to specific environments.

A consequence of the abandonment of cultivation in mountain territories is the degradation of the traditional terrace systems which represent a common construction in the Italian rural landscape, from the coast to well above 2,000 m a.s.l. Their origin is usually unknown but presumably goes back some centuries or even millennia. Soil is present usually only on a thin layer, sometimes only 10–20 cm, whereas the main part of the terraces volume is formed by stones. Gravity, human and wildlife activities, water movements, tree roots pressure and the alterability of stony materials cause the collapse of these constructions. At the same time a woody vegetation cover may represent a protection from erosion and therefore reduce the degradation and collapse of terraces. The role of spontaneous afforestation on terraced land is quite complex. Once more no model can be suggested since also the dynamic of terraces is different from place to place, according to geology, climate and times of vegetation dynamics. The consequences of these processes on the activity of mountain watersheds are still unknown.

It has been observed (Torta 1999) that woody vegetation can colonize in few decades even badly eroded sites and therefore limit the erosion process and improve the situation of degraded watersheds. Solid transportation by streams is therefore reduced and sedimentation in rivers is stabilized. This change has been favorably seen by foresters and engineers involved in watershed management, soil protection, reforestation, and land reclamation. But new problems arise along the coasts: at the mouth of rivers the reduction of solid transportation has changed the balance between erosion caused by the sea and the build-up of soil transported from eroded mountain slopes (Pranzini 1994). The consequence is the erosion of beaches, active on most of the Italian coastline, and large scale disturbances on settlements, roads and other coastal structures.

5. Public perceptions of spontaneous afforestation process

Spontaneous afforestation of mountain areas is perceived in different ways depending on the observer's point of view, on where it takes place, on the extent and type of new woodlands, and on the time frame considered (see Table 3). Afforestation can be judged as a positive or negative phenomenon, but insufficient information regarding a process still under way ads uncertainty to the evaluation.

It has been frequently discussed how changes in agricultural landscape and the diffusion of a forest cover could have influenced the rural population. Nutini (1998) developed a thorough research between inhabitants of a small town of the Apennines in Tuscany where part of the population is still employed in agriculture and animal husbandry. Young people frequently have a positive impression of the scene deriving from the abandonment of land cultivation, the degradation of abandoned buildings and the build-up of new kind of "wild" vegetation. The new landscape represents a memory of harsh life conditions of the past and, at the same time, is an occasion for imagination and plays.

Adults who in the past were not employed in farming consider the interruption of cultivation as a negative event since it shows a lack of attention toward necessary

maintenance of the land. On the contrary, those still active in agriculture see the fallow as an economical choice of a farm. Stockbreeders use fallows as a grazing ground where shrubs and young trees provide forage.

Biodiversity has also a specific aesthetic value which becomes an important issue when considering the point of view of tourism, a fundamental element of the economy in many mountain regions. New woods in territories formerly devoid of forest cover enrich the landscape and may represent green areas appreciated for outdoor recreation. On the contrary, the forest cover replacing the landscape mosaic created by traditional rural activities can be uniform and tedious, in many cases restricting attractive panoramic views.

From a more general point of view the expansion of forest area over large territories can be welcomed in a world where destruction of forests is a widespread process. New resources are produced and carbon dioxide is fixed. Hardwood stands formed on agricultural land abandoned 30 or 40 years ago are already exploited for fuelwood. Wood production and utilization mean jobs and an income, however small, for locals.

6. Management issues in spontaneously reforested areas

"New forests" may appear where woods and forestry did not previously exist. The forest owners lack, therefore, forestry tradition and skills and have little knowledge of the most appropriate techniques (silviculture, economy, forest works and machinery) to manage these woods. Since most of the land is privately owned, and property is small and usually fragmented in different plots separated from each other, management of the new woods is not easy and some of the traditional technical solutions cannot be implemented.

But probably the most important aspect related for the implementations of some silvicultural activities is the forest owner's entrepreneurial motivation. Type of ownership in newly afforested land becomes a key problem for future management of this land. In Italy the majority of owners can be included in the following categories:

a) Owners living far away but still interested to their land: these people are no longer farmers any more, often they live in towns or, in any case, far from their property. Their interest for the land is not based on economic grounds. They want to maintain the property rights and a sort of cultural link with their land.
b) Absentee owners: as the previous category, these people, owners of small lots of land, live in town and get their earnings from activities different from agriculture. They have no interest in managing their forest land or in selling the inherited land (frequently the transaction costs of a sales are higher than the derived revenue). No managerial services are provided to them by contractors or associations and therefore land is totally abandoned.
c) Public owners (which in Italy usually are the municipalities): these were once interested in incomes provided by rights of hay mowing or grazing, substantial in relation to the total amount of their budget. Today public managers are more aware of extra economic requests of the local population, such as green areas for recreation and aesthetic values, but also job opportunities in environment maintenance activities.

It is quite obvious that both municipalities and small family farms, traditionally in charge of forest activities in mountain areas, will not have in the future the key role in the rural economy and in shaping the landscape which they had in the past. New management forms should be devised, based on contractors and external supporting agencies providing technical

advise, financial support, and marketing services, with special contractual arrangements with the owners. This external support is essential: elderly people still living in the village are rarely willing to organize the exploitation of the new woods with modern criteria. Moreover, there is no management tradition for highforests, and no interest in exploitation planned in the long term. Nevertheless, where hardwoods appeared on agricultural land, small forest enterprises have been sensible to the formation of this new wood resource, and young stands are therefore utilized as coppice. Fuelwood is economically less rewarding than hardwood timber, but represents a product based on relatively short rotations and with a rather good market. In fact, some small landowners establish new woods, on very small patches of land, to utilize them as coppice. When these woods have been coppiced for the first time it became clear that the stand structure was rather irregular and thin. After coppicing many seedlings appeared between the stumps, originated by a seedling bank and newly fallen seed. The next generation will be formed by a much higher number of trees, a selection will be possible and high forest silvicultural criteria will be implemented more easily and with better results.

Positive aspects of this development are the immediate financial benefits obtained by landowners, and the possibility for local firms to develop a forest activity without sophisticated machinery and complex logging operations skill. On the negative side there is the lack of a long term planning to produce wood of better quality.

New managerial solutions must take into account the situation of the forest owners but also the public perception of the afforestation problems by other stakeholders which are generally, as we have seen in section 5, more interested in problems concerning the management of the whole landscape than in wood production. All this represents an important challenge for foresters. It will be necessary to define spaces in which afforestation is acceptable or desirable, and others in which different types of vegetation would be preferable.

7. Conclusions

The crisis of rural societies, reflected in the spontaneous diffusion of woodlands, has its roots in economic and social events taking place mainly, or totally, outside the forest, or even the rural regions. These events are conditioning the current exploitation of all rural, but especially mountainous, regions. The new activities which develop are functionally linked to the urban society and its requirements: industry, production of hydroelectric energy, recreational activities, seasonal sports, transport lines (highways, railroads, power lines). Unless it becomes a tourist attraction, the old landscape shaped by an obsolete economy does not respond to the new needs, hence a different landscape develops in which a new system of settlements, roads, ski runs, and power lines alternate with young forests.

Economy and ecology must face this situation. A deep analysis of local afforestation conditions will show more clearly economic and environmental advantages and disadvantages, in connections with the site, the type of forest cover and the section of society involved. This analysis is badly needed: afforestation is still underway in new and extremely varied situations, and its negative impacts or benefits are changing with time. Its control is theoretically possible, so that a better knowledge of the process could suggest more appropriate technical measures. In Italy the spontaneous afforestation process has been initially ignored by the scientific and technical world, and only recently have its implications on territory and society been examined (Sulli 1996; Pettenella and Piussi 1999). For the future it seems therefore necessary to investigate the ecological and social consequences of new woods at a landscape level, including their inhabitants, and to define what use

contemporary society, both rural and urban, can make of the new forests. Even if some kinds of research shall necessarily concern a restricted area, it is advisable to keep a wider picture in mind, because of the heterogeneity of landscapes shaped by mountain agriculture.

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Afforestation in Eastern Europe

Afforestation Programmes in Hungary – A Story of Success

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Abstract

The ecological conditions of Hungary are favourable for the forests. After World War I the most valuable woodlands were annexed to the neighbouring countries reducing the former forest land from 7.3 million hectares to 1.1 million hectares due to the Trianon peace treaty. But later the extension of new afforestations amounted to 700 thousand hectares in the period 1920–1999, by which the rate of woodlands has raised from the former 12% to 19%. Among the tree species priority was given to the fast-growing ones, namely to the black locust, hybrid poplars and conifers. Due to the large extension of these species, and introduction of intensive sylvicultural methods, the growing stock of Hungarian forests has doubled, its annual yield and exploitable timber volume has grown threefold. Afforestation has also improved nature and advanced environmental protection and the multiple use of forests by their beauty and harmonic variety. Currently, a new afforestation programme is being compiled which aims to afforest 700 000 hectares by the year 2035 assuming EU financial support. In this way, the country may attain an optimal woodland cover of 25–26%.

Keywords: afforestation, forest cover, growing stock, ecological conditions, nature protection, environmental protection

Introduction

Systematic forest stand establishment and increase of woodland started in Hungary after the end of World War I. As a result of these endeavours the extension of forest-covered land increased from 1.1 million hectares in 1920 to 1.8 million hectares in 1999. The percentage of woodlands was raised from 12% to 19% during this period. In the years 1920–1945 about

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50 000 hectares, in 1946–1989 600 000 hectares and in 1990–1999 50 000 hectares were afforested. The growing stock rose from 150 million m^3 in 1950 to 320 million m^3 in 1999; the annual yield from 3 million m^3 to 11.5 million m^3. The atmospheric carbon fixed in the growing stock of the woodlands amounts to 90 million tons. The annual yield is building in yearly further 3 million tons reducing the rate of air pollution and diminishing the harmful glass-house effect. For the first half of 21st century, further 700 000 hectares of afforestations are envisaged between 2000 and 2035 supposing an EU grant. If it will be realised, the extension of woodlands in Hungary will amount to 2.5 million hectares meaning a forest rate of 26%, which can be regarded as optimal for the country.

As a result of the afforestation activities, the preservation of the ecological balance as well as its reconstruction and perpetuation will be better and the nature and environmental protection, the recreational potential for the benefit of the majority of society will be as well improved not only in quantitative, but in qualitative relation, too. The proportion of environment-friendly crop species will be increased and near-natural way of management can be introduced and these all will lead to a rapid rise of timber production improving the timber supply of national economy. The structure of agriculture and its production will better meet the EU requirements. This afforestation programme planned EU with 21st century serves well the foundation of a welfare-forestry similarly to the steps made in the 20th centruy. These results were based on farreaching forestry research activities. Decisive importance can be attached to a strategic research programme sponsored by the Hungarian Academy of Sciences under the title “Hungary at the turn of millennium”.

The results and their preconditions outlined above will be presented below.

Ecological background, woods and afforestations

Ecological conditions of Hungary (its extension is 93 000 sq. km) are good for both agricultural and forestry use. 19% (1.8 million hectares) of the whole territory is under forests. Most part of the country (nearly 70%) is lowland with 0–10 grade slopes. Proportion of lands with an altitude over 400 m.a.s.l. amounts to only 2%.

The climate is influenced by three climatic impacts: the Atlantic, Mediterranean and Continental ones. Basic precondition for a successful forest management is the water supply of forests, the success of replanting sand afforestations highly depend on the water sources and their utilizable water. The country mean of annual precipitation is about 550 mm, the mean temperature is between 9 and 10 °C. The air humidity is changing, depends on the precipitation amounts, altitude above sea level and aspect of the terrain. Based on the relative air humidity measured at 2 p.m. in July the whole country can be divided to four climatic zones as follows:

- lands of relative air humidity of over 60% can be ranged to beech forest climate, the extension of it is 9.3% of the total,
- lands of relative air humidity of 55–60% can be ranged to the hornbeam-oak forest climate, it is 38.5% of the total,
- lands of relative air humidity of 50–55% can be ranged to the mixed oak (Turkey oak and sessile oak) forest climate, it amounts to 27.3% of the total, while
- the rest can be ranged to the forest-steppe climate amounting to 24.9%.

80% of the forested lands are of free-drained sites meaning, that the vegetation can only rely on the precipitation water stored by the soil. 43% of the soils are of unfavourable, 26% of medium good and 31% of favourable water regime. More than half of the forests is situated on brown forest soil types, while the proportion of skeletal soil types is 22%. It is the

productive soils that are providing more than the half of the natural resources in Hungary. The species diversity of living world is rather high due to the nature-geographical conditions of the country and the late industrialization and urbanization in it, thus, the number of taxons of the living world is 15fold to the world mean. There are about 3000 plant and 42 000 animal species, the number of tree and shrub species is near to 200.

In the 20th century the impact of afforestation has been the most important factor in Hungarian forestry, and Hungary has achieved one of the highest increases in the proportion of forested land of any country in the world. Given the ecological conditions, mostly the native broadleaved tree species – beech, oaks, hornbeam – account for some 60% ot the forested land. The proportion of deciduous trees in the Hungarian forests amounts to 84.9% with only 15.1% under coniferous species. Non-native species are mostly on lowland sites. The species distribution is as follows:

oaks 22%
Turkey oak 11.3%
beech 6.3%
hornbeam 6%
black locust 20.1%
other hard broadleaved species 4%
hybrid poplars 6.8%
native poplars 2.8%
willows 1.4%
alder 2.9%
other soft broadleaved species 1.3%
Scots pine 9.1%
Austrian pine 4.2%
other conifers 1.8%

Forests and land use

The importance of forests in the land use of the country is increasing, it is shown by the data in Table 1.

As a result of the wars of the 20th century, the most valuable Hungarian forests were annexed to the neighbouring countries. This situation was even aggravated by a major reduction of the area of coniferous forests (from 24% to 4.1%). Consequently, only 10% of the domestic demand of coniferous timber could be met by domestic sources, 90% had to get imported from abroad.

In order to change this unfavourable situation, a new forestry policy was introduced, the main element of which was an afforestation programme. The “Lowland Afforestation Act” came into force in 1923 promoting wide-spread afforestations on sandy regions of the Hungarian Plain. In this programme the emphasis was laid not only on timber production, but also on the protective, recreational role of the forests.

The afforestation work started during the interwar period and have continued until the present times. The aim is to continue this work in the 21st century as well.

These efforts have helped the rational use of land, as well as the increase of and improvements in timber production. More recently, the multiple use aspects of forests

Table 1. Land use evolution in Hungary (in %).

	1938	1990	1994	1996
agricultural land	81.2	69.5	65.8	66.5
woodland	11.9	18.2	19.0	19.0
productive land	93.4	88.5	85.5	86.2
non-productive lands	6.6	11.5	14.5	13.8

(recreation and conservation aims) have been given increasing attention. Based on this process four periods can be discerned as follows:

1. 1920–1945. Launching of afforestation and tree planting on lowlands
2. 1946–1989. Golden age of afforestations
3. 1990–1999. Transitional period after the political changes
4. 2000–2035. New afforestation programme with EU support.

Planning and implementation of afforestation were in each period highly supported by the results of scientific research. High priority is being given to afforestation operations.

Period 1: 1920–1945

At the begin of this period, Hungary was among the countries in Europe that had the least woodland cover. Poverty dominated the defeated country after the First World War. In spite of this the first afforestation programme was established at this time, the main aim of which was the efficient utilization of tree-less sandy lands by forest management; besides the sand fixation and preventive control of wind and water erosion and not at last the improvement of human health. Beside this pronouncedly protective target of first afforestation steps some moderate improvement in timber supply and landscaping were also aimed. Foundation of new new jobs was also expected from the fulfilment of the programme. Unfortunately, these endeavours couldn't be fully implemented. In the 25-year period 50 000 hectares were afforested mostly on the Danube-Tisza Midregion Sands and in the eastern part of Great Plain, on lands of salt-affected soils. The heavy economic situation of the country hindered more progress on this field, however it was a high achievement in that time and those circumstances.

The effect of the wood shortage was the priority given to the planting of black locust, poplars and coniferous species. Landowners hoped that they could get short-term results on this way. The principal tree grown was and has been up to now the black locust, which has had excellent timber quality, modest site requirements and fast growth. Though this species is not a native one, it formed useful shelter-belts around the farmsteads and settlements which were heavily attacked by wind-storms. There were no possibilities of large extension for afforestations as the small-holders would not have sacrificed with pleasure their small estates for tree planting. Larger forested estates of 2000–3000 hectares were found mostly around the towns (Kecskemét, Szeged, Debrecen etc.) providing together with large state-owned lands possibilities for the introduction of modern large-scale forest management operations.

Period 2: 1945–1999

At the end of the Second World War Hungary had 9 million inhabitants and a woodland of 1.12 million hectares, meaning 12.1% of the total land of the country. The economic and political status of the country was decisively determined by the fact that Hungary was located in the „eastern block" where the state was the greatest landowner and 90% of the woodland became state-owned. Most of the agricultural land was also taken into state hold or forced into agricultural cooperatives. Thus, the private ownership of land effectively ceased. The market economy was replaced by a centralised planned economy, where the market rules were replaced with centralized regulative measures. In place of the former privately owned large estates large agricultural and forestry concerns were organized. Utilization and

production structure on them were formed in accordance with the centralised demands of the state.

The conversion programme for the abused forests, which had suffered from the war, was begun in the the late 1940s. Development programmes were launched which not only took the local conditions into consideration, but also the requirements demanded by co-operation with eastern countries, first of all with the interests of the Soviet Union.

Fortunately, most forestry experts had earlier worked on big forestry estates and they could apply their valuable experiences in large-scale forest management. They were not motivated by political conviction but by professional vocation This latter gave them the impetus to elaborate a development programme for the forestry. In this programme, high priority was given to afforestation, by which the economic burden of unavoidable timber imports could be relieved and timber supply improved. At that time, 90% of processed coniferous wood was imported from the Soviet Union. At the same time large areas of land were abandoned from agricultural use and food production. These lands could be utilised for forest stand establishment with potentially good results.

Following the forced organisation of agricultural cooperatives, considerable labour force was released into the regions, where there were few possibilities for getting a job, other than in agriculture or forestry (East-Hungary). Politicians were therefore motivated to employ financial means to help the solution of these problems: unemployment was an undesirable phenomenon for political reasons. Thus, the afforestation work offered good labour opportunities for the unemployed. State financing of afforestation reached sums never before provided for this purpose. By the end of this period, some 600 000 hectares had been afforested, and the forested area of the country was raised by 18.2%.

Thus, the lowland afforestation programme which was outlined in 1923 became a nation-wide tree planting and afforestation programme. The long-term target was that Hungary would have approximately 24–25 % of its land under forests by the end of the 20th century.

A milestone in this process was the government decree of No. 1940/1954 on the development of forestry, the impact of which was to affect the whole second half of the 20th century. The afforestation programme was central to all development endeavours. Its aim was determined as follows:

- to increase the home-produced wood; to expand the domestic supply of wood; to promote the planting of fast-growing tree species such as hybrid poplars, black locust and coniferous species;
- to increase nature and environment protectional benefits of forests, and to improve the multiple use of forests.

The basic prerequisite of this ambitious afforestation programme was the production of the necessary propagating stock (seeds and seedlings). In a short time we were successful in organising the supply of seedling stocks, both in terms of genetic quality and in quantity, necessary for the annual planting of 20–25 000 hectares. Some 1700 new nurseries on 3900 hectares were established with an annual output of 300 million seedlings. In addition, the seedling demands for replanting and conversion of abused forests were also met.

Due to the afforestation activities during this period, the woodland area increased from 1.1 million to 1.7 million hectares. Accordingly, the age class composition of forests also changed. The proportion of young forests (1–40 years) exceeded 60% of the total by 1989. The composition and areas of tree species in the Hungarian forests can be seen in Table 2.

The growing stock of the Hungarian forests doubled during this period, increasing from 150 million m^3 to 288 million m^3. Annual increment, exploitable timber volume and timber supply of the country from domestic sources also increased. The total volume of timber cut in 1950 amounted to 3.1 million m^3 and 8 million m^3 in 1989. These numbers demonstrate the

Table 2. Tree species by proportion and areas (% / 1000 hectare).

	1948	1980	1990
oak	26.5/283	23.1/339	23.0/356
Turkey oak	18.0/192	12.2/179	23.0/176
beech	9.5/901	6.8/99	6.5/103
hornbeam	9.6/102	7.0/103	6.1/95
black locust	18.7/199	18.3/268	18.8/291
poplars	3.2/34	10.7/157	9.5/15
other deciduous species	8.2/88	8.0/118	8.8/137
coniferous species	6.3/68	13.9/205	15.7/243

fact that this period was one of the most successful ones of the Hungarian forestry. The afforestation costs were completely financed from state budget. Besides timber production, other benefits of the large-scale afforestation activities began to materialise. The second period in the history of afforestations ended with the long expected political changes in the country in 1989–90.

Period 3: 1990–1999

The political changes following 1989–90 had a bearing on the field afforestations programme as well as the change in agricultural relations. The other reason was the change in the financing arrangement for afforestation. From the outset, only a certain part of the afforestation costs had been covered by the state budget, because the state did not have the financial means to cover all costs. The third reason was the intention of the country to enter into EU and costs of the fulfilment of membership.

Hungarian agriculture, which used to be among the most advanced of the eastern block countries, lost its former markets after the disintegration of the soviet block. Consequently, agricultural production decreased to 30% of its former level. In spite of this, the food over-production problems and crisis have remained, resulting in an increase in abandoned farmland and also problems with the cultivation of reprivatised farms. There is lack of means, professional skills and capital, which can be seen as the sight of large areas of uncultivated land. Supervision of the rational use of land is an unavoidable task as in the event of EU membership as food production will have to be reduced by 16–17% from present levels. Thus, some 1 million hectares of farmland have to be withdrawn from food production, and this land has to be utilised in another way.

Concerned specialists have been indicating these land use problems for two decades. Even at that time, 800 000 hectares of farmland was in excess of requirements and therefore land suitable for afforestation. Consequently, the government agreed to a new afforestation programme according to which the afforestation of 150 000 hectares between 1991 and 2000 was instigated. This solution was revised and re-confirmed after the political changes in 1991. But only 1/3 of the planned work was implemented because of the uncertain state of land ownership. In the 1990s, the extension of newly established forest stands was consequently little more than 50 000 hectares.

Beside these problems, it has to be stressed that there were other factors involved as well. An ecological view has appeared in the planning of afforestation activities, with environmental protection, landscape development and social aspects becoming increasingly important in the implementation of afforestation targets.

Period 4 (Planned): 2000–2035

Based on the results of an agro-ecological potential survey in Hungary, as well as other investigations, the greatest afforestation plan has been prepared on the basis of an assumption of the afforestation of 700 thousand hectares by 2035, i.e. 20 000 hectares/year, for which the necessary professional pre-conditions have beeen created, even though the financial means are so far lacking. In the 1950s, Hungarian forestry was able to carry out afforestation activities at c. 25 000 hectares/year using manual labour. Since that time, the mechanisation of afforestation and other pre-conditions have developed considerably to the extent that the rate of mechanisation on lowlands has increased to 100%.

According to the plans, 75% of the newly established forests will be for wood production, while 25% will be for environmental protection. In case of its implementation, the following socio-economical benefits can be expected:

- land use and the structure of agricultural use will become more favourable,
- possibilities for new jobs and new income sources will be created,
- timber supply of the national economy will be improved and timber imports reduced,
- the aesthetics of the rural landscapes will be increased together with possibilities for recreation and the development of tourism,
- the changes will be ecologically sound and encourage biodiversity.

The implementation of afforestation plans envisaged for the first half of the 21st century are being supervised by the Forestry Office of the Ministry for Agriculture and Rural development and its 10 regional directorates. Landowners have to make detailed afforestation plans in order to obtain financial support from the public funds. These plans have to be co-ordinated with the regional development plans.

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Afforestation of Agricultural Lands in Latvia

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Abstract

In Latvia, a number of statutory acts and regulations deal with the afforestation of agricultural lands: the new Forest Act, currently drafted, provides for cultivating forest on the land categories other than forest lands; a number of regulations cover such issues as transformation of farmlands into forest, an exemption from real estate tax for young stands and afforestation, subsidies for the afforestation of surplus farmlands.

In Latvia, the research on surplus farmland afforestation was started in 1994. Today pilot demonstration and experimental plots of the total area of more than 50 ha are established. The related research is focused on the following: selecting the most suitable species for different soils, optimal density of planting, optimal tending models for the stands established on farmlands, fertilization effect on the stand performance in lean soils, protecting the stands against competing vegetation and animal damage.

Birch, aspen, black alder, wild cherry, larch, spruce, pine are found to show the best survival and increment. Under the conditions existing in Latvia such species as ash, oak, beech, because of their susceptibility to late spring frosts, during the first ten to fifteen years after planting require the presence of some protecting species. In lean soils fertilisation has a beneficial effect on the tree crops established. A careful and regular management and protection of the stands established is a prerequisite for successful afforestation.

Keywords: agricultural lands, afforestation, experimental plots, tree species: pine, spruce, larch, birch, aspen, ash, black alder, oak, maple, lime, beech, wild cherry, spacing, fertilization, protection

Introduction

The total land area in Latvia is 6,495 mill ha, including 2,882 mill ha of forest land and 2,829 mill ha of farmland (Figure 1). Following the estimates of the possible developments in land

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Figure 1. Land-use categories in Latvia, 1998 (in %).

use in Latvia made by the Ministry of Environmental Protection and Regional Development (MEPRD), the amount of surplus farmlands could reach 500,000 ha or even more.

According to the data of the Latvian Institute of land Survey and Development (Starkis 1999), about 15.6% of farmlands are out of use at present. According to the expert opinion, the share of surplus farmlands is likely to increase, taking into account the expected accession of Latvia to the European Union (EU). Because of low fertility, relief features and moisture regime, there is no economic interest in cultivating these lands (Skromanis et al. 1994). The actual land use situation is a proof of it.

To improve the situation in the countryside, the Latvian authorities have taken a number of actions:

- The new Forest Act, currently drafted, provides for cultivating forest on the land categories other than forest.
- The programme for the development of rural areas in Latvia, worked out by MEPRD (approved by the Cabinet of Ministers on March 10, 1998), advocates afforestion of abandoned lands and surplus farmlands. The said programme envisages the afforestation of 6,000 ha of surplus farmlands per year.
- The Regulations of the Cabinet of Ministers Nr. 300 of Aug. 12, 1997 establish a procedure for transforming farmlands into forest. According to the above regulations, no transformation into forest is allowed, if the land value estimated is above 60 points; to exclude the disruption of hydrological regime, the same refers to the areas drained by closed drainage. Recently MEPRD worked out regulations providing for the protection of natural meadows, bogs, some special wilderness areas, etc., by excluding forest cultivation there.
- The regulations of the Cabinet of Ministers Nr. 22 of Jan. 26, 1999 provide for the exemption of real estate tax for the young stands and afforestations at the early age, established by seeding, planting or naturally: for conifers and hardwooded deciduous it is up to the age of 40 years, for soft wooded deciduous – 20 years and for grey alder – 10 years.
- During 1998 and 1999 the regulations are worked out for granting subsidies for the afforestation of farmlands, providing for an annual state- granted subsidy of 100 LVL (~140 USD) per ha. These subsidies come from the EU funds, intended as an aid to improve the national economy of Latvia. Within the SAPARD programme, a part of the EU financial aid will be used for the afforestation of farmlands. The regulations for administering these funds, currently drafted, will provide for covering not only the costs of forest establishment , but also a part of the costs for stand tending during 3 years after the forest is established.

- Latvia upholds the Regulations of Coucil of Europe Nr. 797/85, 1609/89, 2328/91, 2080/92 and has acceded to the international conventions "On Forest Protection in Europe"(Antalia, Turkey,1997; Lisbon, Portugal, 1998), providing for the preservation of forest resources, increasing forest value and afforestation of abandoned farmlands.
- During 1997, a PHARE project "Technical Assistance to Private Forestry", headed by Dr. Heikki Vessikalio (Finland), was worked out. Within the project 13 demonstration sites were established in order to show the farmers the methods of afforestation as well as carry out the related research work on a long-term basis.
- A new PHARE project "Institutional Support for the development of Private Forestry "headed by Mr. Leif Stromquist (Sweden) was launched in 1998. Within the project the afforestation of abandoned farmlands, exemplified as pilot afforestation in three communities in different parts of Latvia, appears as a component of land use and regional development.
- Proceeding from the research data on afforestation problems already available, the specialists of the Latvian Forestry Research Institute "Silava"(LFRI "Silava") have, by the end of 1999, worked out provisional regulations for the afforestation of abandoned farmlands, taking into account the optimum growth conditions for a number or tree species: substrate, nutrient availability, climatic region, end use (Daugaviete 1996,1997,1999).
- The scientists of LFRI "Silava" are currently concerned with the issues of breeding the deciduous species suitable for afforestation: birch, wild cherry, oak, ash, maple, beech, black alder, aspen, etc. In the related research work the focus is on selecting the clones and provenaces, most suitable to the local climatic conditions as to the resistance and wood quality, and used for obtaining the propagation material for afforestation (FRS 1999).
- Research projects at present carried out by LFRI "Silava" cover the following: models for the afforestation of abandoned farmlands, regularities governing the change of field biocenoses into those of forest, changes in soil agrochemical properties during the period the forest gets established on former farmland, etc.

In afforestation efforts undertaken in Latvia, one may distinguish between three sets of goals: (i) ecological – improvement of the environment, promoting biological diversity, excluding the spreading of weeds and overgrowing of abandoned farmlands by low value tree and shrub species; (ii) economical – rational land use, providing for high quality wood resources for the future; and (iii) social – creating alternative job opportunities in the countryside, developing tourism, game management and hunting, recreation, diversifying landscape.

In general, these goals agree with the internationally accepted goals, advanced for the afforestation of abandoned and surplus farmlands. Normally it is done to achieve the following objectives:

- providing for a prompt supply of wood, one of the world's most important renewable sources of organic matter by sort rotation plantation cultivation of forest crops, usually for energy and other uses (Ford-Robertson and Mitchell 1992; Kleinschmit 1998; Ranney et al. 1992);
- absorbtion of CO_2 gas (Fleming and Freedman 1998);
- rational land use compensating for the loss of forest cover;
- as a land use alternative in a situation of low demand for farm products (Hyttinen and Kallio 1991);
- solution of ecological problems (Harou 1994).

Ample experience in afforestation of surplus farmlands is already gained in a number of EU countries (Germany, France, Finland, Sweden, Italy, the United Kingdom, Denmark), the U.S.A. and Canada, the developing countries in Africa etc. (Von Althen 1980; Hyttinen and

Kallio 1991; Johanson 1996; Youce et al. 1998; Karlsson et al. 1997; Nowakowska and Borecki 1997; Volz and Weber 1991). Cultivation of some special purpose forest crops (poplar and some other fast-growing species) is quite common in U.S.A., Italy, Yugoslavia, France, Sweden, Scotland, etc. (Ford-Robertson and Mitchell 1992; Ranney et al. 1992). Plantation cultivation of forest crops as compared to traditional forest management, requires quite substantial investments and intensive management to achieve a faster return on investments (Otto 1996).

Of late, afforestation is done with a focus on landscaping and enhancing recreation values in the given locality. A number of countries have worked out national level programmes for intensifying the recreational role of forests (EU countries, U.S.A., Canada, etc.). Over the last two decades forest scientists all over the world have done intensive research in agroforestry (Auclair 1995; Brownlow et al. 1995; Herzog 1994; Kenney 1992; Long 1993; Williams and Gordon 1994).

An analysis of literature sources suggest that we in Latvia can draw from the experience of other countries only in the methodological approach, while specific recommendations, as the choice of tree species, tending practices, etc. are of no use for us due to the climatic, soil, pest and disease differences, to say nothing of cultural differences, traditions in forest management, etc.

Looking back to the history of Latvia, over the course of centuries the most fertile soils have gradually been put to farm uses. However, in many situations there has been no good reason for transforming forest into farmland, as these lands are not suited for cultivating farm crops.

In Latvia, the earliest afforestation date back to the 19th century. When forest management started to yield profit, an interest was aroused in forest cultivation. It was more convenient to establish forest stands on fields than on a cutover where site preparation was a laborious task. Parts of the farmland were invaded naturally by forest, especially during the period after World War I, when a lot of lands were abandoned for a long time. In the early 1960s, the Soviet kolkhozes and sovkhozes started afforesting low value farmlands (Gailis 1960).

The Latvian forest scientists of that period (Sarma 1947–1950; Sacenieks and Gaross 1960; Gailis et al. 1960) made an inventory and evaluation of the forest stands on former farmlands, especially those of pine and spruce: growth, standing volume, sanitary condition, etc. Providing the average stock volume increment is 4.0 m^3 /ha, the overall area of surplus lands 0.5–1 mill. ha, the total yield would amount to 2–4 m m^3 of wood, or, in monetary terms at the currently existing price level, 25–50 mill. USD.

In the opinion of Latvian specialists, the following land categories are to be excluded from afforestation:

- fertile farmlands, the value of which is estimated to be above 50 to 60 points and the area of the tract exceeding 50 ha;
- areas of great tourist attraction, important for the recreation and preservation of the nation's cultural ad historical heritage;
- agricultural lands on polders;
- areas which, as provided by the laws and regulations, must not be used for cultivating forest;
- natural meadows of high biological value;
- areas where afforestation entails adverse consequences for the neighbouring landowner (loss of land value).

Afforestation is admitted for the following land categories:

- agricultural lands on lean soils with low degree of cultivation:

- erosion affected and erosion-prone farmlands;
- areas where natural overgrowing by forest is under way (not counting those where afforestation is excluded);
- areas with low population density and low forest cover percent;
- wastelands not cultivated for a long time;
- degraded lands, as former military training grounds, landfill sites of industrial waste, etc.

In Latvia the most typical arguments against afforestation, especially among the farm specialists, are as follows:

- transformation of afforested lands to other uses becomes very expensive;
- because of tax relief for the afforested and young stands, the local governments lose a source of income;
- loss of traditional Latvian landscape;
- negative effect on the functioning of the existing drainage systems;
- the landscape becoming largely homogenous;
- depopulation of the countryside;
- loss of soil fertility (especially on the areas under spruce stands).

The afforestation of abandoned and surplus farmlands is making headway in Latvia due to a number of developments: as a result of the land reform 36.6% of farmlands and 42% of forest lands are privately owned; fairly successful policy of granting subsidies interest in afforestation of some private companies; quite considerable overgrowing by forest of abandoned farmlands already under way. For example, in 1998, the subsidies for afforestation were paid for a total area 177 ha, while for 1999 this area was 400 ha. This figure is believed to be much higher as in many cases the farmers have, due to complicated formalities, refrained from claiming the subsidy. Besides, the subsidy covers, on a per ha basis, only 1/3 of the actual costs of forest establishment, not counting the costs of managing and protecting the plantation.

The plywood manufacturing company “Latvijas Finieris” is now actively working on forest cultivation, especially birch, of former farmlands. With a policy of creating a stable raw materials base of birch veneer logs in mind, the company has organized a number of competitions for the afforestation of farmlands by birch, partly covering the costs of planting stock. As of January 1, 2000, the total area of birch plantations supervised by “Latvijas Finieris” is 400 ha. Starting with the year 2000 the company will also sponsor in part the research work on birch provenances, its cultivation and analysis of factors affecting the mechanical strength of birch wood.

In Latvia, so far no comprehensive research has been carried out on the afforestation of farmlands, including the regularities for changing the field ecosystems into forest.

Material and methods

In 1994, the State Forest Service (SFS) of the Latvian Ministry of Agriculture commissioned a research programme in afforestation to be carried out along the following lines: creating a basis for the production of seed and top quality planting stock of deciduous, models for afforestation of surplus lands, and the tending of the stands established (Daugaviete 1996, 1998, 1999).

The paper focuses on models for afforestation of surplus farmlands. During the period of 1994–1999, pilot demonstration sites of the total area more than 50 ha have been established.

The related research is focused on the following:

- the most suitable tree species for different soil types
- optimum planting density
- optimum management practices for the afforestation
- fertilization effect on the plantation performance in lean soils
- protecting the plantations established (animal damage, suppressing competing vegetation)
- changing of field ecosystems into a forest
- changes in soil agrochemical properties of farmlands after forest establishment.

The pilot sites are distributed all over the country, covering the principal agroclimatic regions and partly also the soil types: podzolic, sod calcareous, alluvial soils, i.e. in the Coastal agroclimatics region: sod-calcareous leached, typical podzols, sod-podzolic, alluvial sod-gley, typical sod- calcareous soils; in the Kurzeme (western) agroclimatic region: typical sod-calcareous; sod-calcareous gley soils; in the Latgale (south-eastern) agroclimatic region: brown base unsaturated, sod-calcareous gley, alluvial sod-gley, sod-podzolic soils; in the Vidzeme (north-eastern) agroclimatic region: sod-calcareous leached, sod-podzolic soils (Karklins 1995; Skromanis et al. 1994).

In these pilot plots the following tree species are tested: pinus – *Pinus sylvestris L.*, spruce – *Picea abies (L.) Karst*., birch – *Betula pendula Roth*, aspen – *Populus tremula L.*, ash – *Fraxinus excelsior L.*, oak – *Quercus robur L.*, red oak – *Quercus rubra L.*, wild cherry – *Prunus avium L.*, beech – *Fagus sylvatica L.*, black alder – *Alnus glutinosa (L.) Gaertn.* and larch – *Larix decidua Mill*.

Within a PHARE project for a support to private forestry, the pilot plots were laid in 1997 following a unified method (Daugaviete 1999).

To identify criteria for the choice of species depending on the soil type, each pilot site comprises a plantation of deciduous (birch, ash, oak, red oak, aspen, black alder, beech, wild cherry, maple, lime) and conifers (pine, spruce, larch) of area 0.25 ha for each. The planting pattern for deciduous and spruce was 1.5 x 2 m (3,300 stems/ha), for birch, maple, oak, ash and larch in some sites also 2 x 2 (2,500 stems/ ha); 2 x 3 m (1,666 stems/ha) and for pine 1.0 x 2 m (5,000 stems/ ha).

Depending on the agroclimatic region and soil conditions, these pilot sites are used to carry out research on the following: tree survival, increment in height, diameter increment at breast height, development of the root system, changes in soil agrochemical properties, changes in ground cover vegetation, age of canopy closure, etc. Results of the data analysis, related to the typical parameters describing the soil types and the agroclimatic region, will serve as the basis for identifying the criteria for selecting the tree species. The objective of the tests with different planting densities is to investigate their effect on the growth and performance of individual trees, branching habits, stem quality, canopy closure, stock volume, etc.

To find out an optimum density for deciduous, 5 different planting patterns are chosen: 10, 000 stems/ha (1 x 1 m); 5,000 stems/ ha (1 x 2 m); 2,500 stems/ha (2 x 2 m); 1,666 stems/ha (2 x 3 m); 1,111 stems/ha (3 x 3 m). To find out the most optimum management practices for afforestation, on each pilot site there are 5 plots for each species represented on the site, the plot size in 10 x 10 m, the planting pattern 2 x 2 m, the number of plants in each plot – 25. Altogether 215 plots comprising 5,375 planting spots are arranged, 1,075 for each variant of tending. The variants are as follows: mowing grass around each stem, hoeing up the weeds, treating by herbicides, mulching (by black plastic/sawdust), control (no tending applied). Management efficiency is evaluated proceeding from the data of survival and increment.

To investigate fertilization efficiency in lean soils, the tests are staged in five pilot sites. To provide for an optimum nutrient supply, fertilization doses are estimated following the deficiency of N, P and K. According to the data of Latvian researchers, the following amount

of nutrient substances (per mg in 100 g of soil) is considered optimal for conifers and deciduous: 5 mg/100 g of soil of NH_4; 8 mg/100 g of P_2O_5; 11 mg/100 g of K_2O.

Tests are also laid to find out the best ways of protecting the plantations against animal damage. Two methods are under test: repellents ("Alcetals" made by LFRI "Silava" and "Fitorodents"made by A/S Biolat), application of plastic tubing, control (no protection). On each pilot site the protection method is represented by smaller plots of the size 10 x 10 m, each plot comprising 25 stems with three plots for each tree species. The total number of stems under test (including all sites) is 1,225.

The number of trial sites for afforestation has by now increased, 5 new sites are already established or are in the process of establishment. Moreover, landowners, effecting afforestation, have agreed that their plantations are used for monitoring the performance of afforestation, their sanitary condition and the efficiency of protection measures taken. This will significantly widen the base of observations and strengthen the credibility of conclusions made.

Results and discussion

In the choice of tree species for each demonstration site, we were guided by experience. Birch, aspen, maple, ash, spruce, larch were chosen for the following originally dry mineral soils: areas with podzolic, podzols, brown soils, gleyish soils on loam, loamy sand and clay bedrock.

Oak, ash, maple, lime, beech, wild cherry were chosen for sod-calcareous, typical brown, podzolic-gleyish, podzolic soils on loam, loamy sand and clay bedrock (Cogliastro, Gognon, Bouchard 1997). Black alder was chosen for alluvial soils, pine- for lean, strongly podzolic soils on sand bedrock or for hydromorphic-bog soils (Kocjan 1997). For the purpose of experimenting, seemingly inappropriate species were planted in different soils.

The performance of birch *Betula pendula Roth* is followed up on 11 trial sites, representing 5 different soil types. The results show the performance of birch during the first years after planting to be significantly different for one and the same type of soil. From the averaged data over a three year period, the increment in height for birch in different soil types is, in a descending sequence, as follows: 45.2±19.3 cm/yr in brown soils; 40.0±16.1 cm/yr in alluvial soils; 32.6±13.2 cm/yr in sod-calcareous soils; 32.5 cm/yr in sod-podzolic soils; 25.5 cm /yr in typical podzols (Figure 2).

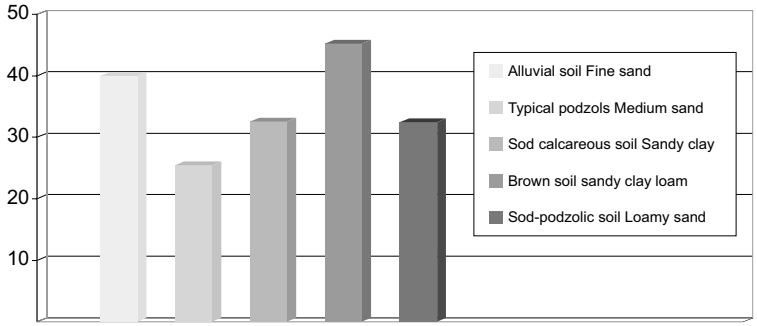

Figure 2. The increment in height for birch (*Betula pendula* Roth.) in different soil types in 3-year-old plantations, 1999.

The growth in height and survival of trees planted in farmlands primarily depends on a number of factors other than soil types:

- the quality of planting stock
- the method of site preparation and its quality
- soil hydrological properties
- soil agrochemical properties
- the time of planting
- tending applied.

The existing plantations of birch established on farmlands show this species to be frost-resistant and suitable for planting in open spaces. For birch, so far, no serious pest and disease damage is observed. Besides, on the geographical line of latitude on which Latvia lies birch reaches the dimensions required for veneer logs by the age of 30 years.

The field data of trial plantations for such relatively fast growing species as aspen, black alder, spruce, pine, and especially their annual increment in height, show, that it takes for them three years to become established before they start growing very fast. The highest increments in height are observed for black alder and aspen (Figure 3).

The field data of trial plantations for such hard-wooded deciduous as oak, ash, red oak, beech on farmlands, especially in open areas, show that the cultivation is difficult due to their susceptibility to late spring frosts under the climatic conditions of Latvia, likely to occur as late as the first two ten-day periods in June.

The field data for the trial plantations of hard-wooded deciduous over a three -year period show their annual increment in height to be comparatively slow (3–8 cm/yr). The highest increment in height is for oak in sod-calcareous soils. Right now trial plantations are laid out for cultivating hard-wooded deciduous in a mix with such frost -resistant trees as birch, lime, black alder, grey alder, spruce, aspen. Trials are also established by using large-dimension planting stock (1.5–2 m in height).

To develop scientifically valid models for cultivating forest crops on farmlands, the field data for all the trial plantations cover the following: changes in ground cover vegetation and soil chemical properties, diameter increment, stem quality, tree crown form, canopy closure, debranching, sanitary condition. A method is also proposed to a follow-up these indices over a period of ten years.

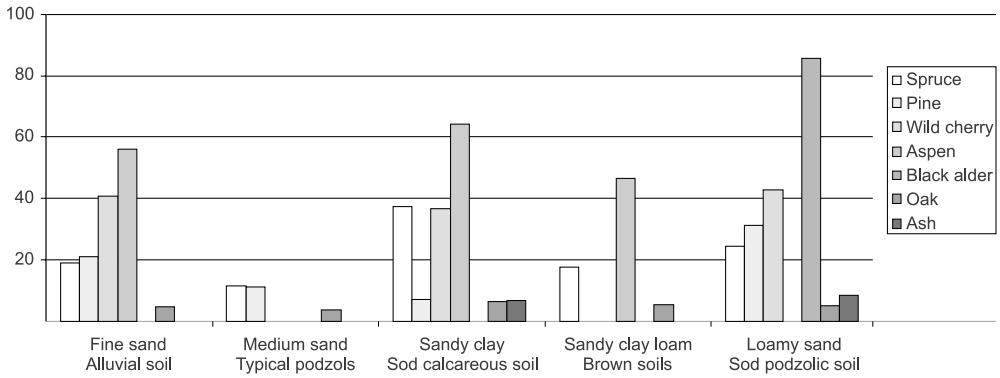

Figure 3. The increment in height for spruce, pine, aspen, b. alder, w. cherry, oak and ash in different soil types in 3-year-old plantations, 1999.

To achieve success in afforestation, great attention is paid to the management of plantations established. A number of experiments are staged to find out the optimum management methods. Field data for different methods of plantation management (herbicide application, mechanical treatment, mulching), indicates that the elimination of the root mass of herbaceous next to the tree stems has a positive effect on the survival of trees after planting and their further development (Table 1, Figure 4).

The field data obtained from trial plantations prove that without tending no good quality forest stands are possible on farmlands (Daugaviete et al. 1999). Additional fertilization of forest plantations established on lean soils is a management action of no less importance. Experiments are staged to test the efficiency of fertilization in such soils.

The data analysis shows the fertilization to improve the performance of all the tree species tested, and in particular that of birch and pine in poor typical podzol soils. In different variants of fertilizer application, the growth of pine in height in the third year after planting has increased on the average by 42%, for spruce and birch by 18 and 41%, respectively, for all the soil types (Table 2).

The protection of forest plantations against animal damage (rodents, cervidae) is also of importance. The experience gained shows that forest crops established on farmlands are to a significant extent damaged by mice, gnawing the bark at the root collar of young trees.

Table 1. Management effect on the young stands established on farmlands, stem increment in, % (averaged for all the pilot sites)

Tree species	Tending applied				
	hoeing	mowing	herbicide application	mulching	control
1. Birch (*Betula pendula*)	108	100	156	132	100
2. Oak (*Quercus rubra*)105	108	134	125	100	
3. Ash (*Populus tremula*)	100	100	115	120	100
4. Wild cherry (*Prunus avium*)	107	117	180	178	100
5. Pine (*Pinus sylvestris*)114	125	130	144	100	
6. Spruce (*Picea abies*)100	100	171	133	100	

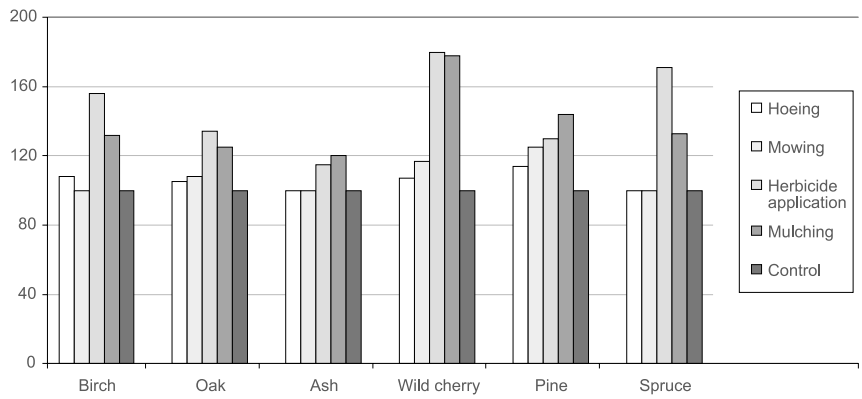

Figure 4. Management effect on the young stands established on farmlands, stem increment in % (averaged by year 1997–1999).

Table 2. Fertilization tests on the young stands established on farmlands, stem increment, in % (1997–1999).

Soils types	Increment in height, in % fertilizer applied	control
Spruce-*Picea abies*		
Typical podzols	123	100
Sod-podzolic	117	100
Pine-*Pinus sylvestris*		
Typical podzols	150	100
Sod-podzolic soil	132	100
Birch-*Betula pendula*		
Typical podzols	128	100
Sod podzolic soil	122	100

Tests on protecting the plantations prove plastic tubing to be adequate for protecting trees, and deciduous in particular, against animal damage. It appears that the plastic tubing not only protects the tree, but also acts favourably on the growth of deciduous species. In such cases, the increment in height has increased by 30%. So the data of growing season of 1998 show the average increment for tubing-enclosed wild cherry to be 52.7±12.3 cm against the background of average increment for the same species 32.7±10.2 cm. It was very much the same for birch.

The use of repellents (Fitorodents and Alcetals) shows good results for the first three years. The browsing damage on young deciduous seedlings reached 50–70 % of all the trees on the control plots (without protection), but in the protected plots only 1–2 %.

Conclusions

The afforestation of abandoned and surplus farmlands is high on the agenda in different land use and rural development programmes for Latvia. It is envisaged that over the present decade about 6,000 ha/yr of farmlands will be afforested. It may be said that the legal basis for streamlining this process is already created and the motivation of different categories of land owners is increasing. The experiments show that in afforestation the selection of tree species should be based on the analysis of the available growing conditions, enabling the choice of species that would show the highest annual increment under the given conditions.

In the case of the afforestation of agricultural lands, the best survival and increment during the first years after planting is shown by the birch, aspen, black alder, wild cherry, larch, spruce, pine. Application of mineral fertilizers is advisable to improve the performance of tree crops in lean soils. All tree species react positively to fertilizers. The related tests for pine show the fertilized trees to out-perform in height growth the control by 22–57%. The results for spruce and birch are 4–17% and 18–46%, respectively. Careful management and protection is vital for successful establishment of tree crops on farmlands. The average increment in height for birch, oak, ash and spruce on herbicide-treated spots is found to exceed the control by 38%; while in the variant with mulching this figure is 28%.

Proceeding from the field data obtained from trial plantations, and by analyzing the methods of forest establishment/ management on farmlands, the performance of the plantations established in private holdings and the protection measures applied, provisional

regulations for forest establishment on farmlands are developed. In order to ensure successful establishment of forest plantations on abandoned farmlands with end-use targets in mind, the specialists of LFRI "Silava" now focus their efforts on developing science-backed models for afforestation, and selecting high-value and resistant clones and provenances from the indigenous stock of deciduous.

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Afforestation Potential in Russia

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Abstract

Nearly forty definitions of afforestation were found (Lund 1999) which are indicative of the fact that terms, concepts, discussions and estimates vary. According to the Forestry Standards of the Russian Federation, afforestation is interpreted as "the establishment of man-made forests on non-forest lands". This does not only mean planting trees for commercial purposes. According to the Forest Code, the main objective of afforestation is to establish protective forests on non-forest land. Another goal is to decrease the proportion of non-productive land.

The very notion of afforestation is much closer to Agriculture than to Forestry and this is reflected via general terminology. The main components of afforestation include conservation afforestation, afforestation of arable lands, afforestation of pastures and steppe afforestation. Up to now, agricultural afforestation (or reclamative afforestation) has covered an area of 3.2 mill. ha.

The very idea of planting trees in order to protect arable lands, roads and rivers was first introduced in the 18th century. Two main reasons for this were:

- unfavourable natural and climatic conditions for agriculture (43% of arable land lies in the arid and semi-arid zones, 27% in humid and semi-humid zones, and almost 14% is spread over the desert); and
- the need to compensate for the loss of natural forests that began to occur due to agricultural expansion.

The establishment of a network of wide forest stripes along watersheds had already started by the end of the 19th century. Afforestation of arable lands and conservation afforestation began to develop, laying the foundation for the Complex Agricultural Afforestation Theory subsequently introduced on collective farms of the Soviet period. Adopted in 1948, the famous regulation, "On Afforestation of Arable Lands…", started a new era in agricultural afforestation. Strongly associated with Stalin's governance in the post-war period (1945–1953), this regulation is much better known as "Stalin's Plan of Nature Transformation ".

Over the whole history of agricultural afforestation (arable land only), 5.2 mill. ha of forests have been planted. Because of natural mortality and poor maintenance, only 3.2 mill.

Norbert Weber (ed.)
NEWFOR – New Forests for Europe: Afforestation at the Turn of the Century
EFI Proceedings No. 35, 2000

ha have survived. It has been estimated that 14 mill. ha. must still be planted to ensure that favourable conditions will be maintained on existing arable lands. These goals have proven difficult to meet since Russia is still undergoing radical political and economic changes with numerous reforms. Due to unreliable financial and legislative support, and because of untimely land allotments set aside for tree-planting, the pace of agricultural afforestation has slackened.

Keywords: afforestation (agricultural), protective forest stripes, arable lands, Russia

Terminology

Nearly forty definitions of afforestation were found (Lund 1999) which are indicative of the fact that terms, concepts, discussions and estimates vary. According to the Forestry Standards of the Russian Federation, afforestation is interpreted as "the establishment of man-made forests on non-forest lands". This does not only mean planting trees for commercial purposes. According to the Forest Code, the main objective of afforestation is to establish protective forests on non-forest lands. Another goal is to decrease the proportion of non-productive land.

The very notion of afforestation is much closer to Agriculture than to Forestry and this is reflected via general terminology. The main components of agricultural afforestation include:

- conservation afforestation (meant for soil protection, against erosion and ravine formation),
- afforestation of arable lands or agroforestry amelioration (meant for improving and better functioning of arable lands, irrigated lands and meadows),
- steppe afforestation and
- afforestation of pastures.

Historical background

Afforestation in Russia is more than 150 years old. Throughout its history, a "Theory of Agricultural Afforestation" has been developed and introduced into practice thus developing most of the agricultural landscapes of Russia and former USSR countries.

The very idea of planting trees in order to protect arable lands, roads and rivers was first introduced in the 18th century. Two main reasons for this were:

- unfavourable natural and climatic conditions for agriculture (43% of arable land lies in arid and semi-arid zones, 27% in humid and semi-humid zones, and almost 14% is spread over the desert);
- the need to compensate for the loss of natural forests that began to occur due to agricultural expansion.

Agro-ecological concerns began to develop and one of the leading scientists of the 19th century, Vasily Dokuchaev, has become most famous for his achievements in the field of agricultural zonation, transforming nature on the steppes, and improving both snow retention and water regulation.

The establishment of a network of wide forest stripes along watersheds had started by the end of the 19th century. After the 1861 Land Reform a considerable deforestation occurred, so

afforestation of arable lands and conservation afforestation were widely introduced, laying the foundation for the Complex Agricultural Afforestation Theory subsequently introduced on collective farms during the Soviet period.

After the revolution (1917) a specific institution was founded to perform agricultural afforestation on the state scale. A wide network of afforestation divisions was developed, prioritizing afforestation of arable lands. The drought of 1931 made the policy even more pronounced and it was planned to create 3 mill. ha of forests in the southern, south-eastern and middle Volga regions of Russia.

The period 1948–1953 proved to be most intensive in terms of agricultural afforestation and protective forestry. Adopted in 1948, the famous regulation, "On Afforestation of Arable Lands…", started a new era in agricultural afforestation. Strongly associated with Stalin's governance in the post-war period (1945–1953), this regulation is better known as "Stalin's Plan of Nature Transformation ".

Stalin's plan of nature transformation

The plan was designed to stimulate Russian agriculture and to increase its development. The plan incorporated a wide, balanced and systematic introduction of a whole complex of actions in agricultural afforestation, hydrotechnology and agrotechnology. Afforestation of arable lands was the key component, and ravine afforestation and water bodies afforestation were also seriously enforced.

The plan stipulated the creation of 8 large-scale State Forest Stripes (112 000 ha) and also a network of narrow stripes of arid land protective forests (Mattis 1998). For the purpose of better performance, the Department of Arable Lands Afforestation was established. The planting itself was performed by the collective (agricultural) farms with the assistance of forest management units and with state support. Huge forest nurseries had numerous divisions for providing seedlings, and in a period of 5 years (1949–1953), more then 2 mill. ha of protective forests were created (Pisarenko 1998). However, the pace of change was so enthusiastic that it ultimately resulted in high quantities with rather low quality. When combined with reductions in seed productions and infringements of agrotechnical regulations this led to low survival rates. According to a 1975 inventory, the area of protective forests planted between 1949–1953 which was remaining was only 22% (289 thousand ha) of that planted (Pavlovskii 1995). Many of the oak plantings died during the first decade, and quite a large area was re-ploughed after 1953.

Trying to analyze the results of the Plan and being based on the 50 year of experience it can be stated that the Plan played a very positive role in the development of Russian agriculture. Dokuchaev's idea of applying a complex of measures in order to overcome the unfavourable conditions of the natural environment was successfully realized and confirmed in practice. This complex of measures became a prototype of the so-called adaptive farming practiced worldwide. While adaptive agriculture is based on the use of nature's own capacities to raise soil fertility, transformative agriculture relies on intensive ploughing up, wide irrigation, heavy mechanization and application of chemicals. Agricultural afforestation has become a strong factor in the establishment of a self-regulating ecosystem, playing a long-term stabilizing role. A 25–30% increase in crop yields was proved as well (Table 1).

The ecological role of agricultural afforestation was also proved and expressed in:

- accumulation of industrial pollution (radionuclids included);
- decrease of CO_2 concentration;

Table 1. Mean crop increase due to arid lands afforestation (by climatic zones).

Crops and Cereals	Forest steppe		Steppe		Semidesert	
	Centner / ha	%	Centner / ha	%	Centner / ha	%
Cereals in total	3.7	19	3.8	20	3.1	23
Winter wheat	3.1	14	4.0	16	3.0	23
Winter rye			3.4	20		
Industrial crops						
Sunflower	4.0	24	2.9	20		
Sugar-beet	61.0	21	59.0	22		
Forage crops						
Corn (silage)	54.0	27	44.0	30	29.0	28
Perennials for hay	12.6	44	8.9	25	4.6	29
Potatoes	38.0	30				

*Note: 1 ton (1000 kilograms) is 10 centners
(Source: Spravochnik Agrolesomelioratora, 1984)

- flora-fauna enrichment;
- stream and river flow purified of mineral and organic impurities;
- water bodies protection against pollution;
- providing the population of forestless regions with fuel, construction materials, fodder, medicinal resources and other resources.

A gradual decline in agricultural afforestation occurred after Stalin's death in 1953 and continued until 1966. Annual plantings decreased from 250 thousand ha per year to 71.6 thousand ha per year. From 1967 to 1990, attention was given mostly to the protection of soil and water bodies via the planting of 2.6 mill. ha of forests.

Advantages of afforestation

Agroforestry landscapes increase the percentage of forest land. Forests improve ecological regulatory systems of energy, water and atmospheric gases by stimulation the key functions of an ecosystem to greater activity. This leads to:

- better regulation of hydro-thermal regimes;
- reduction of surface water run-off;
- elimination of soil erosion and deflation;
- elimination of the damaging influence of droughts and hot dry winds;
- optimization of soil formation (Table 2).

In general, the afforested landscapes have less dusty air, rivers and waterbodies are full-flowing and flora and fauna are much more diverse. Afforested and stabilized gullies become water regulative instead of drying up and draining. Eroded banks and grounds turn into productive forest grasslands. Making the areas more comfortable for living and working, afforestation of sands and arid pastures prevents erosion, increases productivity, provides forest products and fodder crops, and ensures diversity of flora and fauna. According to the VNIALMI data, agriculture practiced at the area of 3–5 hectares of afforested sands (Low

Table 2. Ecological Effectiveness of Steppe Afforestation (long term average).

Index	Open Area	Agroforestry Landscape
Snowcovering, cm	12–27	2 –46
Water Stored in Snow, mm	70–80	110–120
Water Absorption, mm	58–63	100–108
Surface Runoff, mm	19–20	6–7
Soil Wash-off, m^3/ha	3.0–4.0	0.5–0.7
Evaporation/per vegetation period, mm	750–760	625–640
Air Humidity (13:00 in July), %	25–28	30–34
Air Humidity, but in droughty years	14–15	20–22
Total Number of Fauna Species	35–60	83–149
Zoomass/ per 100 ha of an area, kg	180–186	356–880

(Source: VNIALMI data)

Volga river lands) yields the same amount of plant production as would be obtained from one ha of irrigated high quality land.

The current state of the agrosphere, and the numerous convincing proofs of the diverse and beneficial influences of the protective forests, suggest that they should not be regarded simply as a means of protecting soil and arable land. Forests are also an important factor in reducing destructive processes and restoring the regulative potential of agricultural ecosystems.

Afforestation today

Throughout the whole history of agricultural afforestation or reclamative afforestation (arable lands only), 5.2 mill. ha of forests have been planted. Because of natural mortality and poor maintenance, only 3.2 mill. ha have survived. Unfortunately, the completed agroforestry landscapes are like separate oases. The total area of afforested agricultural land is not more than 14%. 222 mill. ha of agricultural lands Russia, 656 mill. ha still unprotected and degraded are directly and indirectly used for agricultural needs. It has been estimated that total area of 14 mill. ha must be afforested to ensure that favourable conditions will remain on existing arable lands.

Ploughed lands, expanding up to the zone of dark coniferous forests in the North and down to the arid and semi-arid pastures in the South, have converted large areas of the agrosphere of Russia into “plough-eroded” and disturbed land. This transformation has led to the depletion of numerous biological resources and has decreased the self-regeneration and self-regulation capacity of the land. About 35% of arable lands have lost from 10 to 60% of their initial fertility due to erosion by water. The area affected by ravines area is now more than 6 mill. ha and another 30 mill. ha are inclined to get ravines.

The danger of growing degradation is becoming more pronounced due to the prognoses of global warming and increase of CO_2 concentrations along with other greenhouse gases and air-soil-water pollutants. The negative effects already occurring are reflected in the instability of weather, disordered seasonal cycles and an unbalanced regime of moisture and energy exchange.

The current rates of protection planting (25–100 thousand ha/ per year) are too low, and we can not expect problem-solving in agricultural afforestation, not to mention the biosphere aspect of protective tree planting. Current rates of tree planting are lagging far behind the rates of ecosystem exhaustion, pollution and land degradation.

On average, the annual loss of humus on arable lands occurs twice as fast as its accumulation. During the past 20-30 years, the speed of desertification (arid zones of Russia) has doubled, forming up to 50 000 ha per year. Land retirement (loess blow-off) is about 15 mill. tons per year. The area of pasture that is slowly transforming into sands is growing. It is estimated that annual ravine increase is from 30 to 150 000 ha, and eroded lands increase annually by 400-600 000 ha. These areas are equivalent to deforestation rates.

This is followed up by the disorder in water regulation and river flows and accompanied with higher dust concentrations and air pollution. Annual CO_2 and other greenhouse gases emissions vary from 0.6–2.6 mill. tons while their absorption is about 1 mill. tons. It is a clear fact that deforestation and expansion of arable land have also contributed to the rapid increase of CO_2 concentrations in atmosphere (by 25% during the past 150 years).

A new State Afforestation Program was adopted in 1989. Measures to increase the amount of protective afforestation and to improve planning, financial and technological schemes were envisaged. However, since 1991, a clear decline in agricultural afforestation has occurred, as is revealed by the figures for arid land afforestation:

- during 1981–1985 about 77 000 ha were planted annually;
- during 1991–1995 only 73 000 ha were planted;
- in 1997 only 22 000 ha were created (Popov).

It is clear that vast agricultural areas of Russia are in need of afforestation. To date, only 3.1 mill. ha of agricultural lands have been successfully afforested (Popov). The Federal Program on the development of agroforestry amelioration has been adopted in 1994 and it has been estimated that by the year 2015 the total area of protective afforestation should reach 6 mill. ha. (the optimal requirements are 14 mill. ha) (Matiss 1998, Popov). However, this goal will be difficult to meet since Russia is still undergoing radical political and economic changes accompanied by numerous reforms. Due to unreliable financial and legislative support, and because of untimely land allotments set aside for tree-planting, the pace of agricultural afforestation is slackening considerably. The collective farmers' debt for the created afforestation has totaled at more than 2 mill. US dollars. In some regions, afforestation projects conducted in 1995–1996 years remain unpaid for.

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VNIALMI – All-Russian Research Institute in Agroforestry Amelioration (data presented in Russian).

Afforestation in Ukraine – Potential and Restrictions

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Abstract

Afforestation in Ukraine has a long history and a rich tradition. This paper discusses the achievements and failures of afforestation programs in former years and the current state, including both afforestation experiences and regional peculiarities.

During the last few decades there has been a radical reduction in the creation of new forests. The afforestation of the agricultural land offers a good chance for diminishing the environmental problems of rural areas. In addition, there is an opportunity to develop the timber production, recreation and other economic activities.

This paper makes a realistic analysis of present day preconditions, looking at both the existing potential and the constraints in the realisation of afforestation programmes that arise from an economy that is in a period of transition. A model of afforestation planning based on forest coverage optimisation is presented. The opportunities for a strategic approach and for practical improvement are also discussed.

Keywords: afforestation, reforestation, marginal productivity lands, forest history, protective forest stands

1. Introduction

The forest is a complex biological system, which plays a determining role in maintaining life on this planet. World society has recently paid more attention to the question of increasing the forest areas. "Countries should contribute to the 'greening of the world'" is one of the Forest Principles, which is in the Global Action Program for 21st century (Agenda 21; Chapter 11 Combating deforestation). The importance of actions about regeneration, together with forestry management according to sustainable development, is stressed in the Forest Policy Program for the period 1996–2000 Environmental Program of UNO (UNEP). Rapid afforestation and reforestation programs are recommended as major action in Resolutions of

Norbert Weber (ed.)
NEWFOR – New Forests for Europe: Afforestation at the Turn of the Century
EFI Proceedings No. 35, 2000

the 1999 Report of the World Commission on Forests and Sustainable Development "Our Forests – Our Future". Also in this document, among other actions, are recommendations concerning "special efforts to reforest deforested land and land abandoned by agriculture through establishments of plantations and woodlots."

The program of optimising the areas covered by forest is a very significant task for Ukraine. It is difficult to overestimate the role of forests in the national economy and in the social and cultural life. At the same time, because of insufficient wooded areas and a well-developed metallurgy industry, in terms of energy sources, Ukraine is one of those countries that consume a high amount of oxygen on the planet. The problem of the decision to increase wooded areas in the country is important to consider in the world context.

Carbon emissions in Ukraine have decreased from 160 million tons (1991) to 100 million tons (1996) because of industry reduction. Ukraine is on the 8th place in the world as CO_2 emitter in the energy sector. Its share is 2.35% of the world emissions from energy production. The biggest pollutants of the atmosphere are the energy producers (32%), metallurgy (27%), and the coal industry (23%). Forest covered area in Ukraine, which is now 9.4 million ha (according to approximate calculations), is able to produce nearly 100 million tons of organic matter per year, to extract from atmosphere 180 million tons CO_2 and to produce 130 million tons of oxygen. Thus, the capacity of our forest is only 40% of what is needed for utilisation of our CO_2 emissions (430 million ton) and air oxidation (Baytala 1999).

Even the UN International Conference about climate change (Kyoto 1997) gives Ukraine the right to reach the emission level in 2008 with present quotas for emissions from industrial pollution (100 million ton). Current State policy aims to stabilise the internal carbon-oxygen balance. This problem will become extremely acute in the 21st century. The proposal to double the forest area in Ukraine is becoming the most effective environment-economic solution, because considerable further decrease of CO_2 emission would be problematic via other means.

2. Land use and forest resources

2.1 General review of land use

Ukraine has the largest area of arable land (over 70%) in Europe and almost 40% of the world's most productive black soils. The state land holding includes 15.5 million ha of the most valuable; productive lands, including 11.9 million ha of black soils (76.8%). It is one of the main riches of the country. Ukrainian agricultural lands are one of the best in the world from a productivity point of view, but between 1961 and 1981, the content of humus in the agricultural soil decreased from 3.5 to 3.2%.

While the total area of the state is 60.4 million ha, lands in agricultural use occupy 48 million ha, including 34.2 ha of arable lands and 6.2 million ha of meadows. The cultivated area is considered to be too high (Figure 1). The area of arable lands amounts to 90–95% in some agricultural regions of the forest-steppe zone (some districts in Ternopil, Chmelnicki regions).

Soil erosion is still a problem. Over 13 million ha of lands have been damaged by water erosion and 6 million ha were damaged by wind erosion. The area eroded is estimated to have increased by 70–100,000 ha per year during the last decades.

Water erosion is most extensive on slopes, riverbanks, and shores of great water reservoirs, the shore zone of the Black Sea and the Sea of Azov. Water erosion on slopes is due to incorrect use of slopes, the loss of forest cover. Erosion in the basins of rivers occurs due to

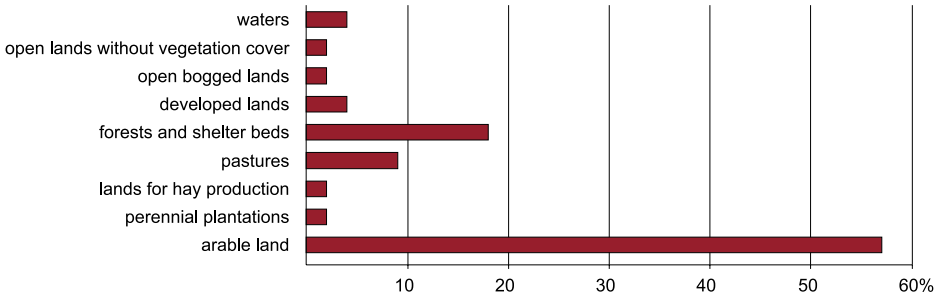

Figure 1. Structure of land resources.

the destruction of watersheds, and cultivation close to the banks of rivers. Stony lands cover 1.2 % of the total area of arable lands.

Wind erosion is spread in the plain steppe regions of the south and east of Ukraine, where blowing away of the most fertile soil horizons and dust storms are observed. The most effective measure against such phenomena is the creation of shelterbelts and land regulating operations to achieve rational organisation of the areas.

Wide-scale irrigation of lands in the past years resulted in flooding of more than 600,000 ha of arable lands not only in the zone of irrigation, but also on adjoining areas. The largest areas of flooded lands are in the Crimea and in Odessa and Dniypropetrovsk regions. The increase in the level of ground waters preconditions secondary salinization and water-logging of soils.

The area of drained lands in Ukraine is about 3 million ha. Their productivity is rather low and negative consequences connected with the draining of waterlogged lands and swamps are rather conspicuous. In these regions, one can observe changes of microclimate, dried soils degradation and, on some plots, mineralization of a turf layer has taken place. On the surface appears to be unproductive sands, and the processes of wind and water erosion increase.

Great areas are occupied by low productive lands due to excessive acidity. During recent years the area of these lands has increased due to the secondary acidification of soils as a result of the use of mineral fertilisers, in particular physiologically acidic ones, acid rain, and insufficient use of meliorates, which neutralise soil acidity. The area of salty and saline lands in Ukraine is about 4 million ha, including about 3 million ha of arable lands.

Current technologies associated with the mineral fertilisers are the reason for only a proportion of the fertilisers being assimilated by plants and accumulating in soil, preconditioning the worsening of its structure and eventually leading to environmental pollution.

Contamination of lands with adverse substances emitted by industrial enterprises and transport is a particular worry. In the zones of great industrial cities, on the fields near the sources of emissions, the yields of grain crops have decreases by 20–30%. In the fruits of crops grown on polluted lands one can observe an increase of the general content of ash, sulphur, manganese, and iron, resulting in deterioration in the food value.

In order to solve ecological-economic problems of land use in Ukraine it is necessary to initiate afforestation of the low productive lands, and optimisation of the agricultural landscapes. These operations must pay attention to specific regional problems of land conservation in Ukrainian Polissia, South of Ukraine, Podillia, and regions along the Dnister River.

It is important to note that close to 4 million ha of the different categories of degraded low productive lands are potentially suitable for afforestation (Gensiruk and Niznyk 1995). The structure of the low productive lands is the following: stony soils 29%, ravines 18%, salty and saline soils 7%, highly erosive and sandy 33% (Cemko et al. 1989).

One of the important elements in increasing the ecological and economic efficiency of land use is land relation, that is, rational allocation of the land fund among different categories of land users. Adoption of the Land Code of Ukraine in 1990, along with the supplements in March 1992 on multipurpose land use, and introduction, along with the state and collective private ownership of land, gave the land users equal rights. The Land Code determines in detail the obligations of the land users to increase the productivity and protection of the land.

2.2 State of forest resources

Ukraine still remains a country with low forest cover where the forest cover (Forested Areas) is 15.6 % of the total land area. According to the Ukrainian forest classification system, the Forest Fund is subdivided into Forest Land and Non-Forest Land. The land which constitutes the Forest Fund is the area that could be of importance to the forest sector economy and amounts to 10.78 million ha. The Forest Land includes Forested Areas and Unforested Areas; the latter are designated for forest growth, but are temporarily without forests. The Forest Land constitutes 10.04 million ha, and the Forested Areas (stocked forests) amounts to 9.4 million ha.

The area of artificially regenerated forests is larger than the area of forests being. As a result, the forest area in Ukraine has been extended by 1.5 million hectares over the last 30 years, and timber volume has been increased by 600 million m³ – that is 1.8 times. The increase in forested area is mostly due to forest planting on areas no longer suitable for agriculture

The total growing stock is evaluated as being 1.74 billion m³. These figures correspond to 0.18 ha of Forested Areas and 33 m³ of growing stock per capita. The average annual increment per hectare is equal to 4 m³ (for forests under State Forest Management – 4.8 m³/ ha). It changes from 5 m³ in Carpathian mountain forests to 2.5 m³ in Steppe region.

The age structure of forests is characterised by the prevalence of young trees (32% of the area covered with forests) and middle – age plantations (44%) and a relatively small area of mature (11%) and overmature plantations (13%). The percentage of mature species with the prevalence of valuable woody species is low – pine (2%) and oak with tall trunks (1.9). The area of mature stands decreased sharply due to the intensive fellings, done before 1965. It resulted in the depletion of forest resources, decrease in watershed protection and loss of other protection functions of forests.

There is a dominance of young and middle aged stands, accounting for 76% of the forests. The average age of forests is 51 years and the average age of coniferous stands is 49 years (Shvidenko and Andrusishin 1998). Mature forests cover only 11% which is two times lower than established standards for a sustainable forest management regime.

The forests of Ukraine are distributed very unevenly (Figure 2). In the Ukrainian territory the following zones of forest vegetation can be marked out Ukrainian Polissya, Forest-Steppe, Bayrak Steppe, and South Dry Steppe in the plain part, Ukrainian Carpathians and Crimea as mountainous regions (Figure 3). Most of the forest area is concentrated in the North Polissya region and in Ukrainian Carpathian Mountains. In Polissia they amount to 26.1% of the whole territory of the region, in the forest-steppe – 12.2%, the Steppe – 3.8%, in the Carpathians and in the mountain region of the Crimea – 40.5% and 32%, correspondingly. The highest forest cover is in Trans-Carpathian, Ivano-Frankivsk, Rivno, Zhytomyr, Volyn', and Chernovtsy administrative regions, where this index is 29–40% of the whole territory. On the contrary, forest cover of the Steppe regions is very low. Thus, in Mykolaiv, Zaporizhzhia, Dniepropetrovsk, and Kherson administrative regions it is only 1.2–3.1%

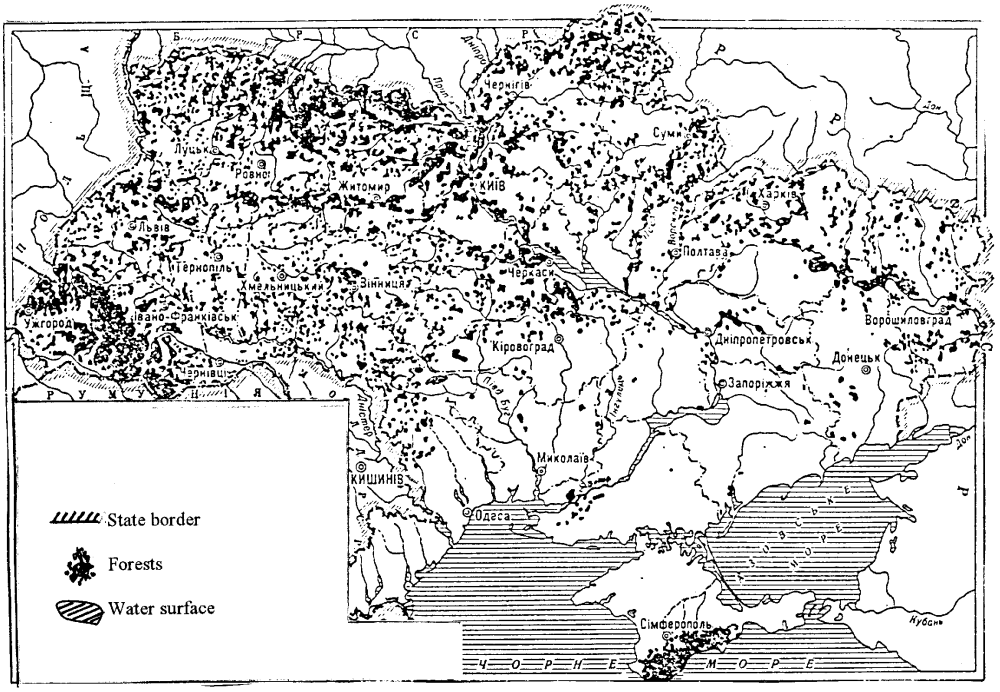

Figure 2. Distribution of forests in Ukraine.

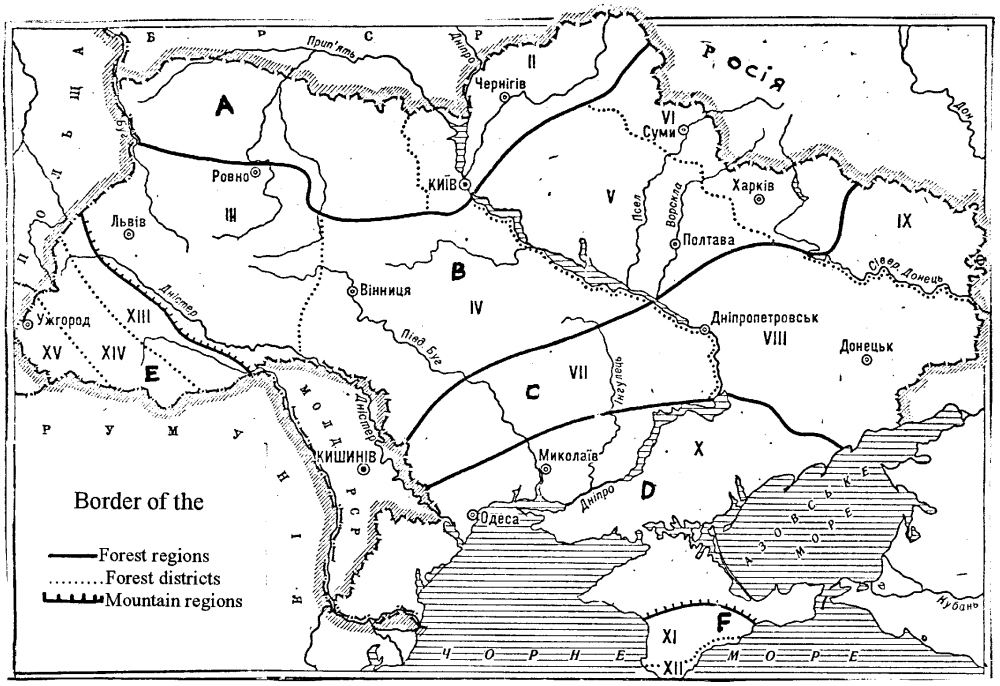

Figure 3. Forest zoning of Ukraine. A – Ukrainian Polissya, B – Forest Steppe, C – Bayrak Steppe, D – South Dry Steppe, E – Ukrainian Carpathians, F –Crimea Mountain.

The current distribution of forests in Ukraine is a consequence of climate, geology, soil, and other natural conditions and of anthropogenic influence over a long period.

Forests dominated by coniferous species cover 42% of the total area, and hardwood forests 43%. The forests are dominated by the following species: pine (33%), oak (33%), spruce (8%), and beech (7%).

About 13 million m³ of timber is harvested annually in Ukraine including 45% from the final harvest. The 13 million m³ cut annually are not enough to meet domestic demand. About 60% of finished wood products are used internally, 30% go to other parts of the FSU, and 10% to foreign export. 70% of timber produced from final harvest comes as logs. Taking into account the high deficit of forest resources in Ukraine, the forest industry fully utilises timber waste and non-timber forest products that comprises about 30% of harvested timber value.

Forests with protection functions account for 56% of the forested areas. In these protected forests 6.6% are inaccessible and 30.2% have restrictions on the rate of exploitation, according to the forest legislation. About 10% of the Forest Fund has the status of natural reserves. The total area of specially protected areas is 1.66 million ha or 2.8% of the total land.

Ownership of forests is determined by the Constitution of Ukraine. Article 13 of the Constitution declares that land and fossils, the atmosphere, water and other natural resources which are within the territory of Ukraine, as well as natural resources of its continental shelf, are subject to the ownership rights of the Ukrainian people. The ownership right is executed on behalf of the Ukrainian people by the bodies of state and local administration within the limits set by this Constitution. Forest management is carried out in accordance with Ukrainian current legislation, in particular with the Forest Code of Ukraine, regulations on the forest fund of Ukraine, resolutions on hunting, and other normative documents.

Article 6 of the Forest Code declares: "All forests of Ukraine belong to the state. On behalf of the state, Verkhovna Rada of Ukraine carries out management of the forests. Verkhovna Rada delegates its powers of forest management to corresponding Radas of people's deputies determined by this Code and other legislative acts. The Radas of people's deputies award land areas of the forest fund for permanent use or take them back under their control in the fashion determined by this Code."

Forests are state owned, with 72% managed by state forestry departments at the oblast level, 24% by state and collective farms (long-term use of peasants' unions) and 4% by the military and institutes of teaching and research.

Forest land plots from the Forest Fund are given for permanent use to specialised forest enterprises and organisations where there are specific departments for forest management, afforestation, health improvement, sport and tourist purposes, and research. If the citizens (of Ukraine) have special training, they can be given individual forest-land plots from the Forest Fund with an area up to 5 hectares, provided that it is part of the farmer's property. According to a new law, the forests of Ukraine are its national wealth, and according to their purpose and location, perform chiefly ecological (water protection, protection, sanitary, health-improvement, recreation), aesthetic, educational, and other functions. They also have exploitation purposes and are subject to state registration and protection (Article 3). The main requirements concerning forest management organisation is also described (Article 34). These are forest preservation, protection from fires, protection against harmful insects and diseases, and improvement of water protection.

Many Ukrainian scientists, politicians and forest professionals have an opinion that massive forest privatisation might result in the deterioration of the state of forests, leading to a decrease in its productivity and exerting a negative impact on the environment as well as recreation, protective and other useful forest functions.

3. Brief history of deforestation and afforestation

3.1 Changes of the wooded land

The long-term history of human development on Ukrainian territory has been consistently accompanied by deforestation. Investigations carried out by scientists have shown that in the first AD millennium forests were spread almost over the entire territory of Ukraine, except the Steppe zone, where they grew only in small groups, and on the banks of the rivers. The zone of Polissia, Carpathian and Crimean Mountains had an almost closed forest canopy. Only swamps, sandy soils and steep slopes of mountains remained unforested. Forest-steppe zone, in particular Galychyna and Podillia, was also rich in forests (Gensiruk and Bondar 1973). The historical sources show that forests used to cover 43% of the land area of Ukraine.

The forests on the present Ukrainian territory in the 16th–18th centuries experienced a considerable reduction of their area, but the territory was still extensively wooded. The most comprehensive materials about forests distribution in Ukraine in 16th–17th centuries are Boplan's maps. In more recent centuries the forest areas gradually decreased due to deforestation activity. In Europe, up until the late 18th century, timber was one of the most basic requirements of human existence. Intensive forest fells in Ukraine during the 19th century were caused by development of crafts that demanded a vast quantity of wood (production of potash, iron, glass, and saltpetre). Many forests were cleared and burned in order to obtain agricultural lands. The development of industry contributed greatly to the extermination of forests. In particular, forests were felled for the needs of sugar beet production, for timber – both for export and local markets – and for railway building.

Development of industry in the second half of 19th century increased demand for timber and resulted in mass destruction of forests in Ukraine. In the 20th century most of the areas of virgin forests in Polissya and Forest-steppe were gone and only small areas of forest were left. Along with the sharp decrease of the forest resources and forest area the natural composition of forests also worsened. As a rule, valuable species such as oak and pine were felled in Polissia and forest-steppe, and beech in the Carpathians. They were replaced with less valuable species, such as hornbeam, maple, lime, and birch. Excessive exploitation of the Carpathian forests resulted in a decrease of oak and beech areas during the last 100 years by 25%. The sharp decrease in woodland cover resulted in such negative phenomena and processes as soil erosion, and floods.

A very substantial area of forest was cut in this century, for example during First World War and Civil War more than 650,000 ha of forest were felled. The forests were extensively damaged during World War II and, by the end of the war, represented only 11.7% of the land

Table 1. Reforestation and afforestation in 1961– 1979 (thousand ha).

Years	Reforestation by planting forests	Afforestation / Stands on the ravines, sands etc.	Afforestation / Shelterbelts
1961–1965	594	169	22
1966–1970	343	191	41
1971–1975	221	199	82
1976–1979	164	109	27

area. Large areas of forests were also destroyed because of construction of the reservoirs on Dnipro River; where a forest area of 201,000 ha was cut and flooded.

During the Soviet period the forests were also excessively used. Intensive exploitation of the forest resources during the post-war period led to a considerable depletion (the amount of forest use exceeded estimated norms by two times and more). The resulting sharp decrease of wooded areas resulted in such negative phenomena and processes as soil erosion and floods.

From 1946 until 1978, about 3.5 million ha of new forests were created in Ukraine. Afforestation occurred particularly in the steppe zone, where the forested area increased by a factor of 2.5 to 3. Overall, the increase in forested area during this period lay at a mere 3%.

According to expert opinions, the optimal level of forest coverage in Ukraine lies at around 25%, including 40% in Polissya, up to 20% in the forest-steppe zone, no less than 10% in the partially wooded steppe, 6–7% in the steppe zone, 40% in the Crimea region, and 55% in the Carpathians.

3.2 National afforestation experiences

The first literary works about the afforestation in the Ukraine date back to the 17th century when the Cossacks planted in Zaporizhska Sich forest and also planted fruit trees on the Dnipro islands (Khortytsya, Monastyrskyy, and Demekoviy) and in other places (Gensiruk and Nizhnik 1995). They planted oaks for shipbuilding, as well as other trees along the lines of fortifications as a defence measure.

Peasants and colonists during settling of the steppe regions also carried out afforestation. According to a government decree, tree planting was one of the obligations for everyone in a colonist community. Also, new settlers planted trees hoping to get building material and fuel wood in this almost non-forested region.

In Ukrainian history there is a wealth of experiences of afforestation for ecological reasons. The most successful afforestation was done in the landlords' estates of I. Ya. Lomykovsky and V. P. Skarzhynsky, and in some military settlements. For example, on the mediocre quality lands of Myrgorod district, Poltava region, Lomykovsky created in 1809–1837 the whole system of shelterbelts, which ensured conditions for obtaining high and stable harvests.

Academic G. M. Vysotskiy, the famous Ukrainian scientist and environmentalist with encyclopaedic knowledge about Nature, is counted as a founder of scientific steppe afforestation. The afforestation of Oleshkiv Sands, under the initiative and leadership of academic P .S. Pohrebnyak, is the most prominent example of an important contribution of Ukrainian foresters, scientists and experts to the forest re-creation on previously wooded land. Valuable experience is collected about rational use in the different categories of low productive lands. Shelter belt afforestation achieved a high scientific and technical level in the Ukraine after 1948, when the programs of the shelter belts foundation in the steppe were carried out on a large scale (the so-called plan of nature remaking).

After the Second World War (1945), afforestation operations were considerably intensified. Gradually all the cut areas were regenerated and low-productive agricultural lands partially afforested. The highest level of afforestation was reached in 1971–1975 (Gensiruk 1980).

The history of forest management for field erosion control started more than 150 years ago. The planting of artificial stands was introduced in Ukraine on small areas at the end of the 17th and beginning of the 18th century. Before the 20th century there was development of the technologies of forest's plantation establishment, advance soil preparation, and further treatment of the young trees.

During the last 30 years, foresters created 747,000 ha of forest stands on highly erosive lands. In the forest plantations about 20 different coniferous and deciduous trees and about 40

types of the highly productive native types of stands are widely used. However, the problem of erosion control still remains. The State Committee of Forestry plans to conduct more programs of reforestation of highly erosive lands.

During the last decades the protective stands on the highly erosive slopes in the Carpathians were created. In practice tree planting is combined with the entry of fine-grained soil (sometimes involving the use of baskets) and the creation of terraces with willow-shrub hedges on the lower sides in the basin of the Dnister-river (Parpan et al. 1999). The technology of slope reforestation is highly developed and involves using mechanisation for site preparation, such as soil mellowing and digging of pits (Agaponov et al. 1999).

In 1971 the intensive use of the selection methods started. For such reason there was a selection inventory of the highly productive stands, marking out the plus trees of the principal types. From this base there were created the seedling plantations, and now the new young plantations are being created.

According to the policy of the State Committee on Forestry the primary tasks for forest management in Ukraine are (Kolisnichenco 1998):

- to increase forest cover and to reach the sustainable level in all the climatic zones;
- to increase biological diversity of existing forest ecosystems;
- to improve the ability of forest ecosystems to withstand natural disturbances such as climate change, forest fires, disease and insect outbreaks and anthropogenic disturbances;
- to promote the concept of sustainable forest use that provides for national timber needs;
- to continue research in agroforestry and forest management in steppe areas.

The science and practice of forestry started in 18th century. Nowadays, Ukrainian foresters have the unique scientific knowledge and practical experience in steppe forestry, agroforestry and melioration, afforestation of highly erosive lands, reforestation for stabilisation of sands, systems of creating protective stands for farms, silvicultural methods for mountainous conditions, and forest management in areas protected for nature.

The Ukrainian system of forest education was created by the co-operation between the Ministry of Education of Ukraine, Ukrainian State University of Forestry and Wood Technology and the National Agricultural University. The training of specialists of higher qualification for forestry is carried out in these two educational establishments. Besides that, the system of forest education includes seven technical colleges, one Forestry College and Ukrainian Centre of Education, Continuing Education and Improvement of Professional Skills of Foresters with its own branches.

The major scientific research in forest ecology, forestry, mechanisation and technologies of the forest and woodworking industry are conducted by University's Faculties (Lviv, Kiev, Kharkiv), Ukrainian Research Institute of Forestry and Agroforestry after G. M.Vysotskiy (Kharkiv), Ukrainian Research Institute of Mountain Forestry after P. S.Pasternak (Ivano-Frankivsk), Institute of the Ecology of Carpathians in the structure of the National Academy of Sciences (Lviv), and by ten Forest Research Stations in all forest zones of Ukraine.

4. Present state of afforestation and development proposals

Therefore, for the last 10–15 years, the attention to these very important questions at the state level has not been sustained. Protective afforestation can play a powerful role of increasing the environmental sustainability and productivity of agricultural lands. However at present it is being neglected due to uncertain legislation and under-estimation of the role of legislation.

Forests and shelterbelts play a very crucial role in protecting soils from erosion, and agricultural landscapes from deterioration. About 1.6 million ha of protected forests are growing on lands of agricultural organisations, of which 150,000 ha are shelter belts along small rivers and 440,000 ha are shelter belts, which protect 13 mill. ha of arable land. Forest regeneration and cultivation in Ukraine usually take place at the expense of artificial afforestation. In 1995 forest regeneration in Forest Fund was made on the area of 38,600 ha, planting forest stands in ravine, sands and other non used lands – 12,900 ha, planting farm shelterbelts – 1,900 ha.

According to the Council of Ministers Decree of 1987, during the period up to 2000 the plan was to plant annually 39,700–40,000 ha of new plantations in Ukraine, of which 5,000 ha would be water protection and soil protection plantations. Those annual volumes are insignificant when compared with the plantations that would be necessary to reach optimal forested areas, although these plans have not been fully achieved, especially with regard to protective afforestation and afforestation of abandoned land (see Figure 4). The current plan is to create more than 1 million ha of the different types of protective stands, under the framework of the National Program of the Land Conservation for the period 1996–2010, which was prepared in response to a decision of President of Ukraine.

The general tendency of decreasing volumes of protective afforestation can be seen by following the example of the West Region of Ukraine. The considerable areas here were afforested in the late 1950s. In Volin oblast – oblasts are administrative regions -59,000 ha of stands were planted during the period 1956–1961, of which forestry farms had planted 27,900 ha on low productive lands, 3,800 ha on sands. Collective farms had planted 26,700 ha on low productive lands. The highest rate of protective afforestation is peculiar in Ukraine for the late 1960s and the beginning of 1970s. At the end of 1970, and in the beginning of the 1980s, the rates of protective afforestation basically decreased. For the last years in Ternopil and Khmelnytskyy oblast not more than 300 ha of forest stands were planted annually, in Lviv oblast 250 ha, in Rivnenska oblast 400 ha and in Zakarpatska oblast 100 ha, not larger areas of forest stands in other regions. At the beginning of 1970, separate forestry farms had planted even much larger areas.

A decrease in quality of forest melioration works has been observed. The present system of anti-erosion stands do not completely provide the protection of agricultural lands from water and soil erosion. The systems of forest stands is almost absent in many farms, and in other farms the areas of forest stands are not being increased. About 30% of farm shelterbelts are in bad condition and need reconstruction. The forest planting rates are insufficient in arid

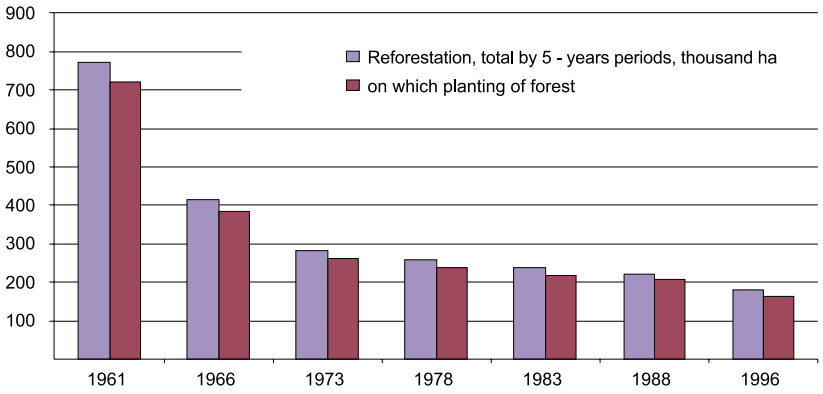

Figure 4. Reforestation under state forest management according to the data of Shvidenko and Andrusishin (1998).

lands; problem of the afforestation of the small rivers banks is still not solved. It does not promote the protection of land of agricultural land resources.

Forestry enterprises meet considerable difficulties in receiving land intended for protective forest stands. As a rule, farms give to it casual territories, which are out of the complex of erosion struggle actions. That's why instead of the very small areas of stands, which were created in some farms and can be easily destroyed by peasants, we need to have the completely formed systems of forest protective stands, which would take into account regional peculiarities of agriculture. In many cases even forestry enterprises do not show proper initiative and persistence in deciding on this problem of national importance.

A large number of deliberately planted shelterbelts are evident in much of Ukraine. For many agricultural regions, shelterbelts are essential, and thus with changing land use environmental and agricultural authorities need to be concerned with their possible destruction. An incentive system is needed to encourage development of shelterbelts because they are costly, a long-term investment and eventually probably benefit the general public more than individual landowners. Shelterbelts can be designed for a number of different purposes: to reduce wind erosion or to protect the diversity of agricultural landscapes, increase wildlife habitat and boost crops productivity.

There are a number of positive developments in the Ukrainian forest sector. The forested areas increased by 2.27 mill. ha between 1961 and 1996 and by 800,000 ha between 1988 and 1996 alone, (which can, to a large extent, be explained by changes in the Forest Code and improved forest inventory system). But during the same last period the deforested (i.e. areas converted from forest to agricultural land) areas has increased from 184,000 to 292,000 ha (Shvidenko and Andrusishin 1998).

According to the State Forest calculation that was conduced in January 1996, for almost all forests in Ukraine during the 8-year period (1988–1995) the State Forest Fund experienced both positive and negative qualitative and quantitative changes. The main negative tendencies concerning deforestation and forest degradation are:

- the increasing areas of non forested lands,
- the increasing preference for deciduous species,
- stand age structures which are far from optimal,
- reforestation of oak stands (by non-autochthonous seed origin),
- decreasing stability of growing forests against negative factors.

The main problems of forestlands that are not covered with stands at present are:

- the decreasing rate of creation of new forest stands;
- reforestation for timber production is lower than the felling because of the economic crisis;
- destruction of the previously created artificial stands in consequence of extreme conditions, pest damage, forest fires;
- dedication of low productive lands to landscape protection and of meadows for game management during forest management at the same time;
- land transference from other land users;
- forest swamping due to the drainage improvements by neighbouring collective farms;
- spontaneous natural disasters (especially storm damage).

4.1 Problems of afforestation policy

There are a lot of different constraints to afforestation on national, regional and local level. Afforestation policies have been introduced in a wide range of historical and policy circumstances. By definition, state policies involve some form of government intervention.

Individual landowners can and do carry out afforestation without or outside of national policies, but such efforts are usually short lived. In many countries the state was instrumental in initiating afforestation, either directly on land by it for that purpose, or indirectly through incentives offered to the private sector (Mather 1993).

The agricultural sector of Ukraine after eight years of the country's independence is still in the process of transition. The dynamics of the ownership structure of the sector is showed in Figures 5 and 6. Recent decisions of the president and government will increase the intensity of the process of privatisation. When considering the question of afforestation possibilities we should take into account this specific situation. The main question is how to stimulate the afforestation activity of private landowner?

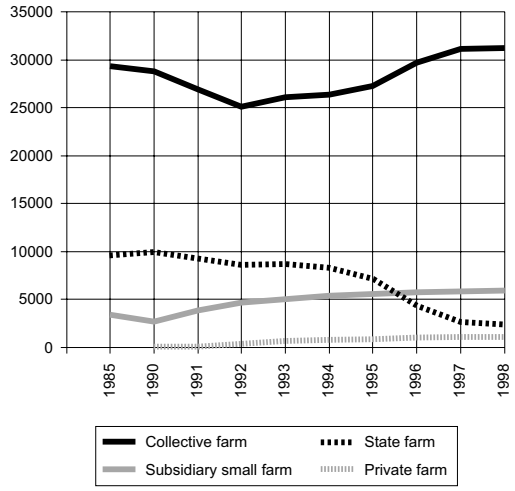

Figure 5. The agricultural area of the different forms of ownership, thousands ha.

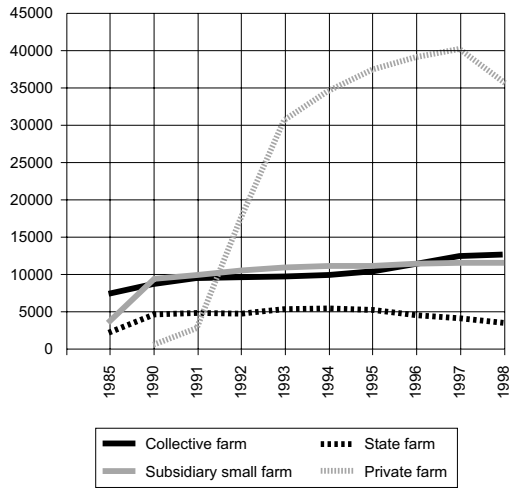

Figure 6. The quantity of agricultural enterprises of the different forms of ownership, numbers.

European Union experience in this field could be used. In European Union countries afforestation of arable land and grassland is furthered in the framework of the Common Agricultural Policy (CAP) as a long term means to reduce surplus agricultural production. But the reduction of agricultural surplus production was not as high as expected, and the first European programmes to further afforestation proved to be insufficient. According to the expectations of the European Timber Trends Study V, the area of Europe's "exploitable forests" is expected to grow by just less than 5 million hectares between 1990 and 2020, of which 3.5 million hectares would take place in the EU (calculated for the former 12 member states) which is an increase of 8%. Most of the expansion is accounted for by three countries: Spain and France, where forests expansion policies will continue, and Poland, where the area under agriculture is expected to shrink markedly due to the to the transition process. Experience over recent years has shown that forest established on former agricultural land is often managed for landscape, hunting or biodiversity reasons, not primarily for wood production.

According to Weber (1998), in recent years there has begun an important change in the discussion of afforestation, with a shift away from agricultural aspects to environmental ones. Large-scale afforestation is seen as an appropriate instrument to reduce the GHG Carbon Dioxide in the atmosphere. New approaches to improve the afforestation planning by integrating socio-economic and ecological aspects appear to be promising.

Taking a look at the current transition situation in Ukraine and preconditions for future afforestation, several advantages and restrictions can be observed (see Table 2). Some additional comments are offered on this situation:

1. Lack of finance. In the existing conditions of economic crisis there are growing difficulties in long-term state subsidies for afforestation.
2. Institutional weakness. Insufficient financing, lack of tools, equipment and materials have a negative impact on the forest service unit's activity. Forest melioration operational units (state enterprises created specifically to combat water and wind erosion) reduced its afforestation activity. State forest enterprises are more oriented towards reforestation activity as the more important task.
3. Lack of incentives. Because of the privatisation process in agriculture new forms of agricultural enterprises and farms were created. New mechanisms for afforestation promotion, financial support of bare land afforestation (such as planting grants by farmers

Table 2. Framework for Afforestation in Ukraine.

Potential	Restrictions
1. Favorable climatic and soil conditions for tree planting	1. Difficult conditions for afforestation on degraded lands
2. Available land resources (lands unsuitable for agriculture)	2. Unstable system of land ownership in the transition period
3. Forest policy motivations: Ecological – reduction of CO_2 in the atmosphere Economic – deficit of forest resources	3. Absence of legislative mechanisms for encouraging landowners to afforest
4. Developed system of forest education and science	4. Insufficient financing of the afforestation programs
5. National afforestation experiences	5. Low popularity of afforestation ideas in society. Weakness of the forest lobby

and improvement grants for woodlands on farms in EU) have now been made. Such traditions existed in Ukraine, but they have been long forgotten. The Galician Forest Society that existed in Western Ukraine from 1852 to 1925 gave grants for peasants for tree planting on bare land, with premiums for afforestation of the sandy dunes. A premium system was also proposed for forest workers, to encourage them to preserve the regrowth of the main forest species during logging operations.

4. Research not fully adequate to the current situation. Ukraine has a good scientific and professional background for the establishment of afforestation programs. Evidence of this is the national scientific program "Lis" (forest in Ukrainian), that was created by Ukrainian forest scientists. But the statement of Mather (1993) that "a far greater research effort has been directed at the technical aspects of silviculture than at the political, social and environmental aspects of afforestation" is also true for Ukrainian conditions.

4.2 Planning of the low productive lands afforestation.

Afforestation planning needs the estimation of the sequence in time and space, and some qualitative and quantitative characteristics of the forest coverage optimisation (see Figure 7). For the calculation of the anthropogenic pressure estimator we have proposed the formula:

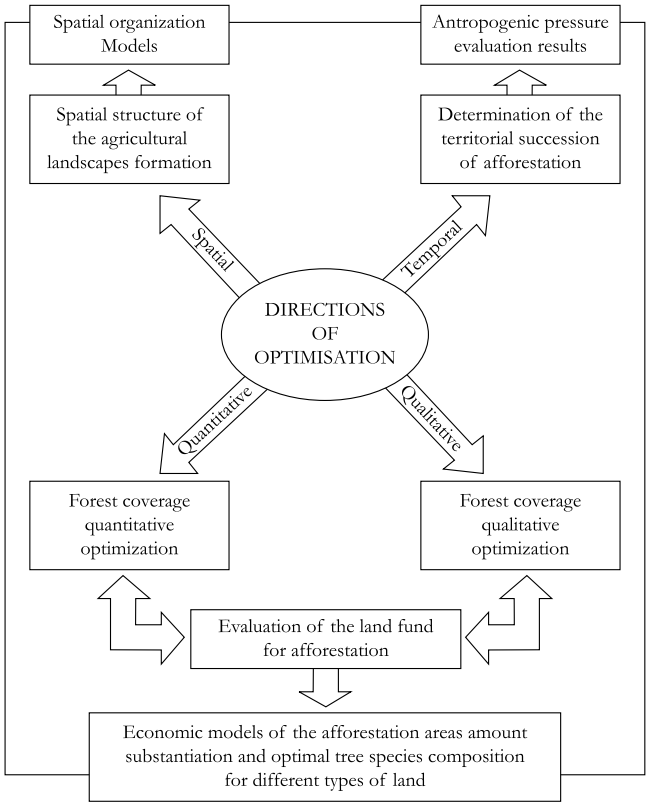

Figure 7. The model of optimal forest coverage formation by afforestation in the agricultural landscapes.

R = (Si Vi Ka):n,

where

Ka coefficient of the agricultural anthropogenity, which evaluates the scale of the agricultural activity influence on the landscape;
Si size of the factor, quantity in points;
Vi weight coefficient;
n number of the factors

The territorial analyses of the separate factors (forest coverage, tillage, water erosion intensity, fertiliser usage level) and integral evaluation have been done to the West Region of Ukraine. Using an administrative district as the unit, the corresponding schemes were prepared. The results could be used for the estimation of the areas that should be afforested at the first stage, second stage, and third stage.

The priority and the way that it is advisable to create forest stands on some categories of low productivity lands according to the real economic conditions can be determined using the economical model based on optimization of the three-aims vector. The model is figured as:

To find unknown value x_{ik}^{r} , for which the purpose are functions:

1. The maximisation effect from decreasing the intensity of harmful anthropogenic processes:

$$f_1(x) = \sum_{i=1}^{m} \sum_{k=0}^{K} \sum_{r=1}^{R} (a_1 + a_2 + a_3 + \ldots + a_n) x_{ik}^{r} \rightarrow \max \qquad (1)$$

2. The maximisation effect from production which is possible to receive from land using,

$$f_2(x) = \sum_{i=1}^{m} \sum_{k=0}^{K} \sum_{r=1}^{R} (b_1 + b_2 + b_3 + \ldots + b_n) x_{ik}^{r} \rightarrow \max \qquad (2)$$

3. The minimisation of inputs for creating forest stands, care for forest stands etc.

$$f_3(x) = \sum_{i=1}^{m} \sum_{k=0}^{K} \sum_{r=1}^{R} \left(B_{ik}^{r} x_{ik}^{r} \right) \rightarrow \min \qquad (3)$$

And the restriction act as

$$\sum_{ik=1}^{mk} x_{ik}^{r} \le S_{ik}^{r} \le S_{k}^{r}, \qquad k = \overline{1,K} \wedge r = \overline{1,R}$$

$$B_{ik}^{r} x_{ik}^{r} \le B$$

Where

$k\left(k\overline{1,K}\right)$ - index, that signifies forestry region;

$r\left(k\overline{1,R}\right)$ - index that signifies the way of using (afforestation with some trees species);

x_{ik}^{r} - Unknown value, that strike off square **k** -lands category of forest reclamation fund in forestry region, that is proposing to use by **i** -method;

S_{k}^{r} - The square **k** -land category of forest reclamation fund in **r** forestry region;

S_{ik}^{r} - and the part from square **S** , that can be assimilated by **i** -method, taking into account the present manpower, material and technical basis (techniques, saplings etc.);

B - the limit of investment per 1 ha;

B_{ik}^{r} - the costs for afforestation using **i** -method for 1 ha of lands in **k** -category in region;

a_1 - the effect after decreasing of the lands water erosion;

a_2 - the effect from the silting up of water reservoirs prevention;

a_3 - the effect from the decreasing of damage, caused by filling with sand the areas of agricultural lands and roads;

a_n - the effect from the decreasing the intensity of other negative processes;

b_1 - the effect from wood production;

b_2 - the effect from non-wood forest products;

b_3 - the effect from the increasing of the agriculture productivity;

b_n - the effect from other beneficial forest functions.

The type of planting would depend on location and local objectives. We should mention that in selecting the species composition for protective forest stands, it is necessary to consider the technological peculiarities of forest plantations. The technological peculiarities of afforestation should be taken into account, for example the species' demand for soil care. On the eroded lands the advantage is given to the species that are most resistant to unfavourable hydrology and that can grow with minimum care.

One important aspect is the aesthetic appearance of stands created by afforestation. The choice of species composition should be in harmony with the morphological structure of landscape, complementing the landscape and in the same spatial forms that are typical for the traditional scenery.

5. Conclusions

According to the social needs for forest resources, the attitude towards the aforementioned problem in our country should be fundamentally changed. Ukraine has a window of opportunity during reform to reduce conditions leading to soil erosion by redirecting land use to permanent vegetation in selected regions and parts of the landscape. Now would be the ideal time to convert some of the sloping land (too steep to be farmed safely without severe erosion) into forest. At the same time the present socio-economic situation demands a new approach to the creation and realisation of afforestation programs on low productivity land. This approach has to include the following aspects:

1. The orientation towards international programs, which foresee the integration of socio-economic and environmental aspects drawing attention to the global ecological role of forests.
2. The integration of wide scale afforestation projects with changes in structure of agriculture, and realisation of agrarian reform in Ukraine.

3. The elaboration of our own strategy and state program of afforestation which takes into account the following aspects: the need for forest resource, the economic viability, the necessity of solving problems in environmental optimisation in agricultural landscapes, natural resources protection (both existing natural and semi-natural forests, which will affect water resources, CO_2 in air, etc), and increasing amount of recreational use of landscapes.
4. Maintenance of sustainable land use, taking into account the demands of social interest groups, which is necessary to make prognoses and prevent forest conflicts and land conflicts.
5. The stronger public involvement in the control of overcutting, illegal cuttings and forest fires, and also involvement in the creation and practical realisation of national and local afforestation programmes.

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Afforestation Programmes in Bulgaria

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Abstract

The total area of Bulgarian forest lands amounts to 3.877 million hectares and comprises 34% of the country's territory. The forest fund area has been enlarged constantly during the last 40 years. It has increased from 3.612 million ha up to 3.877 million ha. This was due mainly to an expansion of the afforested areas. The part of the afforested area created by plantation rose from 16.5 up to 29.3% for this period.

During this transitional period for Bulgarian economy and under new forest-political conditions, reorganisation of the state forest sector is going on. Restitution of the forests to the former owners and privatisation of state forest companies started on the base of the new forestry legislation. The opportunity is being given to private foresters and companies to run their forestry business on market economy principles.

The National Forestry Board (NFB) determines governmental policy in forestry, hunting, non-commercial fishing and management of protected territories on forest land. The principle goal of the forest policy of the NFB is the preservation, protection and development of Bulgarian forests through sustainable development and multifunctional use and management.

Afforestation in Bulgaria has a more than 90 years long history as a priority within the activities of National Forestry Board. Major investments were made and over 1.6 mill. ha of forest plantations were established. Three periods can be considered in afforestation history in Bulgaria:

1. Up to 1951, by which time a total of 170,000 ha of new forests were created mainly on bare and eroded grounds;
2. 1952–1989 when over 1.4 mill. ha were afforested with a priority towards improving the productivity of forests and to increase their environmental protection functions;
3. Since 1990 when the main objective was defined to be the protection and preservation of forest biodiversity and sustainable forest development.

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The afforestation rate in Bulgaria has tended to decrease during last 10 years. Over the next few years it is planned to afforest some 7,500 hectares. The relative percentage of broad-leaved species used in afforestation – mainly local oaks, common beech, lime, black locust, poplars etc. – has increased gradually reaching 50.4% of all forestry in 1991–1995 and 63.3% in 1996–1999.

In order to provide high-quality planting stock for the afforestation programme, a modern seed production system is organised based on the most valuable forest populations and gene centres which have been put under a special management regime. Some 5,375 stands (52,543 ha) have been selected including almost all species – autochtonous and introduced – which are of particular interest for forestry. Also 119 vegetative and generative seed orchards were established. Production of seedlings for afforestation is carried out in 300 state forest nurseries. This number is decreasing because of the reduced needs for planting stock for afforestation.

A National Forest Programme is now under preparation and discussion in Bulgaria. Its main objective is to ensure the sustainable development of forests.

Keywords: afforestation, forest plantation, forest fund, forest policy, sustainable forest development

Introduction

The total area of the Bulgarian forest lands amounts to 3,877.6 thousand hectares and amounts to 34% of the country's territory. In total forest area as part of the total land area (3.3 million hectares, 30%), Bulgaria ranks 19th in Europe.

Some of the major indicators for the structure and dynamics of the Forest Fund are presented in Table 1.

Positive trends are shown. There is a 17% increase of the total Forest Fund in 1995 compared to the forest area in 1965. This is due mainly to an expansion of the afforested areas, esp. the increase of stands of plantation origin from 0.521million ha up to 0.928 million ha. The share of the area of stands of plantation origin as part of the afforested area rose from 16.5 up to 29.3% for the period.

Because of the variation of physical and geographical conditions in Bulgaria there is a great diversity and uniqueness of flora. All the following factors influence the structure, distribution and yield of forest tree vegetation: the location of the Bulgarian territory between three phyto-geographical areas – the Mediterranean, the Steppe and the European broad-leaved forest; the diversity of climatic conditions resulting from the rugged relief and

Table 1. Changes in forest area in 1965–1998, in thousand ha (National Forestry Board).

Item	1965	1970	1975	1980	1985	1990	1995	1998
Total forest fund	3612	3709.1	3797.2	3845	3867.4	3871.4	3876.3	3877.6
Forest area	3144.3	3162.4	3228.1	3293	3320	3327.1	3334.3	3251.4
Stands of artificial orig.	520.6	628.8	769.4	949.4	1011.7	1032.2	976.1	928.1

existence of high mountains, lowlands as well as the sea impact; large scope of hydrological conditions, diverse rock types giving rise to varied soil types.

A large part of the forest area (approximately 80% of the total) is situated in the mountain regions. Bulgarian forests occupy steeper slopes and regions of higher altitudes. Only 4.8% of the forest lands are on slopes up to 4 degrees; 12.7% on slopes from 5 up to 10 degrees, 29% from 11 to 20 degrees and 53% over 20 degrees. Some 39.8% of the total forests have predominately environmental and protective functions. 85% of the water flow in the country originates on forest lands. The plain and mountain forests in this country play a key role in the conservation of biodiversity and in the development of recreation and tourism.

Coniferous species cover 1.07 million ha. The largest area is under Scots pine (16.5%). Austrian pine and Norway spruce taken together occupy almost the same area. The broadleaved species cover 2.28 mill. ha of the total forest area. Common oak is the most widespread species in the forests as it covers 32.2%, followed by common beech at 16.9%.

The mean annual increment is estimated to be 3.8 m^3 per ha and the total annual growing stock is 12.3 million m^3. Because of the intensive afforestation during last 50 years young forests up to 40 years old account for 54% of all forests.

Forest-political conditions

The contribution of the forestry sector to GDP in 1998 was 0.5%, however, the value of public-beneficial functions is many times higher. As in other Central and Eastern European countries, the state owned more than 95% of the forests during the last 50 years.

After the political changes in Bulgaria in 1989 the process of transition of the economy started. The forest sector development depended on significant changes connected with the change of property rights, restructuring of the sector, the building of new administrative structures, privatisation, etc. The legal bases of the changes in the forestry sector are the Forest Law, 1997 and Forest Restitution Act 1997, as well as Protected Areas Act 1998 adopted by the Bulgarian Parliament.

Restitution of forests and forest lands nationalised in 1947 is going on at present. After this process is over, the ownership is expected to be the following: 17% private forests; 57% municipal forests; and 23% state forests; 3% church and school forests.

Some 294,500 applications from former owners claiming their proprietary rights to a total of about 2.2 million hectares of forests exist. Most of them will receive on average 0.1–0.2 hectares. This represents the major problem both for forest management and for protection activities.

The NFB has been concerned about this situation and has pointed out in its policy provisions the necessity for the completion of the restitution process and the need for the stimulation of the formation the groups and unions of forest owners. Management of the state Forest Fund and the control over all forests and woodland regardless to their ownership is executed of the National Forestry Board in The Ministry Of Agriculture And Forestry (NFB).

The National Forestry Board determines the governmental policy in forestry, hunting, non-commercial fishing and management of protected territories on the forest land. According to its functions, it manages and controls: the organisation of the Forest Fund; the regulations on forests use and protection of the forests and wood lands; construction in the forests and financial support of activities in state forests. Sixteen regional forestry offices and 176 state forest stations are included in the structure of the NFB. Two Forest Seed-control stations were established to realise the NFB's policy in the field of forest seed production and control; forest selection; registration, management and conservation of the gene pool. Other units,

Forest Protection Stations, Experimental stations, Forest Information System are additional elements of the organisational structure of the NFB. For the direct management of the natural parks, special structures of the NFB, called Directorates, were established.

The principal goal of the forest policy of the NFB is the preservation, protection and development of Bulgarian forests as a national wealth through sustainable development and multifunctional use and management.

Recognising the fact that forestry is a business activity, which is also a part of an open market economy, the reorganisation of the state forestry sector continues. Measures aimed at the restructuring of the sector include: the establishment of 61 state companies to implement economic activities such as timber harvesting and trade, afforestation, thinnings and other works in state forests. Five of these companies have already been privatised, and the same process is expected to be followed, with the others.

Thus, the State functions of the NFB will be separated from the business ones. New ordinance on private forest practice licensing and instructions on execution of silvicultural operations in forestry, and on tending procedures for timber harvesting have been adopted. This gives the basic rules for business activities in forestry. In this way, it is possible for private foresters and companies to run on their forestry business on the market economy principles.

Afforestation practice in Bulgaria

Afforestation practice in Bulgaria was initiated at the end of 19th century. The establishment of the first forest plantations near Sofia, Kyustendil, Radomir and on the southern slopes of the Balkan Range began in 1880–1885. The planting of "Ayazmoto" (near Stara Zagora town), a park that is well known today, was considered very large for that time and is impressive even now.

Afforestation in Bulgaria has more than 90 years long history as a priority within the activities of National Forestry Board. This priority has been reflected in the forestry plans, projects and the strategy for development of the forest sector. Major investments were made and over 1.6 million hectares of forest plantations were established. The mean annual rates of afforestation are presented in Table 2.

In terms of the priorities and the scale of the afforestation in Bulgaria three periods can be recognised in afforestation history. The first one up to 1951 is characterised by anti erosion afforestation of bare and eroded grounds. In the period 1904–1909, six tons of seeds of Scots pine, Norway spruce, Corsican pine, Douglas fir, Black locust were brought in from abroad, as well as Scots pine seedlings from Germany, for establishing new forests. Between then and

Table 2. The mean annual rates of afforestation (National Forestry Board).

Period (Years)	Mean Annual Afforested Area (thousand ha)
1952–1960	49.310
1961–1970	56.480
1971–1980	49.480
1981–1990	33.790
1991–1995	12.500
1996–1999	8.580

1931, 44,700 hectares of forest plantations were established and in the period up to 1951 a total of 170,000 ha of new forests were there in the country (Kostov et al. 1997).

The second period was from 1952 up to 1980. During this period the most intensive afforestation programme was implemented. The objectives of this afforestation programme were to improve the condition and the productivity of forests, as well as to increase their environment protection functions.

This period is impressive for the scale of the work done and with the considerable support and participation of the local population in the work. Over 1.3 million hectares were afforested. More than 80 "Complex technical projects" for anti-erosion afforestation and construction of hydro-technical facilities were realised. The result of the implementation of projects on erosion control is biological stabilisation and correction of flood regimes of many torrential rivers. The erosion processes in most of the cases have been stopped and the waste lands have been converted into productive ones. A system of shelterbelts, utilising forest tree species, has been established for controlling erosion and improvement of the micro-conditions in farmland areas.

After 1960, afforestation was gradually firstly directed mainly to reconstitution of low-productivity stands occupying up to 45.2% of the total area afforested. and also to artificial regeneration of mature stands which were not regenerating (20% by area). Work on establishing two-storied stands and industrial plantations began after 1970 and their proportion of the afforestation programme reached 2.5% and 11.2% respectively. In the period 1981–1995 close to 0.4 million hectares were afforested with some 41% of these being in stands for reconstruction, 25% in bare and eroded grounds, 22% in mature not regenerated stands, and 2% in two-storied stands.

The third period, since 1990, is the transitional one after political changes. The main objective was defined to be the protection and preservation of the forest biodiversity and sustainable forest development.

As shown in Figure 1, afforestation in Bulgaria tended to decrease during the last 10 years. The actual area of forests planted per year is below the provisions in the forest management plans. According to these plans around 20,000 ha per year are planned to be afforested. For the next five years 7,500 ha are planned for afforestation. The actual figures show that this forest activity sharply diminishes from 30,000 ha in 1990 to 6,500 ha in 1999. The main reasons are:

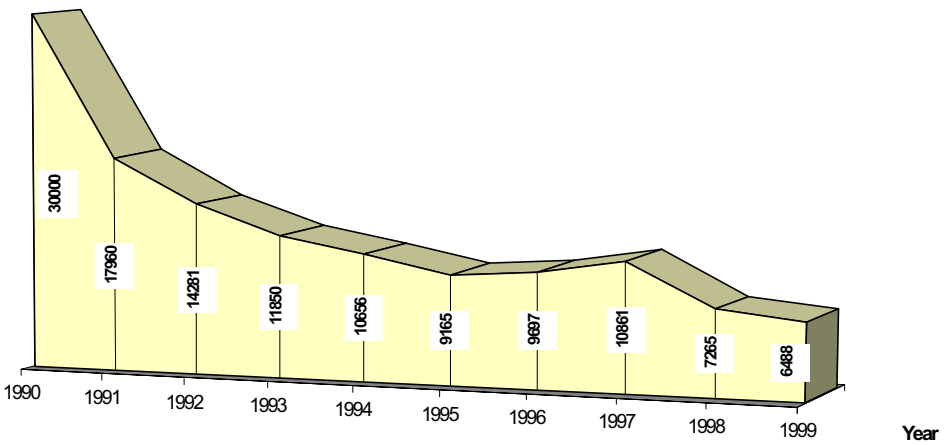

Figure 1. Afforested area in Bulgaria in ha.

- the economic transition affecting forestry (radical cut in the investment in afforestation and a reduction in wood consumption etc.)
- the priority of natural regeneration instead of artificial one, especially in high-stem stands
- problems related to the process of forest restitution.

The great diversity of edaphic, climatic, geological and soil conditions, relief-form, types of sites and ground cover determines the choice of tree species. This is the most important element of the afforestation activity. This process has been influenced by some economical and ecological conditions. The productivity of forests has been considered in the forest policy as the most important principle rather than their sustainability. Until 1990, priority in the composition of the forest plantations had been given to the coniferous species – mainly Scots and Austrian pine and Norway spruce. The non forested and clear-cut areas for reconstruction were also planted with coniferous species. Regeneration with the same species was also tolerated when main fellings were conducted in the stands.

Nevertheless, this period can be regarded as a great achievement for the afforestation practice in this country, especially in regard to the large-scaled plantations, most of them created with anti-erosion and protective purposes. But it has caused some errors both in relation to the choice of forest tree species and also in the use of monoculture planting. Afforestation with conifers beyond the boundaries of their natural distribution zones had as a consequence a deterioration of the ecological stability of many areas.

Since 1985 the forestry management practice in the country has been reconsidered. Its main objective was redefined to be the protection and preservation of forest biodiversity. The forest management practice and planning have been influenced by the decisions of the Rio Conference on Environment and Development (1992) as well as of the conferences on the preservation of European forests in Strasbourg (1990), Helsinki (1993) and Lisbon (1998), asserting the guidelines of sustainable forest management.

This resulted in a prohibition on clear fellings performed in high-stem forests, reduction of clear cuttings for reconstruction, extension of the share of natural regeneration, especially in the deciduous types of forests, as well as other activities. The reduction of the share of coniferous tree species by 1990 was also influenced by a change in the ecological conditions in the country. These conditions caused droughts and withering of a large number of coniferous plantations, mostly in those planted outside their natural habitat. Thus the relative percentage of the broad-leaved species used in afforestation – mainly local oaks, common beech, limes, black locust, poplars etc. gradually increased reaching 50.4% in 1991–1995 and 63.3% in 1996–1999 (Table 3). Afforestation nowadays is done mainly in:

- forests destroyed by calamities or damaged by abiotic agents and fires;
- coppice forests for conversion and reconstruction;

Table 3. Percentage of coniferous and deciduous tree species used in afforestation (National Forestry Board).

Period/ Years	Coniferous, %	Deciduous, %
1961–1970	72.6	27.4
1971–1980	78	22
1981–1985	65.6	34.4
1986–1990	59.1	40.9
1991–1995	49.1	50.4
1996–1999	36.7	63.3

- bare forest land as anti-erosion means;
- in areas to supplement natural regeneration.

A large portion of man -made forests is aimed at creation of protective forests in ecologically polluted regions and also of industrial plantations with fast growing species (poplars, willows).

Forest seed production and nurseries

In order to produce high-quality planting stock for the planting programme, a seed collection process was set-up on the same principles adopted in most European countries in compliance with the principles of forest genetics and breeding. On the basis of long standing inventory and improvement assessment records certain seed collection stands were marked off. Stands, mostly of autochtonus origin with high bio-productivity and stability, as well as high-quality stand composition were included in this base. In this way a valuable genetic resource has been selected for preservation and utilization. In total some 5,375 stands of a total area of 52,543 ha have been identified including almost all species both autochtonous and introduced These are the stands and the species which are of particular interest to the forestry programme.

These stands representing the most valuable forest populations and gene centres have been put under a special management regime with a view to seed production.

In addition to the above stands, 33 vegetative seed-yielding plantations of *Pinus sylvestris* L., *Pinus nigra* Arnold, *Abies alba* Mill, *Pinus strobus* L., *Picea abies* L., *Picea pungens* Engelm., Pinus peuce Griseb, Pseudotsuga menziesii (Mirb.) Franco and Robinia *pseudoacacia* L. of a total area of 155.2 ha have been established, as well as 86 generative seed orchards of Scots, Austrian and Macedonian pine covering a total area of 380.4 hectares.

The production of seedlings for afforestation is carried out in 300 state forest nurseries. As it is seen in Table 4, production is decreasing because of the reduced needs of planting stock for afforestation from 415 million plants in 1990 to 95 million plants in 1999.

Seedlings of over 30 coniferous and 60 broad-leaved tree and shrub species are produced in forest nurseries. The main coniferous species represented in this production are: Austrian and Scots pines, Norway spruce, Macedonian pine, mountain pine as well as Atlas cedar,

Table 4. Rate of seedling production in forest nurseries in 1990–1999 (National Forestry Board).

Year	Number of species	Seedlings produced (million)		
		Total	Coniferous	Deciduous
1990	95	415	334	81
1991	90	229.5	236.4	63.1
1992	84	214	158	56
1993	81	144	105	39
1994	90	144	107.5	36.8
1995	96	156	97	60
1996	93	133	80.7	52.3
1997	95	137.8	71.3	66.5
1998	95	113.5	69.4	44.1
1999	88	85.7	57.8	27.9

Douglas fir, cypresses, Caucasian fir, European larch and Thuja species. Local oaks, common and Oriental beeches, Black locust, limes, Greek maple, ashes, poplars, forest-fruit and other species comprise the main part of the deciduous seedling production.

The National Forest Programme is now under preparation and discussion in Bulgaria. Its main objective is to ensure the conservation, management and sustainable development of forests. Some of the basic measures concerning afforestation to be considered are as follows:

- Application of the whole range of forestry methods and techniques of management and regeneration, giving priority to natural reproduction of forests and maintenance and enrichment of the forest biodiversity.
- Creation of sustainable forest plantations by using native species (genetic resources) with good adaptive abilities to ecological conditions.
- Afforestation of eroded and bare land and forests damaged by fires and calamities.
- Maintenance and enhancement of forest productivity and extension of the share of industrial plantations including such for energy production.
- Afforestation of bare agricultural lands in rural areas with fast-growing species or with species for forest fruit's production aimed at giving added value to local landowners through forestry.
- Financial support to forest and land-owners' activities concerning afforestation.

One of the main goals for foresters in this country is the attainment of an optimal proportion between natural and artificial regeneration of forests aimed at sustainable forest development, maintenance and enrichment of their biodiversity.

We consider forest management should be based on long term policy, on periodically updated programmes at a local, regional and national level. It should provide an ecologically suitable and economically acceptable combination of functions and potential benefits from forests.

The process towards formulation and implementation of the National Forest Programme (incl. afforestation) is seen as a work of partnership and collaboration of all public and private actors who are interested in forests, at national and international level.

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Specific Problems Concerning Afforestation in Germany

Afforestation vs. Protection of Scenery

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Summary

Promoted by generous subsidies, the afforestation of formerly agricultural lands has lately gained much importance in Germany. As afforestations always imply some impact on the scenery, nature conservation law must be considered before an afforestation permit can be issued. The following contribution explains the criteria for the assessment of the scenery given by European and Federal law as well as the laws of the state of Baden-Württemberg, and how they have been defined by the courts. Furthermore, the repercussions of nature conservation law requirements on the decision whether an afforestation permit will be granted shall be described. The author will introduce seven criteria and standards for a more objective assessment and for consensual solutions in difficult cases.

Keywords: afforestation, scenery, nature conservation, nature conservation law

1. Introduction

In spite of its undeniably positive effects the augmentation of forest lands may come into conflict with nature conservation concerns, especially with the protection of the scenery. A clear definition of the legal interest “scenery” is hardly possible, neither in theory nor in practice. As a consequence, in practice, the scenery will either not be assessed at all, or the assessment criteria will be chosen arbitrarily, differing greatly from case to case. It is thus evident that there is danger of incongruent execution of the laws. Another open question is the aesthetical evaluation of afforestations. The problem is even aggravated by the instance that afforestations may be said to have also favorable impacts on the scenery. This can be concluded from the German forest laws which stress the recreational value of forests.

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2. The scenery as a legal interest

The obvious question is whether it is at all necessary to grant the scenery protection under the laws. Should not the landscape, being a self-evident truth, be considered beyond legal provisions? Is it not rather another sign of overregulation to discuss legal aspects of the protection of the scenery? The history of nature conservation law gives us a plain answer: The very first nature conservation regulations in Germany were issued to protect the beauty of the scenery. The „Drachenfels“ (Dragon Rock) on the Rhine River Shore was the first protected area in Germany, and this for aesthetical reasons only. At the same time the notion of a “natural monument” as opposed to manmade monuments was brought about.

In the following time the aesthetical protection was further extended, and the harmony of aesthetical and functional protection which can be observed in current nature conservation laws developed. It has found its legal expression in Section 1 of the Federal Nature Conservation Act (FNCA) which numbers the legal interests of nature protection: On the one hand, there are the economy of nature, natural goods, fauna and flora, on the other hand, the diversity, singularity and beauty of nature and scenery.

It may be stated, therefore, that the protection of the scenery is an essential of nature conservation, mainly as a requirement for the recreation of man, but also as an indication for the efficiency of the ecology in question.

3. Legal provisions for the protection of the scenery

3.1 European Community law

The most important European provision in the field of nature conservation law is the Council Directive 92/43/EEC. On the basis of this regulation the European conservation network system “Natura 2000” is currently being established aiming at the conservation and ecological development of specific habitats of protected plants and animals. This program will include several forest societies as well as animal and plant species inhabiting the Middle European woods. Another regulation of the same great importance is the Council Directive 79/409/EEC which is directed at similar goals with a similar conception, but focused only on the protection of wild birds. It wants to achieve this goal by protecting the birds´ habitats and establishing bird sanctuaries where they rest and where they breed.

Both regulations, however, concentrate on functional protection of species, ecosystems and habitats only. If they lead to any protection of the scenery at all, it is just as an involuntary reflex, as natural habitats may well be of aesthetical importance as well – natural grasslands for instance, or decidious mixed forests.

3.2 Federal and state nature conservation laws

Additional to the above cited general provision of Section 1 FNCA, the federal and state nature conservation laws comprise more precise clues as to which landscapes have to be considered valuable. One of the principles of nature protection is, for instance, to avoid the devastation of the landscape or parts thereof through the exploitation of mineral resources. Another principle under Section 2 FNCA is to preserve the singularity of historical, cultivated land. In order to protect the diversity, singularity and beauty of the scenery, the land is to be maintained and to be sheltered against any impairments.

The protection of the scenery is a prominent legal interest especially with regard to establishing landscape protection areas. The setting aside of such areas requires diversity, singularity and beauty of scenery. Natural monuments may be set aside for their particular characteristics or beauty, e.g. rivers, creeks and meadows. In order to maintain the scenery of towns and landscapes, public greens, avenues and tree ensembles may be legally protected as well.

The interference clause, found in all nature conservation laws, provides for a minimum standard of nature and landscape protection. It concentrates on avoiding interferences with the scenery caused by changes of land use. Impairments of the scenery must be compensated for, if they cannot be avoided at all. Compensatory measures must aim at the restoration of the landscape, or at least ensure the creation of a new landscape architecture. On balance, if a compensation is not possible, the interfering project may be entirely enjoined for reason of protection of the scenery.

Finally, it is possible to oblige land owners to suffer maintenance measures on their grounds, if otherwise the landscape were exposed to harms and dangers. The state law of Baden-Wuerttemberg even obliges the owners of agricultural land to cultivate and maintain their fields in order to avoid natural seeding and afforestation. Therefore, it can be concluded that under the law, natural development may cause harm to the scenery.

3.3 Other legal provisions

Apart from the nature conservation laws, other laws also contain references to the protection of the scenery. Especially building law provisions are directed to avoid the disfigurement of the scenery and the particular characteristics of the landscape caused by building projects in the country side and outside townships. Protection of scenery is also a legal interest of the Environment Impact Assessment (EIA). The German EIA-Regulation requires a detailed account of a project's impact on the scenery. Possible impairments of the landscape, its structure and characteristics must be assessed.

3.4. Conclusions

As a conclusion, the following assessments can be obtained from the analysis of the legal provisions on the protection of scenery:

- Landscape scenery is protected under the laws in settled as well as unsettled areas, cultivated as well as natural lands.
- The protection of the scenery refers to the general characteristics mentioned in the principal section of federal and state nature conservation laws, i.e. to diversity, singularity and beauty. Therefore, an objective assessment of landscape can be carried out on the basis of these three general criteria.
- As with functional nature protection, there is also a graduation of the aesthetical requirements for scenery protection, e.g. between natural preserves and landscape protection areas, or, more general, between explicitly protected areas and areas protected only under the minimum standards of the interference clause.
- The laws comprise no definition of landscapes worth of being protected nor do they provide any methodical instructions for the assessment of the scenery. A comprehensive synopsis of the provisions produces a great number of landscape characteristics to which the nature conservation laws yield particular importance. There is no such regulation as a

"Technical Instruction for the Assessment of Scenery", nor will there be one in the foreseeable future. Therefore, the authorities concerned with afforestation applications are left the challenge and the freedom of assessing and deciding according to their own judgment in the individual cases.

4. Guidelines given by the courts

As it is with all indefinite legal terms, it is particularly interesting to examine whether precedences with respect to the protection of scenery can be applied to help solve other individual cases.

However, it is obvious at first sight that all precedences comprise only very few general assessments, simply because they always relate to individual cases. The criteria developed by courts vary greatly and can hardly be classified. The only indisputable assessment is that such interferences which mar and disfigure the landscape can be considered deterioration of the scenery. All other, less far-reaching damages to the scenery are assessed by the courts by the help of the legal construction of *bona fide*, thereby referring to the "judgment of an average, well-educated onlooker, receptive to the ideas of nature and landscape protection" who is to be neither particularly in favor nor against nature and landscape conservation. It is quite obvious that this role of the well-educated, unbiased and open-minded onlooker is usually taken up by the justices themselves, so that experts opinions will generally not be called for.

However, even the receptive and unbiased onlooker will need some points of reference to give his perception a reliable background: According to court decisions, the scenery is affected when the landscape surface is changed in a detrimental way and when the project appears as an alien element in the scenery. This is not only to be referred to the naturally grown landscape, but also to the scenery as it has beeing developed and shaped by man in centuries. The assessment is to cover a certain greater region, relating the current land use to the intruding, alien use, the relation being a decisive criterion.

Another opinion claims that the main criterion for the impairment of scenery is whether the characteristic of the landscape as a whole is being changed. Changes of only particular features of the scenery are not to be supposed detrimental. Such judgments would promote „salami" strategies to destroy the landscape, i.e. subsequent afforestations of small areas, being insignificant themselves, would eventually lead to a change of character of the whole area – which by then could no longer be called an impairment, as the small changes before would already have diminished the value of the scenery bit by bit.

A different precedence stresses the typical singularity of the landscape which can be considerably damaged by afforestations, especially with coniferous forests. Here, the justices point out that what matters when assessing the impacts of an afforestation is the future appearance of the young forest plantation, not its current state.

Lately, the Federal Administrative Court has emphasized the significance of nature conservation law provisions on the worthiness of protection of the particular landscapes. The court refers to the legislative intention to distinguish between areas set aside as protected areas under nature conservation law, therefore being particularly worthy of protection, and landscapes that are not protected under the law and hence not particularly in need of protection. Only the former type of scenery may acquire the benefits of protection against all adverse changes of the landscape.

Conclusion: The legal provisions and the courts' interpretation of the laws produce a pattern of argumentation, but do not provide a clearcut assessment method or even a checklist. The aesthetical impression the scenery makes on the reasonable onlooker is finally

decisive. Therefore, all assessments should include detailed reasons, referring to the overall impression as well as to individual features of the landscape, also giving a concrete description of the landscape and of the impairments to be expected.

The courts are receptive to a scientific method of assessment of scenery, but have to clearly state its application and requirements in their decisions. Additionally, the Federal Administrative Court's precedence on the significance of legal provisions for the evaluation of the landscape should become the point of reference for an assessment more directed at legal criteria. This shall be referred to in detail as follows:

5. Afforestation and the protection of scenery

5.1 The requirement of an afforestation permit

The augmentation of forests lands is one of the principle goals of the German forest laws. However, as other legal interests, especially nature protection interests, may be adversely affected, afforestations require an authorization procedure under Section 25 of the Baden-Wuerttemberg Agriculture and Land Maintenance Act (LLG). There must be a scrutiny whether significant reasons stand in the way of granting a permission or require at least particular injunctions. In the course of the procedure all relevant legal provisions must be observed, especially nature conservation laws, as explicitly governed by Section 25 II No. 3 LLG. Under this section, afforestation measures can be inhibited if they were to inflict severe damage to the scenery. If, however, none of the listed reasons for the refusal of a permit is relevant, the applicant has a legal claim to be issued the afforestation permit.

The procedure must follow the general requirements for lawful administrative proceedings; in particular it must meet the demands of the principle of commensurability. Consequently, the authorities´ decision must be suitable to the case, the least intrusive means and proportionate to the applicant´s financial and economic needs. A permit under legal conditions is therefore to be preferred as a less intrusive means compared to a complete denial of permission. At the same time, a comprehensive balance of the owner´s and of public interests must precede the issuance of any conditions and directions with the permit. Only where serious public interests oppose an afforestation and cannot be overcome by additional instructions (e.g. with regard to the composition of tree species, woodside design) may (not must!) authorities decline the permit.

5.2 Relevance of nature conservation law criteria

5.2.1 Natural preserves and other protected areas

Authorities may set aside certain areas as preserves unter the nature conservation laws. Ordinances provide obligations as to what must be done or suffered by the land owners in these areas. They also rule which cultivation or tending measures are permitted, which are inhibited and which may be performed without the need of obtaining a permission at all. Depending on the category of conservation, the obligations imposed vary greatly in character and proportion. Areas set aside as being of „Common Interest“ under the EC-Regulations enjoy an even greater, i.e. stricter degree of protection than areas protected under Section 19 b et. seq. FNCA.

Protected areas can be roughly divided into two groups: In natural preserves, on the one hand, afforestation is usually opposed by a general interdiction to alterations of the area, including changes of scenery. On the other hand there is no general interdiction of alterations in landscape conservation areas and in so-called nature parks. Here, only such interferences are prohibited that are likely to change the character of the area as a whole. Therefore, a close scrutiny must be performed whether an afforestation is eligible to affect the character of the – usually wide – region at all. More detailed directions to that question can be found in the conservation objectives laid down in the ordinances at question. When issuing such ordinances, the relevant authorities are obliged to carefully elaborate the conservation objectives and to give detailed information why the scenery – if that is the case at all – is precious and worthy of protection from an aesthetical point of view. Only when these requirements are met, afforestations in landscape conservation areas may be considered unlawful.

5.2.2 Ecosystems protected under the laws

Nature conservation laws rule that the devastation or other significant and lasting alteration of particular enumerated biotopes (e.g. certain wetlands, deserts, etc.) is unlawful. These ecosystems therefore enjoy immediate protection under the laws and are subject to an interdiction of alteration similar to that of natural preserves. The interdiction of alterations applies immediately, though, without the need of an extra administrative act. Exceptions may be granted in particular cases, but only when required by predominant public interests or when actual compensation of all adverse effects is possible.

By the concentration explicitly on the status quo of the protected ecosystems, the laws leave no room for any other point of reference to assess the lawfulness of utilization and other measures. Afforestations obviously always alter the status quo and are therefore always be considered an interference, even if they cause no adverse effects on the ecosystem as a whole. The same applies to the aesthetical status quo – the change of scenery is also subject to the general prohibition of alterations as is the change of the ecological composition of species. Although the scenery is no particular object of protection the conservation of particular ecosystems under the law thus also serves to protect the landscape and its recreational value.

5.2.3 Interference clause

The interference clause (which allows an environmental impact assessment) provides for additional protection of the scenery as it applies to all areas irrespective of their status of protection. It enables authorities to impose sanctions in cases of alterations of the surface which adversely affect the ecology of the scenery due to building or other projects:

In the first place, particular avoidable injuries caused by the interference may be prohibited. Second, the compensation of inevitable injuries may be required. If that is not possible, the interference as a whole may finally be prohibited. Alternatively, authorities may claim compensatory payments instead, which in practice is much more often the case.

Afforestations are not necessarily interferences under nature conservation law, this decision calls for a close consideration of all circumstances. Even though afforestations always cause an alteration of the surface and the mode of utilization of a region, they do not always lead to an impairment of the ecology or the scenery.

As opposed to the legal protection of particular ecosystems, the interference clause refers not to an area's status quo but to the ecological efficiency and capability of the place as well

as to the landscape scenery in general. By doing so, the interference clause allows for a comprehensive consideration of all effects caused by the subject of interference. As long as the afforestation results only in a qualitative alteration but not in a deterioration of the ecology and/or the scenery, it is not to be considered an interference. With respect to the protection of scenery this implies that the aesthetic effects of an afforestation are not to be judged just by the current state of an area previous to the plantation, but also by the aesthetical development of the area which is to be expected. Provided that an afforestation represents an interference with the ecology and scenery of an area, an examination must then take place whether the injuries going along with it can be avoided or equalized. In these cases, the afforestation permit must comprise corresponding instructions.

Under nature conservation law, an interference is considered equalized when after its conclusion no significant or lasting impediments to the ecology are left and when the landscape is restored or remodeled appropriately. The objective is not an equalization in a scientific-ecological sense, but only a compensation as far-reaching as possible. It is considered sufficient if the equalization measure functionally relates to the impediments inferred by the interference. It must not be performed on the same spot but only within the region where the repercussions of the interference are still in effect. According to the Federal Administrative Court, impairments of the scenery are equalized, when it is achieved to create a state of scenery within the region concerned which maintains the former landscape features and functions without surrender of significant aesthetical characteristics.

This approach, however, emphasizes too strongly the reference of equalization measures to the status quo and leaves not enough room for an aesthetical evaluation of utilization and other measures which result in an altered, but not necessarily qualitatively deteriorated landscape. Instead, the general directive to apply is that the interference clause is aimed to prevent the deterioration of the ecology as well as of the landscape, yet it allows for an appropriate restoration or remodelling of the scenery. Otherwise, the interference clause would be upgraded to become an instrument for an overall conservation of the status quo of scenery which was obviously not the intent of legislation.

In those few cases where equalization measures for the impediments inflicted by an afforestation are not possible or insufficient, compensatory action must be considered. Compensatory measures are meant to restore the injured features of the affected regions to their former condition. As opposed to equalization measures, compensation is in practice allowed to take place much further away from the actual interference. Still, it must be observed that an interference with landscape features requires compensation measures which ensure similarly valuable features of the scenery within the region in question. It may, for instance, be difficult to compensate for the loss of diversity due to the afforestation of an open valley in the Black Forest without a deforestation in another place.

Finally, it is possible unter the law to demand compensatory financial indemnities. As these payments must be employed appropriately it is ensured that compensatory payments cannot be abused as “cheap ransom”.

5.2.4 Afforestation planning

In the state of Baden-Württemberg, the local governments can set aside in zoning ordinances areas for afforestation and areas closed for afforestation. This way, they are enabled to direct the forest development within their municipalities. Local afforestation planning is particularly called for where the planning area is subject to lasting changes of the landscape, e.g. due to the closing down of agricultural areas and farms, and where thus afforestations on a large scale may be expected. By an early participation of relevant authorities and representatives of

interests conflicts can be avoided and interests balanced even before the commencement of the actual planning process. Obviously, this applies just as well to problems and conflicts with respect to the field of tension between afforestation and the protection of the scenery.

6. Conclusion

Conflicts between afforestation concerns and the protection of scenery may appear surprising for outside observers. In practice, they usually prove to be the result of the European Community's undifferentiated structural policy and the performance of the German authorities who grant subsidies for afforestations in order to promote the closing down of agricultural enterprises and farm lands as well as to advance economically week regions rather than to further the regionally appropriate augmentation of forest lands. By taking a closer look it is easy to imagine which sensitive areas should be exempted from afforestation from an aesthetical point of view, e.g. valley meadows in well-wooded areas. As a conclusion, the following theses evolve:

- The framework set by the laws and precedents for the assessment of a landscape is rather wide. What is necessary is a reasonable discussion of the relevant features of the scenery in question, taking also into consideration the course of development that can be expected if an afforestation is at question.
- Even though the assessment may be difficult in particular cases, authorities are obliged to guarantee the protection of the scenery. The nature conservation laws comprise an abundance of legal directions and references with respect to the aesthetical protection of the scenery. They establish the authorities obligation to protect the landscape as well as they supply the necessary criteria for the assessment.
- The legal criteria must be applied to all cases, especially the distinguished standards of the irrispectively relevant nature conservation provisions laid down in protection ordinances, legal protection of particular ecosystems and local afforestation plans.
- The resulting evaluations and decisions must refer to the "average, reasonable and unbiased onlooker". This requirement is not met when a decision is only sensible to an ecological expert, if it seems partial to only one side and if it shows no concern for the aesthetics of the scenery.
- Afforestation planning gives an opportunity for a qualified assessment and early solutions of conflicts.
- Appropriate decisions require constructive and cooperative participation of all relevant authorities. Missing coordination in the run-up of decisions increase the risk of later law-suits.
- A change of the current support policy would ease the practical problems of granting afforestation permits. Not everything which is desirable from a nature conservation or forest policy point of view it is also worthy of being subsidized!

Afforestation from the Point of View of Nature Conservation

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Abstract

This article weighs the most important arguments that can be advanced for and against afforestation from the point of view of nature conservation. At the same time it is emphasized that nature conservation itself pursues several rather varied aims. Some of these can best be fulfilled by afforesting areas which have been used agriculturally or otherwise before. Mostly with regard to the specific aims of the protection of biotopes and species, though, the close examination of every single case is imperative. Generally speaking, however, and on condition that the growth of shrubs of local provenance is properly promoted, there are good reasons for strongly supporting the efforts of nature conservation for afforestation.

Keywords: afforestation, agricultural policy, nature protection, protection of species

Preliminary statements

In order to be able to correctly appraise and understand the differentiated attitude held by many ecologists and conservationists on the topic of forest increase, certain basic facts have to be expressed and taken into consideration, although they might appear self-evident or even trivial to the one or the other among the audience. Before entering upon the subject proper, I should like to make the following five preliminary statements.

First, it is an accepted fact that until man gave up his nomadic way of life in favour of a settled form of existence, Central European landscapes have been dominated by huge primeval forests. With a few exceptions (i.e. pine mountains, moors, riverine and coastal marshes etc.), our part of the continent was originally covered with woods. It is also well-known that wherever human interference is withdrawn or comes to an end, the forests begin to regrow.

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Second, we have to state that today there is practically no primeval forest left in Central Europe, that is forest that has been handed down to us untouched and unchanged. Our forests are part of the cultural landscapes which human influence has shaped over thousands of years, and their present form is determined by their particular location and the uses they have been and still are put to (Pflug 1992). It is characteristic of cultural landscapes that they are subject to their own particular dynamics. They can evolve into multiform patterns, and often their ecosystems offer a habitat to a variety of plant and animal species greater than that of the ancient forest.

Third, with the exception of misplaced softwood plantations, forests, and even cultivated forests, compare favourably with other forms of modern agriculture because of their near-naturalness. They differ from other cultural ecosystems by the form, the intensity and the intervals of human interference. Intensive forest cultivation with its preference on a highly differenciated stand of timber ensures working nutrient cycles and guarantees a high biological diversity. This, however, is not true of Christmas tree and timber plantations that are exploited in short intervals (3 to 5 years). These are expressly excluded here as they cannot be considered as forests proper.

Fourth, among the various differing aims pursued by nature conservation a special emphasis is placed on preserving the variety of plant and animal species in our historically developed cultural landscape and its biotopes. Equally important are further conservationist aims as they are stated in article 1 of the Federal Law for Nature Protection and in the environmental laws of the "Länder". They concern the management and protection of the balance of nature as well as the further development of its productivity, so that its resources may contribute to securing the basic necessities of human existence. These laws are also committed to preserving the variety, the individual character and the beauty of the natural landscape as a prerequisite for finding repose in our densely populated country. Finally, natural landscapes play an essential role in the process which makes people identify with a certain part of the earth as their homecountry.

Fifth, we must preliminarily consider the fact that forests can be increased in two very different ways. There is either the possibility of introducing a planned afforestation programme, or one can rely on the spontaneous development of fallows into scrubland.

Afforestation and nature conservation

As forests cover only about 30% of the area of Germany, and as they are spread out quite unevenly, a forest increase is basically to be viewed favourably. If forests grow larger, there is a perceptible reduction of the pollutions caused by intensive agriculture with its abuse of biocides and nitrogen for fertilization purposes as well as of those due to drainage and farming methods that further erosion. The loss of water by seepage is reduced as well as soil erosion, especially in sloping terrain, and the amount of humus in the soil rises continually. Gradually, new forests take over more and more of the protective functions we favour so much in the mature ones: they clean the air, level out climatic extremes, screen off ugly views and noise, stabilize slopes and banks etc.

These multiple functions that forests fulfil enhance their value for nature conservation. The latter also supports, however, the production of timber as a regenerating raw material the use of which can contribute in various ways – not to be explained in detail here – to relieve the

strain on the balance of nature, which is disturbed by the inducement of artificially generated substances into the ecosystems of our cultural landscape. Although the amount of water used up by the forests themselves will increase as well as probably the quantity of harmful substances that are filtered out of the air and passed into the ground and surface waters, this should not be so important as to speak against a forest increase in our country.

As prices for agricultural products are stagnating or even decreasing and as agriculture is losing jobs to other lines of production, chances for a successful forest increase are comparatively high. However, such an increase is often not advisable in precisely those areas where larger forests are most needed, namely in the monocultural deserts created by modern intensive farming, and in the neighbourhood of cities and industrial centres (Figure 1, Bundesamt für Naturschutz 1999).

The larger the forest which is already there, the more careful can we be about increasing it. In any case, new forest should not be grown if it cuts across or limits the range of meadowed valleys with fringing forest. Moreover, afforestation and scrub-growing on former agricultural lands must not cause entire villages and settlements to disappear in the thick of the forest. Viewpoints and aisles dear to inhabitants and visitors alike as well as historically interesting clear-cut boundaries between forest and farmland have to be kept cleared.

Softwood monocultures – possibly in geometrical patterns, introduced into the agricultural landscape regardless of the topographical situation, or simply protruding from the forest into the surrounding farmland, – are generally not accepted by the public, mainly for aesthetic reasons. Contrary to that, a forest increase fostering indigenous hardwoods or mixed forests often complies with the popular wish for natural variety and beauty, particularly if the new forest adapts well to the existing topographical features. Afforesting purely with softwoods goes against the declared aim of the “Länder” to increase the percentage of hardwood, and it undermines the acceptance of afforestation in general by great parts of the population as well as by conservationists (Bundesamt für Naturschutz 1997).

The assumption that it is impossible to start afforestation with hardwood and that spruce or pine trees have to be used instead, to be mixed with hardwood only 50 to 80 years later, has often been disproved. If necessary, a pioneer crop can be left to grow naturally and then be completed by plantations of additional forest trees.

Objections to the increase of the presently existing forest are raised chiefly where the protection of species and biotopes is concerned. Over long years, extensively cultivated fields have become the habitat of a great variety of plants and animals which have successfully adapted to the poor locations and their particular conditions of cultivation. They would not survive in the standard sites typical of our region (which provide plenty of nutrition and are neither too wet nor too dry), chiefly because they would soon be superseded by competitive species.

Therefore, the protection of species and biotopes will take precedence over afforestation wherever there have been preserved rough fields, meadows and pastures as well as dry grasslands – or wetlands, or where an extensive cultivation is guaranteed (Stichmann 1992). In a minor degree, this is also true of areas which can only be kept cleared in the course of landscaping and where the new growth is constantly cut and composted. In these cases, the possibilities of scrub-growing or afforestation on the one hand or clearing on the other must be weighed up with particular care.

As a matter of course, nature preserves destined to protect species and biotopes as well as heaths, rough pastures, arid grasslands, wetlands, or other vestiges of the historical development of the landscape are generally exempt from afforestation or even the toleration of natural scrub-growing. However, in certain cases new forest may serve as a buffer zone for the protection of moors, marshes and surface waters against pollution by fertilizers or biocides from the neighbouring farmlands.

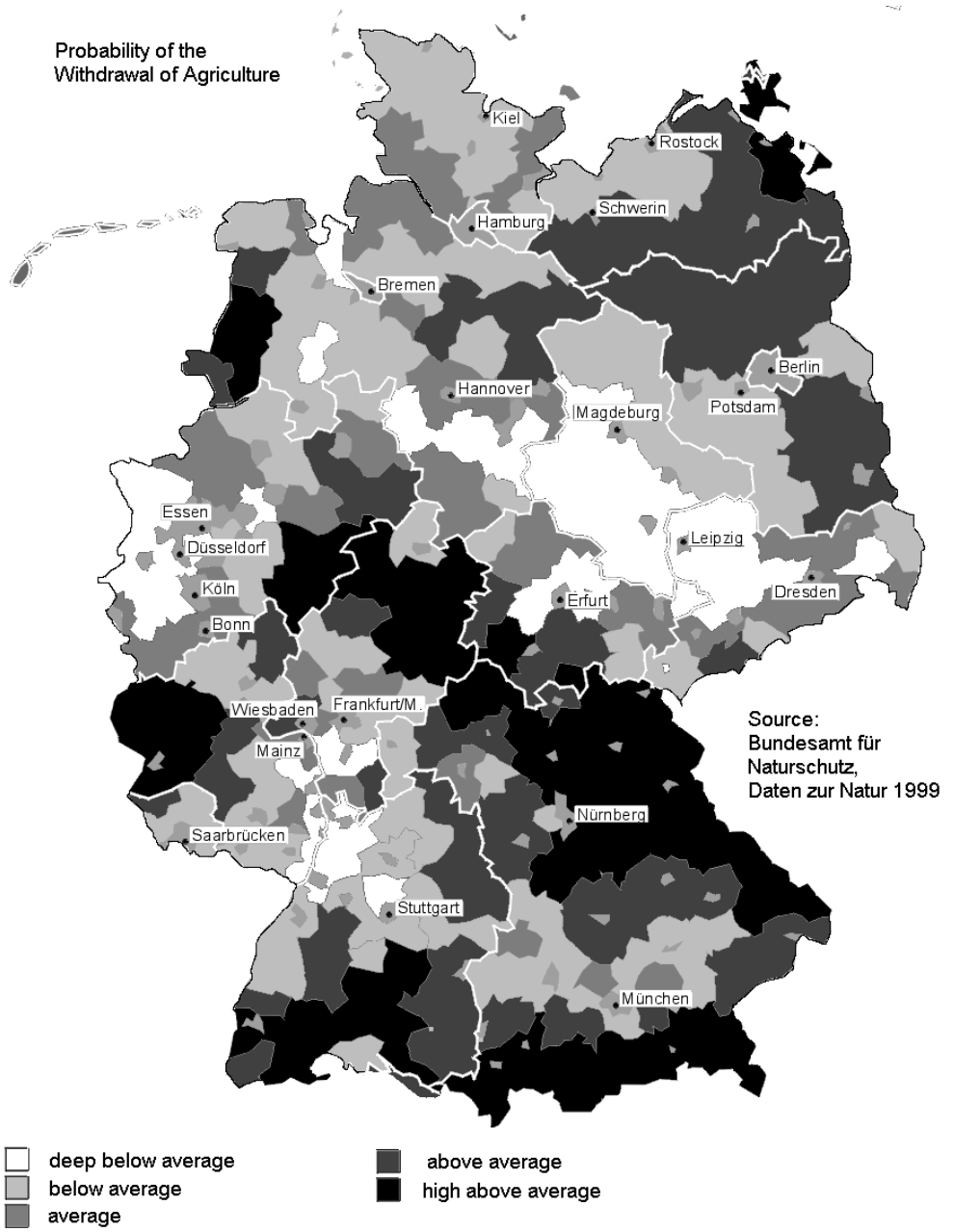

Figure 1. Probability of the withdrawal of agriculture.

Some conservationists believe in preserving a certain amount of potential farmland for future agricultural exploitation, in case intensive farming should gradually be replaced by more extensive forms, which, however, would necessitate the farming of the entire arable surface in order to ensure the sufficient supply of the entire population of the region with agricultural products. At the time, however, there is no reason to fear such a development.

Unfortunately, the acceptance of afforestation is particularly low in those areas which are presently to be agriculturally exploited. Often, there is hardly any forest there at all, which of course would make afforestation most effective as a limit to agricultural overproduction. For various reasons it is desirable to cultivate groves of trees and shrubs in these areas, where they could serve as valuable retreats and stepping stone biotopes for plants and animals.

Some conservationists have a rather reserved attitude towards afforestation in general. They argue that new forests may well compare to their mature counterparts when it comes to the tree stratum, but they often take very long before they have developed into equally complete forestal ecosystems. This is a valuable argument which should be kept in mind if objections against interference with mature forests are lightly dismissed with promises of compensation or substitution by way of afforestation in another location.

Depending on the soil, climax forests may indeed need very long periods of time to mature; only in young raw soil is the development somewhat accelerated. Even if afforestation takes into consideration the variety of species with regard to the expected climax vegetation, the ensuing ecosystems often do not reach the same degree of completeness as the mature forests in their ancient locations.

The best success is promised by a forest increase building up on already existing mature forests. Should well-developed forest edges be lost in the process, they should belatedly be regrown in other locations where they have been missing so far. If afforestation takes place on lands which have previously been put to different uses, enough room is to be left for the present development of multilayered edges. The local shrub vegetation allows for a suitable choice of seedlings, which should best be planted rightaway. Not only with the trees, but also with the shrubs, it is highly important where the seedlings come from. Experience has shown that nurseries often do not provide planting material typical of the region, but merely supply foreign plants or even breeds, which, however, should not be used in the interest of the protection of species.

Among those sites where a forest increase is particularly desirable for the protection of species, floodplains in river valleys are most important. The last vestiges of floodplain forests deserve an increase for several reasons, though it will be a matter of deliberation in every single case whether the increase shall be achieved by afforestation or the spontaneous development of the forest vegetation.

In this context it should be a general rule to determine in the first place if an area that seems suitable for afforestation meets the requirements of economics and business management. There are areas which are evidently borderline cases from the point of view of forestry, as for diverse reasons failures or considerable difficulties are sure to emerge at some point or other between the planting of the seedlings and the harvest of the timber and as therefore profits appear doubtful. These should in any case be left to their own natural development.

Species and biotope protectors generally consider such a natural development to be the best way of achieving a forest increase, as the succession of shrubbery and pioneer forest with willow, birch, aspen etc. offers the best possibilities of immigration to the complementary species of plants and animals. In particular cases, however, it might be preferable to anticipate or even reconstruct a climax forest by way of a well-directed afforestation programme. Such a decision will depend on various circumstances such as the particular site conditions and its previous utilization, the presence of the expected species of trees and shrubs, the neighbours´ acceptance of the “wilderness” and further factors inimical to forest growth, such as the existing species of game and the density of their populations.

I would like to conclude as follows: cultural landscapes have always been subject to change. Periods of relative stability have always been followed by ones of greater dynamics. Together with the urban-industrial change, the shifting of borderlines between forested and open landscapes have shaped the aspect of Central Europe most strongly, beginning with the

successive early clearing periods and lasting through phases of desertification in the Middle Ages until our programmes for forest increase today. And it will continue to do so.

The damage caused by interface and social fallow, fragmentation of property and the enlargement of bare ground as a result of industrial intrusions make us think about a new forest increase today. Generally, nature conservationists support these efforts, at least in the face of the further intensification of agriculture, as the reafforestation of open surfaces leads to a stabilization of the ecological situation.

However, this does not mean that afforestation is to be approved of everywhere and in whatever form. Decisions must be reached after considering the size of the already existing forest, the scenic value of the landscape in question and the overriding importance of the protection of species and biotopes. Those surfaces which are not available for afforestation or the successive development of natural forests have to be excluded as early as possible, and at the same time preferential areas for afforestation must be emphatically propagated. Maximum demands concerning the conservation of the status quo should be dismissed as well as demands for one-sided afforestation.

People have always objected if their environmental conditions changed too fast or too radically, as certain aspect of the landscape play an essential role in their identification with their home country. This forms, among other factors, the background to the wide-spread protest against the “destruction of the landscape” by old-fashioned forms of reallocation and the fast expansion of Christmas tree plantations in several parts of our country.

The forest increase will not take place in such a fast and radical way. If the objections which have been raised in particular cases against afforestation are seriously considered and carefully debated, general acceptance by the public as well as the conservationists can be counted on. A prerequisite, however, is the renouncement to softwood monocultures as they contradict the intentions of modern afforestation policies and silviculture as well as those of ecology and nature conservation.

Afforestation with local shrubs growing up into hardwood or mixed forest and the application of modern methods of forest cultivation should in every case be the basis of the growth of new forests. Of course it is preferable to plant those types of wood which are to be expected in a climax forest typical of the site, and which correspond to the potential natural vegetation. Many ecologists and conservationists think this aim is best reached by leaving the forest to its natural development, namely the regrowing of scrubs and pioneer forest (Stichmann 1994).

On the whole, forest increase in the right place and in the right composition is a task that will not be achieved in the next few years, but that will occupy us throughout the new century we’re just entering upon. In the achievement of this task, nature conservation is ready to play its part!

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Formal and Informal Acting During an Official Procedure to Approve Afforestations in Germany

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Abstract

The focal point of this report is the description of the informal acting within the official procedure to approve afforestations. The objective is the observation of the behaviour of persons involved in the process. The results are based on a 6-month case-study carried out in 1997. The aim of the study was to analyze the informal acting of persons and authorities in the course of a procedure to approve afforestations in the state of Baden-Wuerttemberg with empirical methods of social science.

Keywords: *afforestation, official procedures, formal & informal acting*

Introduction

In Germany afforestations are not permitted in general. People who want to afforest their land need a permission to do that. Each state in Germany laid down the general rules regulating the specific procedure to approve afforestations in their laws concerning forestry or agriculture. Because of the federal system in Germany there are existing different rules for the procedure to approve afforestations. But there is one thing those rules have in common: afforestations must always be permitted by the authorities and the formal procedure is fixed in a law.

The procedures fixed in law contain chains of orders that have to be carried out by the authorities or rather by representatives of the authorities. As it is human beings who operate those chains of orders it is not only the formal way that determines the procedures. Rather an influence on the procedure by informal acting of authority personnel could be expected. For instance, personnel of the authorities know each other, they meet each other regularly and so they have the opportunity to discuss about the procedure in an informal way – a way that is not fixed by law. For this reason there are two main questions concerning informal acting

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within formal procedures: Which scope has informal acting within formal procedures and is there an influence of informal acting that can be shown?

The aim of the case study was to clarify these questions on the basis of a procedure to approve afforestations in the state of Baden-Wuerttemberg in 1997. Baden-Wuerttemberg is located in the southwest of Germany, bordering France (in the west) and Switzerland (in the south). Wooded areas have a share of approximately 30% of the case study area.

The report about the results of the case study can be divided in two main parts. The first part includes a description of the formal and official application process. The second part presents facts and results of the observation of the informal acting during the approval process.

The formal part

As mentioned above, people who want to afforest their land need the permission from official departments. The departments involved depend on the law of the state in which the afforestation is planned. The departments and authorities involved in Baden-Wuerttemberg will be presented later.

In the following the formal application procedure for afforestations in Baden-Wuerttemberg will be presented. First the term "formal" will be defined.

"Formal" means that something, especially a procedure or a process, has a special well-defined course, a chain of order of events. In the connection with the case study "formal" means that the procedure is fixed by laws (Bohne 1981: 42–43; Kippes 1995: 14). The departments involved have to make use of these laws in the case of planned afforestations.

The form of the application procedure is defined by the law of agriculture and landscape management of Baden-Wuerttemberg – the "Landwirtschafts- und Landeskulturgesetz" (LLG). According to §25 LLG the competent authority is the department of agriculture. This authority is responsible for the coordination of the several steps within the approval procedure. The procedure starts on receipt of the application forms from the private landowners. The application forms must include number and size of afforestation areas, the tree species and maps of the intended afforestation areas. The next step is that the department of agriculture has to request expert opinions from three other authorities (Ministry of Agriculture of Baden-Wuerttemberg 1972: Enactment No. II 2003–22). These authorities are the department of forestry, the department of conservation and the responsible municipal office with the representatives of the municipal council. The aim of this procedure is to fulfill the special regulations of the special fields of forestry, agriculture and conservation regarding of afforestation. It is also the aim of this procedure to coordinate the special knowledge of the participating departments in an efficient way.

The next step in the formal application procedure is that the department of agriculture has to decide about the approval of the afforestation on the basis of the expert opinions. For a better understanding it is important to know that afforestation is not prohibited in general. If the expert opinions include technical objections to afforestation the permission must not be given by the decision-making department.

The cause for the empirical case study was an afforestation in the south of Baden-Wuerttemberg that was planned by a private land owner in 1997. The intention of this land owner was to afforest a meadow area with a size of about 40 hectares. The size of this area is equivalent to the average total area that is afforested in the state of Baden-Wuerttemberg each year.

Large parts of the afforestation area in the case-study are bordering on nature reserves and areas of protected landscape. In Germany different levels of nature conservation exist. The

level of nature conservation bordering on the afforestation area is the highest level known in Germany.

To characterize the starting situation of the case study the social status of the private land owner is important. The applicant is not a citizen of Baden-Wuerttemberg but his parents live in a small village in the south-west of the state. Close to this small village the afforestation was planned by the applicant. The family of the applicant is of noble birth, so their social position is seen as very controversial in the village. The citizens of the village observe all activities by the family very critical.

The last elements needed to characterize the situation at the beginning of the case-study are the aim of the applicant on the one hand and the kind of afforestation on the other hand. The private land owner intended to afforest his areas in accordance to the laws of nature conservation. Therefore his plan was to plant only deciduous trees and not to change the character of the landscape. He planned to plant cherry trees on most of the land. The main background of the afforestation was the possibility to produce timber with a high value on non profitable meadow areas. His intention was also to provide his children with a certain future income.

The informal part

In addition to the formal application process the question was which role informal acting played and what kind of informal acting was observed.

First the meaning of the term “informal” will be explained. The definition of this term is not easy in this context. The jurisprudence gives many explanations of this term. Some authors summarize informal acting as all behaviour between two partners that is not regulated in a traditional and fixed way (Schultze-Fielitz 1984: 12). For example a third person is integrated in an ongoing conversation between two persons. In a very strict definition of informal acting this behaviour is seen as a kind of acting that is not fixed by laws or other regulations (Kippes 1995: 14). Another example is a temporary advisory board coping with special situations in organizations. In the case study all acting that has not been part of the formal procedure was defined as informal acts, for instance phone calls between representatives or agents of the departments or additional letters from the applicant. Finally it is important to point out that the term informal does not say anything about the legality or illegality of the action (Bohne 1981: 48).

The results show that nearly every formal activity was linked with an informal action. Some of the informal behaviour came from the applicant, others came from the department personnel (Figure 1). Both parts, the applicant on the one hand and the department personnel on the other hand, tried to influence the application procedure.

The informal acts by the applicant had the aim to create a positive point of view of the afforestation. With several phone calls he tried to convince the decision-makers of his project. He also tried to accelerate the different steps of the application procedure and he wanted to create a better understanding for his intention to build up a future income for his children. The informal actions of the applicant resulted in an increasing conscientiousness in treating the application by the departments and the municipal council.

The application was more than the municipal council was able to handle. So the council members needed more information about the afforestation project than given by the application forms. On the one hand the applicants informal acting had a positive influence because of this the council members could obtain more information. Subsequently on the other hand the procedure got slower.

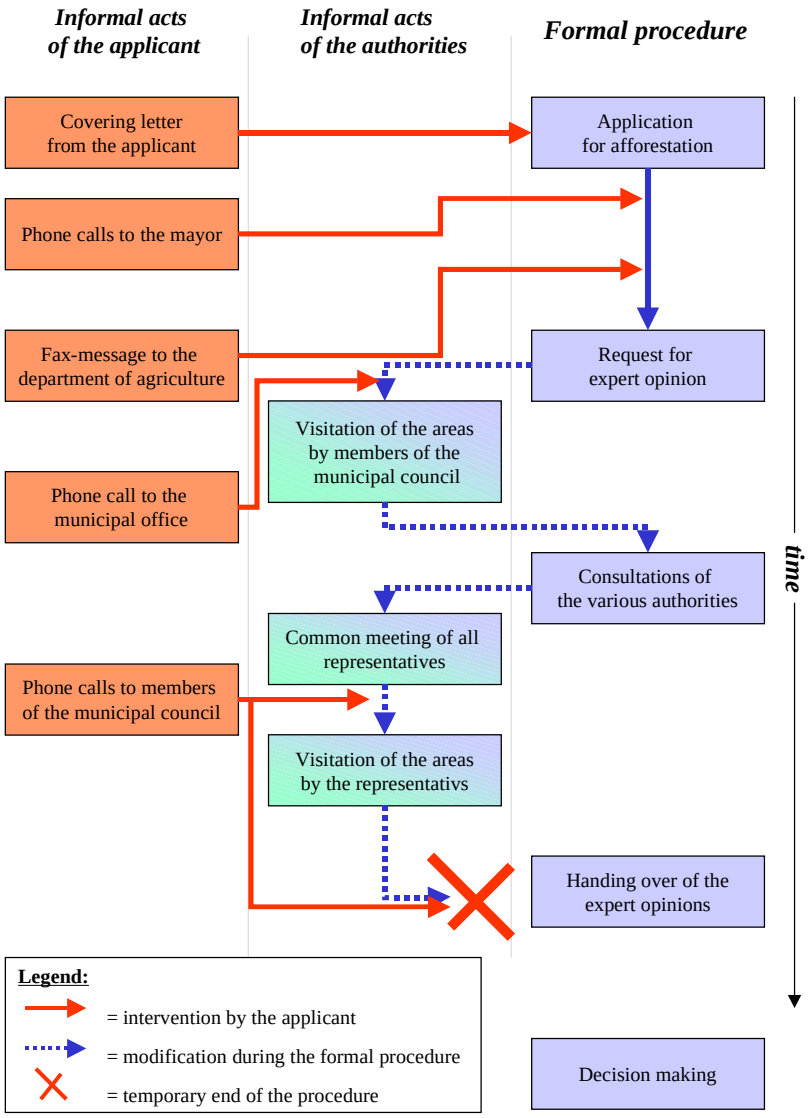

Figure 1. Relationship between formal and informal acts during the observation of a prodedure to approve an afforestation.

The informal acts of the department personnel had two aims. First the informal actions helped the decision-makers to coordinate the approval procedure more efficient. There were a few meetings between the experts of the departments taking place during the procedure. The meetings had the aim to get an agreement between the claims of the different expert opinions, especially the claims of nature conservation and the claims of forestry and agriculture. Two of the meetings served to visit the areas and took place out door. But there was also another kind of informal acting by the department's personnel. A few staff members tried to prevent permission for the afforestation because of interpersonal reasons based on the social position of the applicant; for instance envy played a main role in this context.

Conclusion

What are the consequences of the observed procedure? First, it must be noticed that the informal acting must be used highly responsible. An ill-considered use of informal acting affects a formal procedure. This could be demonstrated by the informal behaviour of the applicant. Because of the difficulties in controlling informal acting it is also impossible to rule out the informal behaviour of the involved persons on the part of the authorities. Especially this kind of informal acting can not be eliminated, it exists by nature in every acting between people.

The other kind of informal acting that was shown were the informal meetings of the department experts. These meetings influenced the whole procedure very successful. The meetings enabled all involved decision-makers to get a higher standard of information about the applied afforestation. Informal meetings can be seen as an instrument to coordinate such procedures and especially to coordinate the expert opinions more efficient than the present formal methods can do this.

The main conclusion of the observed procedure to approve afforestations must be the lawful permission to integrate informal components in the formal procedure in general. At the moment it is not planned to take into account informal acts. Above all it is necessary to make it possible that informal acts, like expert meetings or hearings of the applicants, can be brought into play in a dynamic way. The moment, when the informal acts should be used must be decided by the involved persons – the agents of the authorities as well as the applicants. The same demand must also be considered with regard to the kind of informal acts – for instance outdoor-meetings or meetings of applicants and experts.

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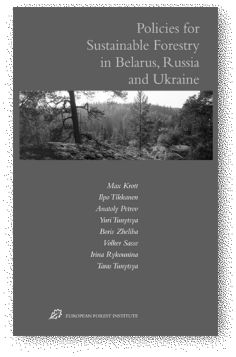

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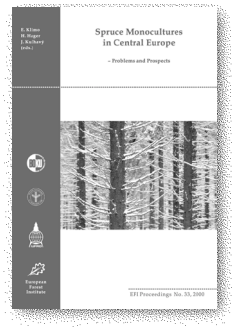

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Why should one talk about afforestation again, after a series of meetings focussing on the important ability of new forests to fix carbon dioxide? Many European countries are still facing a large discrepancy between afforestation aims on the one hand and their implementation on the other. This is even true for those countries where considerable progress has been made in the last decades. Afforestation activities are affected by many hindrances at the local and regional level. New ways have to be found to defuse the conflicts between agriculture, forestry and nature conservation. "NEWFOR – New Forests For Europe: Afforestation at the Turn of the Century" – a joint scientific symposium at the University of Freiburg, Germany, in February 16–17, 2000 – was attended by 20 invited speakers from 11 European countries. These proceedings discuss the different aspects of afforestation at the European level.

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