

Forest research for 21st century Ireland Meeting society's needs

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Abstract

Forest research has a solid track record in Ireland, going back to the 1950s. The scope of forest research has expanded in the intervening years, due mainly to a growing awareness of the environmental role and impact of forests. As new forest establishment is funded largely by the state, forest research needs to play a strong role in supporting and obtaining a return on national investment.

Forest research meets society's needs when it contributes to policy aims being met, insofar as the policy goals are well established and articulated. The general purpose is to provide guidance to policy makers and practitioners through scientifically-based, timely and well-communicated information.

Forest research has a significant time dimension, which needs to be recognised in funding arrangements, expertise and application of results. A weakness of project-based funding is the difficulty in providing for continuity of expertise and information transfer. To address this issue, research programmes dealing with well-defined areas could be funded on a recurring basis, subject to performance, and based in third-level or existing national research establishments.

Continuing and assured investment (state and private) in research is necessary to grow, harvest and process wood and other forest products in a sustainable and competitive way. Gross expenditure on research and development in Ireland in 2008 was €2.6 bn, or 1.68% of GNP. In the same year total investment in forest R&D was €11.2 million, or 0.57% of the GNP contribution of the sector. Investment in research and development in the forest sector, therefore, lags well behind the rest of the economy.

Effective dissemination of research findings to policy makers and practitioners is of fundamental importance to nationally-funded programmes. Meeting society's needs through the uptake of forest research outputs occurs in three main areas: policy, practice and products, and standards.

Keywords

Forest research, forest policy

Introduction

The purpose of this paper, based on a presentation made at the Scientific Seminar of the European Forest Institute (EFI) in Dublin in September 2009, is to outline approaches to ascertain the research needs of the forest sector in Ireland and wider society, and how these have and are being addressed through national research and information dissemination. COFORD – the National Council for Forest Research and Development – was the principal agent in identifying forest research needs from its establishment at the end of 1992, as well as being responsible for funding national forest research until the end of 2008. In the context of this paper it is also opportune to

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outline and review COFORD's operations, and to draw lessons and recommendations for the future.

Forest research has a solid track-record in Ireland, going back to the 1950s (see for example, Forestry Division 1967, Joyce and OCarroll 2002). Species and provenance selection, silviculture, forest management systems still in place today, as well as knowledge of nutrient, water, energy and carbon cycles in forests in Ireland, are largely a result of research carried out over the past five decades, mostly but not exclusively, in the state sector.

By the early to mid 1980s forest research had begun to expand in scope, due mainly to a growing awareness of the environmental role and impact of forests. Much of the new work on the environmental aspects of forests was based in third-level institutions, such as the Forest Ecosystem Research Group at University College Dublin and others at Trinity College Dublin and University College Cork. Work was focussed on understanding hydrological and biogeochemical cycles in plantations, and on the impact of forests and forest operations on freshwater ecosystems. This work has also made a significant contribution to forest policy and practice, mainly through standards and guidelines (for example the National Forest Standard (Forest Service 2000a), the Code of Best Forest Practice (Forest Service 2000b) and the associated environmental guidelines (Forest Service 2000c)). In a more fundamental way it has deepened the understanding of how plantation forests in temperate climates function.

The policy imperative for research on the environmental aspects of forests was given a renewed emphasis following the Earth Summit in Rio de Janeiro in 1992. Society-based issues and needs such as climate change mitigation and adaptation, biodiversity conservation, and protection of water quality increasingly influence forest policy in almost all developed countries. As has been pointed out, prior to Rio research on environmental aspects of forests had begun in Ireland, but the climate change and biodiversity conventions enacted after the Earth Summit had a significant effect on all aspects of forestry, including policy, practice and research priorities (Hendrick et al. 2002).

The purpose of forest research

Research builds on existing knowledge and expertise, by continually challenging existing findings and ways of doing things¹. (The author recalls a protracted discussion with a forest manager on a new approach in forest establishment. Even when all the technical and cost arguments had been clearly laid out, the existing practice was clung to, on the basis "we have always done it that [the existing] way".)

As new forest establishment is funded largely by the state, forest research needs to play a strong role in supporting and obtaining a return on national investment in afforestation. It also has a role in addressing forest-relevant issues that impact on

¹ Forest research, as well as finding out new information, will by its nature disprove and reformulate assumptions, propositions and ways of doing things. This approach to research and science in general has been formulated by a number of thinkers, including Popper's work on the scientific approach to problem solving (Popper 1959, see also www.tkpw.net).

society at large, mainly climate change mitigation, biodiversity conservation, water quality and recreation – often referred to as public goods.

Ireland's forest resource is plantation-based and this is reflected in research priorities. Most plantation forests in Ireland have a 30-year+ rotation, and research projects can span part, or indeed all of the cycle of individual forests, from establishment to harvest. Forest research has therefore a significant time dimension, which needs to be recognised in funding arrangements, expertise and application of results. Long-term research is also needed to investigate the effective provision of public goods. Furthermore, data assembled over periods of several decades from field trials, permanent sample plots, and biogeochemical monitoring sites have applications across several areas, such as process-based modelling of forest growth, assessing the impact of climate change on forests and assessing their contribution to mitigating the rise of carbon dioxide concentrations in the atmosphere. A caveat should be stated here: long-term monitoring sites and field trials need clearly defined objectives and dissemination plans (which should be periodically reviewed) so as to avoid collecting data for data's sake.

Synergies in environmental and competitiveness aspects of forest research are also apparent in forest policy and practice. The competitive and sustainable production of wood resources has achieved a new importance, partly in response to climate change and related policies. Sustainable production of wood fuels, for example, is now a national priority, as Ireland takes on legally-binding targets at national level, in order to comply with the Renewable Energy Directive (2009/28/EC). Indeed, wood products in general have taken on new importance due to their low embodied energy and carbon storage role. These developments partly explain why, even in the current circumstances, roundwood demand is at an all-time high.

Continuing and assured investment (state and private) in research, is therefore necessary to grow, harvest and process wood and other forest products in a sustainable and competitive way. Forest research is needed to address knowledge gaps in the provision of public goods, and in the understanding of biogeochemical (including carbon), and hydrological cycles in forests. The general purpose is to provide guidance to policy makers and practitioners through scientifically-based, timely and well-communicated information. In Ireland, forest research by state and the third level, and more recently the COFORD forest research and dissemination programmes, have attempted to address this agenda.

Forest policy and research

National forest policy is set out in *Growing for the Future* (Department of Agriculture and Food 1996), with elaborations in the National Development Plan (2007) and Statements of Strategy (Department of Agriculture, Fisheries and Food 2008, 2010). Policy is being reviewed following on the Renewed Programme for Government (Department of An Taoiseach 2009).

Forest policy addresses both public goods provision and competitiveness. While, at a certain level, these may be seen to be competing aims, there are, as pointed out, synergies between them, for example in locating productive forest on more fertile

lowland sites, while avoiding less productive upland or peatland areas, many of which have a high inherent habitat value. Or aiming to increase forest productivity, which will also speed up the rate at which CO₂ is assimilated, thereby contributing to climate change mitigation and allowing time for the development of a low emissions economy. At the same time, it is clear that in some instances, particularly in the area of water quality, there is potential for conflicting outcomes.

Research has been seeking to better understand how forests and water interact, and to bring forward solutions. For example, the proposed Programme of Measures for forestry under the Water Framework Directive (Water Framework Directive, National Programmes of Measures – Forest and Water Working Group 2009), proposes a catchment-based approach to forest location and level of operations, as well as other specific measures, which were and are being informed by scientific findings arising from the COFORD-funded research programme and earlier research.

Whatever about the dichotomy between public goods and competitiveness, and the role of research in addressing it, there can be no doubt that achieving the aims of forest policy - in the sense that it is a set of actions to be followed over a period of time - is dependent on national investment in focused, adequately resourced forest research, which must come with effective communication and dissemination of results, and a high level commitment to research-informed innovation, and to following through on promising research findings.

It can be argued at one level that forest research meets society's needs when it contributes to policy aims being met, insofar as the policy goals are well established and articulated. Ways in which forest research needs are prioritised, how it is structured, funded, carried out and disseminated, how buy-in is fostered, how it gets used in policy and practice are all critically important in achieving the policy aim.

Addressing risk of failure and achieving returns from research investment

Risk of failure of research to provide answers and new information can be addressed and reduced by having clear questions to answer, achievable objectives, adequate resources, and perhaps most importantly by having competent and committed researchers and practitioners engaged in the process. These issues can be summarised as follows:

- at the outset asking the right questions, developing testable hypothesis, and
- having competent persons and adequate resources to answer them;
- clear communication of results to policy makers and practitioners, using reports, papers, presentations and advocacy;
- openness to change among practitioners and policy makers, and their involvement in research programmes;
- developing policy support and advice, and innovation systems that take ownership of research results and exploit them (for example the COFORD wood energy advisory service, the COFORD forest growth modelling and financial appraisal system GROWFOR, modification and improvement of wood products in the boardmilling and sawmilling sectors).

Establishing and prioritising forest research needs

The main policy statement on the scope and objectives of the national forest research programme is in Chapter 12 of *Growing for the Future* which states “Policy on research will be: To promote research and development focused on the strengths of the Irish forestry sector, with particular emphasis on market demands, industrial needs, environmental concerns and cost efficiency.” *Growing for the Future* drew on the COFORD programme *Pathway to Progress*² research programme, which had been published two years earlier in 1994: “The need to maintain forest research effort in the areas identified in ‘Pathway to Progress’ is accepted”.

Pathway to Progress was the first formal, large-scale engagement with stakeholders and wider society in Ireland to understand and scope forest research needs: “Committees were set up to prepare the five sectoral programmes [Reproductive Material, Silviculture and Forest Management, Harvesting and Transport, Wood Processing, Socio-economic] contained in this document. Over fifty people contributed their time and energy to ensure that these sectoral programmes were presented within the short time available and to a standard that will ensure long-term economic and environmental benefits. It brought together a wide cross section of the industry, reflecting the ever changing face of Irish forestry. It included not only traditional practitioners such as foresters, sawmillers and nursery managers, but drew widely from researchers, the farming community, administrators and educationalists. The common objective was to develop a programme that was appropriate, affordable, achievable and complete.”

What the scoping exercise achieved “... was a new appreciation of the importance of ‘all sector’ involvement in research planning” (Mulloy 1994). The research programme reviewed the strengths and weaknesses of each sector, past and ongoing research, and made recommendations on research areas and priorities on a sectoral basis. It also identified a number of new areas where research was needed, such as wood supply planning and costs, wood transport and public perceptions of forestry.

The process underlying the development of *Pathway to Progress*, and the associated research scoping, was partly a reflection of an increasing level of private sector involvement in afforestation, timber harvesting and transport, and wood processing. Private sector afforestation dramatically increased from the mid 1980s, on foot of the introduction of annual premium payments, as well as increased capital grants to cover afforestation costs (Figure 1). Forest nurseries were dealing with a wider range of species, new growers had new information needs, and harvesting and transport had not been addressed in any depth in previous research programmes. Prior to the mid 1980s, forestry was by and large (with some notable exceptions) a state undertaking, and research needs were identified within the state forest service through coordination between the Research Division and the forest management inspectorate.

² *Pathway to Progress - A Programme for Forest Research and Development*. (Forest, rather than forestry, research was chosen to reflect the sector-wide nature of the programme. The name COFORD – the National Council for Forest Research and Development – was chosen for the same reason.)

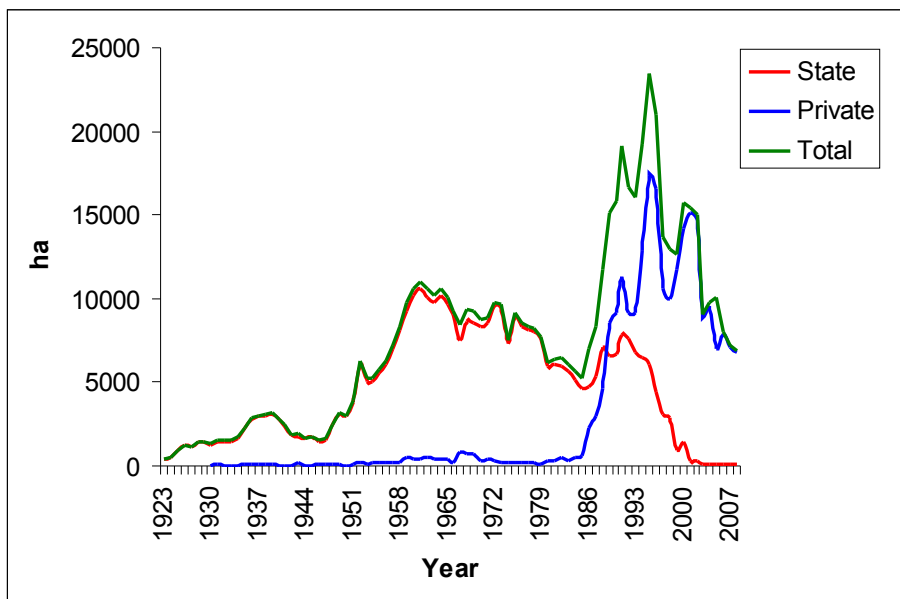


Figure 1: Annual afforestation levels from the foundation of the Irish state in 1922 to 2007.

Growing for the Future determined that: "... a phased and prioritised upgrading of national R&D effort will be brought forward by the end of 1996..." As a result, COFORD entered into a further period of stakeholder consultation, and developed a new programme in two documents, *Our Forest Future*, submitted to government in 1997, and then, following discussion with the Department about the need for a greater level of costing in the programme, in *A costed, phased and prioritised research and development programme for the forestry sector*, submitted in January 1998.

The 1998 document set out seven priority areas for forest research:

1. diversification of the species range in Irish plantation forestry;
2. seed sources for, and the establishment of broadleaved crops;
3. harvesting and wood transport, particularly the needs of farm forestry;
4. the effects of forests and forest operations on water yield and quality;
5. socio-economic research, including recreation and other non-market values of forests;
6. the development of new wood products;
7. information dissemination and technology transfer.

Priorities were to be addressed by a 7-year forest research programme, over the period 1998-2004. Among the measures envisaged was the recruitment of eleven permanent scientists, seven in COFORD. A building to house COFORD scientific and research programme administration staff (part of a new National Forest Institute) was envisaged. The funded national forest research programme was to continue as before, on a competitive basis to address the outlined priorities.

In the event, sanction was not obtained for the permanent scientific staff, nor for the National Forest Institute (NFI), despite endorsement by the COFORD council and protracted discussions, which lasted until 1999, with the Departments of Agriculture, Fisheries and Forestry, and Marine and Natural Resources (which had responsibility for forestry from 1997-2002). A design for the NFI building was produced and a site was earmarked at the Belfield campus of University College Dublin³.

On foot of *Pathway to Progress*, calls for research proposals had been issued by COFORD from 1995 to address the issues identified in the programme, on a sectoral basis. Seventy two projects were funded over the period up to 1999. These addressed traditional ‘forestry’ research topics such as silviculture, genetics and forest planning, as well as newer areas such biodiversity, climate change, forests and water.

From about 1998 onwards COFORD began to disseminate the outputs of funded research projects in workshops, books and reports and through the development of specific advisory services (see **Dissemination and uptake of forest research outputs**).

Forest research under National Developments Plans

National Development Plans (NDPs) were put in place at national level over the period from 1994 (COFORD was established in late 1992). The plans were focussed on capital investment to secure national development and competitiveness. Research and development formed a significant part of the investment, particularly in information and communications technology (ICT) and biotechnology (see Irish Council for Science and Technology 2000, which provides an overview of national thinking at the time in science and technology policy development).

The national forest research programme and its funding came within the framework of three successive NDPs: 1994-1999, 2000-2006, and the current programme which is running from 2007-2013. Under the first two NDPs (Department of Agriculture, Food and Forestry 1994, Department of Enterprise, Trade and Employment 2000), forest research was referenced in specific areas.

In the 1994 NDP forest R&D came under *Measure 2, Forestry Development*, and had the following aims:

- a. to provide and expand research and training facilities related to the development of the timber chain;

³ One of the obstacles to the implementation of the plan was the lack of a formal legal status for COFORD as a stand-alone state body. This was recurring issue throughout the existence of COFORD as an executive body, and it was not resolved. Had it been, it would have strengthened the continuity and effectiveness of the national forest research and development programme, and its ability to meet the needs of wider society, particularly if it had been aligned with recruitment of the additional staff indicated. In the 2009 Budget (Department of Finance 2008), the government announced it was to proceed with the rationalisation of state agencies, based on a number of considerations set out in the budget statement. In all, 41 state bodies were involved, including COFORD. Annex D of the Summary of Policy Changes stated, under the Department of Agriculture, Fisheries and Food: “Merge COFORD, the National Council for Forest Research and Development into the Department”. The forest research function was transferred to the Research Division of the department in 2009. The COFORD council was retained as an advisory body, while the COFORD development areas were retained within the executive that transferred to the Department.

- b. to provide support for research and back up to afforestation and wood processing programmes including genetic research, dissemination, product development, management and marketing;
- c. the continuation of COFORD's activities in the research area.

The programme also stated: "The aim will be to maximise the return on the investment in afforestation and the wood processing sector through the provision of appropriate and necessary support in the fields of research and development. This will optimise the use of resources so that forestry will become a major contributor to the economy, consistent with social, cultural and environmental needs. Action will relate to the following:

- improve the linkage between industrial needs, research, technology transfer and the financing bodies;
- strengthen research and development linkages;
- advance product development, management and marketing techniques."

While the COFORD programme led to the inclusion of research and development as a sub-measure of the *Forestry Development Measure*, the aims expressed did not capture many of the priorities for the forestry sector identified by COFORD. Furthermore, the sub-measure structure was insufficiently focussed on tangible issues and outcomes. The final objective (c above), did however give the necessary mandate to COFORD to continue its activities. As already indicated, for the period of the Operational Programme, calls for research proposals reflected the priorities of the COFORD costed programme.

Under the second NDP, 2000-2006, forest research and development was part of the Operational Programme for the Productive Sector (Department of Enterprise, Trade and Employment 2000). The research priorities were based on the COFORD report, referred to earlier - *A costed, phased and prioritised research and development programme for the forestry sector*:

1. improving the share of home-grown wood products in the home and export markets and developing innovative wood products and conversion technologies in line with market requirements and quality systems;
2. improving the cost competitiveness and underpinning the economic and environmental sustainability of the forest industry through the investigation of silvicultural techniques, wood harvesting and transport systems;
3. forest health and vitality, and environmental interactions of forests and forest operations;
4. determining the impacts of the afforestation programme on rural development,
5. community stability and the national economy;
6. investigating and developing forest products that have a local use and application;
7. developing silvicultural systems, harvesting techniques and information and communications technology appropriate to farm forestry in order to foster rural development and environmental compliance;

8. investigating and developing the genetic resource of indigenous and exotic tree species to ensure that forest plantations are diverse ecosystems;
9. developing cost-effective plant production and handling techniques in line with best environmental practice.

COFORD, in collaboration with the Department of Enterprise, Trade and Employment and the Department of Finance developed a comprehensive set of performance indicators for the four elements of the forest research programme 2000-2006 (funded research, technology transfer, researcher training and mobility, and forest research and development coordination). As well as simple output indicators, such as number of post graduate awards and the level of cofunding by industry, outcome indicators, such as number of research projects that result in products, processes or services that are taken up by the forestry sector (31 over the course of the programme), were used to better evaluate the overall impact of the programme and value-for-money achieved by state investment. In all, 57 forest research projects were funded under the Operational Programme for the Productive Sector.

An *ad-hoc* NDP Natural Resources RTDI Group was also established during the period of the Operational Programme for the Productive Sector. It met on a regular basis in order to better coordinate thematic and administrative aspects of national research funding in the natural resources area. It led to a number of jointly-funded projects with the Environmental Protection Agency in areas such as forest biodiversity (the BIOFOREST project – see <http://bioforest.ucc.ie/>) and forests and water (such as the PENrich project see: http://www.epa.ie/downloads/pubs/research/water/name_24322_en.html).

Joint funding expanded the scope of the research and enabled issues to be tackled in greater depth. Research funding collaboration as outlined, and the general coordination of the national research effort, enabled forest research to better address the needs of wider society.

The current operational programme came into effect from the beginning of 2007. Forest research comes under the Agri-Food Research Sub-Programme. Under the heading *Research in Forestry* it states: “Funding will be provided for a continuation of the COFORD Forestry competitive research programme. The future success of the forestry sector depends on it being able to produce and sell products in a highly competitive market, while at the same time providing public goods and services. Research will focus on the need to position wood production and processing as an internationally competitive sector, as well as to assess and develop the public-good benefits of forestry.”

National system of forest research

Research projects funded by COFORD are generally on a 3-4 year time-frame. However some areas of forest research, such as forest genetics, crop structure and forest biodiversity, are longer term, and benefit from continuity of staffing and resources. To address this issue COFORD has begun funding projects on a 5-6 year time-frame. In addition, it has set up research programme areas, whereby projects are clustered around themes areas. Programmes are led by prominent third-level researchers; some

involving two or three separate third-level institutions. To date, programmes have been established in climate change, forest biodiversity, forest management and planning, and forest policy and economics (COFORD 2010).

The COFORD research administration model was based on integrating research scoping, project selection, technical and financial administration of projects, publication of findings, dissemination and advocacy. The executive undertook the initial scoping of research areas, which involved input from the COFORD council and other stakeholders – addressing society’s needs – as well as seeking input, depending on the topic, from other agencies such as the Forest Service, The National Parks and Wildlife Service, the Environmental Protection Agency and the Sustainable Energy Authority of Ireland.

In addition to the COFORD programme, Coillte (the Irish Forestry Board) and Teagasc also conduct forest research. Coillte’s main area of research is in tree improvement and the development of improved Sitka spruce, the main commercial species in Irish forestry. It also conducts long-term forest monitoring studies and provides science-based services in areas such as water quality assessment and in forest protection.

Teagasc has had a growing involvement in forest research over the past two decades in areas such as broadleaf silviculture and tree improvement, as well as in more recent times in forest economics and forest growth modelling and related areas. Teagasc also provides the national forestry advisory service to private forest owners. The two functions are closely linked in the Teagasc structure which is an effective means of communicating research findings to owners.

Forest product research is now mostly conducted at company level, through research support schemes administered by Enterprise Ireland. Some projects have involved third-level institutions. The National University of Ireland, Galway (NUIG) and the School of Architecture at UCD also conduct research on wood products and timber building systems.

A weakness of project-based funding (the model that exists among national funding agencies, including the COFORD programme) is the difficulty in providing for continuity of expertise and information transfer. The model that operated from the late 1950s, whereby forest research was largely carried out in the state forest service by permanent researchers, changed after the setting-up of Coillte in 1988. While it took on the forest research area, it did not have a formal mandate (as a commercial company) to carry on the work at a national level. Over time the level of forest research in Coillte declined. In hindsight, it may have been preferable had the forest research role remained within the Forest Service, as it would probably have provided a level of funding and the continuity of effort and staffing needed to build on existing knowledge and better contribute to meeting the sector’s needs.

Given that there is little scope for forest research to come directly within the ambit of the Forest Service, alternative approaches are needed to address continuity of effort and related issues. The COFORD forest research programmes in climate change and other areas provide a basis for a way forward. Programmes dealing with well-defined areas could be funded on a recurring basis, subject to performance, and based in third-level or existing national research establishments involving partnerships between third-

level, Teagasc, Coillte and other research providers and industry partners. Membership of international networks, such as NOLTFOX (Northern European Database of Long-Term Forest Experiments – see <http://noltfox.metla.fi/contact.htm>) and Regional Offices of the European Forest Institute, would enable international collaboration, development of competence and the ability to address research questions at scale.

National and business-led investment in forest research

The level of funding envisaged for COFORD in the 1998 forest research policy document (*A costed, phased and prioritised research and development programme for the forestry sector*) was just over €2.9 m per annum, in 2009 terms⁴. By 2004, the final year of the programme, expenditure was to reach €3.8 m, again in 2009 terms. The funding target was based on achieving an annual level of investment by the state and the EU in forest and forest product research which would equate to 3% of the primary forest output value, which in 1998 was estimated as €6 million, out of €200 million.

The levels of funding envisaged in the 2000-2006 Operational Programme (Department of Enterprise, Trade and Employment 2000) for forest research was €12.7 m (£10 m) over the period of the programme, or about €2.1 m per annum (it was well into 2001 before the programme actually got underway).

The actual level of funding (in 2009 terms) of the COFORD programme was €1.9 m in 1998, by 2004 it had reached €2.7 m, and over €4 m by 2009⁵ (Figure 1). Over the period from 1994 to 2009 the COFORD programme grew in real terms by an average of 5% per annum.

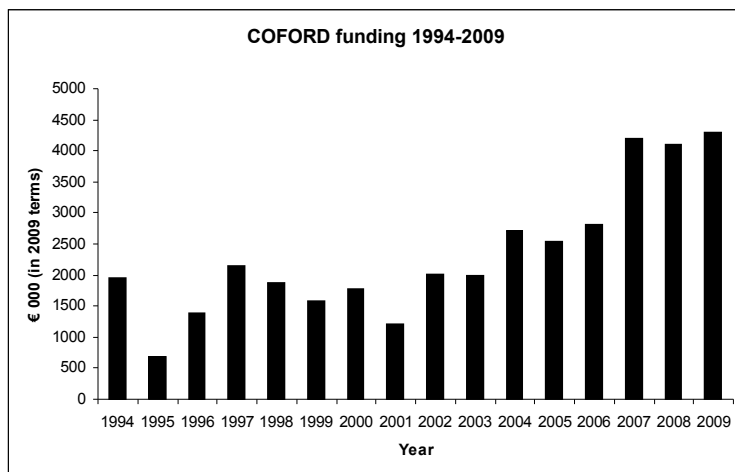


Figure 2: Annual COFORD funding from 1994 to 2009.

⁴ Estimated using the annual Central Statistics Office (CSO) Consumer Price Index.

⁵ The COFORD figure includes expenditure on research coordination and dissemination, estimated as about €0.7 m per annum over the period from 2000 (see COFORD annual reports at www.coford.ie for a detailed breakdown of expenditure).

In addition to the COFORD programme, state-led expenditure on forest research and development (including the state contribution to company-led research) includes Coillte, Enterprise Ireland and Teagasc (Table 1). Total expenditure in 2009 was €8.4 million.

Table 1: State investment in forest research and development (including wood products) in 2009.

<i>Organisation</i>	<i>Funding (€ million)</i>	<i>Nature of research and development</i>
COFORD <i>Department of Agriculture, Fisheries and Food</i>	4.3	Establishing and growing forests Harvesting and forest products Policy and public goods
Coillte <i>(Commercial state forestry company)</i>	1.0	Tree improvement Forest establishment (reforestation) Conifer silviculture Environment-related topics
Enterprise Ireland <i>(National business development authority)</i>	1.5	Business-led R&D in wood products
Teagasc <i>(National agriculture research and advisory service)</i>	1.0	Afforestation and farm forestry Broadleaf silviculture
Other Department of Agriculture, Fisheries and Food (Stimulus programme) Environmental Protection Agency	0.6	Biogeochemical cycling in forests Forests and water
Total	8.4	

Business-led investment in research and development, based on the level and rate of grant-aid (30%) from Enterprise Ireland (excluding Coillte) was in the region of €3.5 million in 2009 (Fitzgerald pers. comm. 2010).

The estimated⁶ value of goods and services provided by the forest sector in 2009 was €1.89 bn. Investment in R&D in the same year (state and private) was €12.3 million, or 0.63% of the €1.89 bn figure. Comparable economy-wide data are only available up to the end of 2008. These show (Forfás 2009) gross expenditure on research and development investment at €2.6 bn, or 1.68% of GNP. In the same year total

⁶ The contribution was estimated by bringing forward the 2003 estimate (Ní Dhubháin et al. 2006) to 2009 using the Consumer Price Index 2004-2009 (CSO).

investment in forest R&D was €11.2 million, or 0.57% of the GNP contribution of the sector. Even allowing for possible discrepancies in data collection and calculation approaches, the relative level of investment in research and development in the forest sector lags well behind that in the rest of the economy.

Part of the reason for the relatively low level of investment in research by the forest sector is the predominance of the “computers and related activities” and “chemical and chemical products” in business-led R&D investment (Forfás 2009). Intense competition, allied to frequent product turnovers, drives investment in these sectors. Data from the UK (Office for National Statistics 2006) illustrate this point. Research and development investment as a percentage of sales in manufactured products (data are for period 2003-2005), ranged from 33% in pharmaceuticals, to 0.1% in paper products, printing and wood. Unlike software development, pharmaceuticals and other rapidly developing areas the forest products sector is normally a technology taker and adopter. Furthermore, wood products tend to remain relatively unchanged for long periods: medium density fibreboard (MDF) for example was first developed in the US in the early 1960s, almost 50 years ago.

Nevertheless, indications are that the level of R&D investment in the wood products sector in Ireland is relatively high, when compared with the UK at least. Wood and wood products rank mid-table in terms of innovation activity by sector (Forfás 2009, p 49).

Whatever about the relativities of investment in forest R&D, there is a continued need for state-led investment to meet society’s needs in terms of the effective provision of public goods and to build a competitive and sustainable forest sector in Ireland. Furthermore, the direct state investment in forestry, through afforestation grants and premiums and other grant-aid and supports (the 2010 budget for forestry was €119.7 million⁷ (Department of Finance 2010) carries an onus to ensure value for money and effectiveness, through supportive and risk reduction measures such as forest research and development.

Dissemination and uptake of forest research outputs

Effective dissemination of research findings to policy makers and practitioners is of fundamental importance to nationally-funded programmes. Meeting society’s needs through the uptake of forest research outputs occurs in three main areas: policy, practice and products, and standards.

Policy

Examples of how forest research outputs are used in forest policy include its formulation, and the ways that research can inform the provision of public goods, such as climate change mitigation. Not only does the research address policy needs (see for example the National Forest Standard, Forest Service 2000) but it can and should itself influence the direction of policy.

⁷ Includes the forest research budget of €3.242 million but excludes *Bio Fuels Establishment Grants (Willow/ Miscanthus)* and *Bio Fuel National Top Up Grant*).

Practice and products

Forest research outputs have more traditionally been used in forest practice. Changes in the national system of forest research referred to tend to lessen direct interaction between researchers, practitioners and policy makers. However, simply having researchers and practitioners working in the same organisation is no guarantee that effective dissemination of research outputs will take place. Indeed, the publication imperative that operates in most third-level institutions directly benefits the recording and critiquing of research outputs, whereas a significant part of the research conducted in state organisations over the past five decades has not been published. Most of this work is recorded in unpublished reports, but these are often difficult to access. Nevertheless there is a need for the state to systematically consider and foster the uptake of research results in forest practice. COFORD has addressed dissemination and uptake of forest research outputs in a number of ways. It has developed information systems and provides advice based on research outputs. COFORD has also engaged in a significant way in the publication of research outputs, drawing mainly on funded projects, but also on other national and international research.

The COFORD Connects series disseminates research findings and information of interest to practitioners and policy makers in the form of short notes, written in an accessible style. The areas covered are:

1. reproductive material;
2. silviculture and forest management;
3. harvesting and transport and forest machinery;
4. wood processing and product development;
5. socio-economic aspects of forestry;
6. forestry and the environment.

COFORD has also been active in outreach activities in areas such as wood energy and broadleaf silviculture, in collaboration with third-level and Teagasc. In the future it is desirable that Teagasc would become the main state service provider in this area, including areas such as management of conifer plantations and first thinning, given its experience and track record, and contacts with growers.

Standards

Research outputs are also taken up through the use of forest certification and forest products standards. Voluntary standards such as the PEFC Irish Forest Certification Standard (see www.pefc.ie) and the draft Forest Stewardship Council of Ireland Standard (www.fsc.org/europe_ireland.html) draw on research findings in establishing indicators for sustainable forest management. A number of forest product standards such as IS 444 *The structural use of timber in buildings*, IS 127 *Timber grading*, Irish timber fencing standards, the recent CEN (European) standards dealing with wood fuels, and the recently launched Wood Fuel Quality Assurance scheme, draw on forest research carried out in Ireland over the past three decades, as well as having a strong input from forest researchers in the drafting process. Without research information many of the standards could not have been developed. Standards are a means of protecting consumers' interests and facilitating open trade and commerce (particularly under the

Single Market of the Single European Act), and by contributing to the development and implementation of standards, research is meeting society's needs.

The COFORD council acts as a vehicle for encouraging the uptake of research results, through the members providing leadership and advocacy for research-led change. In addition, the thematic structure of the COFORD programme, which has developed the programme areas referred to earlier, enables resources to be dedicated to research dissemination and outreach. Examples include programmes such as PLANFORBIO (www.ucc.ie/en/planforbio) and CLI-MIT (www.coford.ie).

Given the recent amalgamation of COFORD with the Department of Agriculture, Fisheries and Food, the publication and dissemination activities referred to need to be put on a long-term footing, to build on what has been achieved to date.

Conclusions and recommendations

Forest research in Ireland has by and large addressed and continues to address society's needs and those of the forest sector. At the same time the increasing demands on the forest sector, in public goods provision and in providing increasing outputs of forest products in a cost-effective manner, contribute to the need for well-resourced and long-term research programmes.

Involvement of end-users and customers in scoping research priorities and in dissemination is an important part of the national forest research process. Such involvement helps to build ownership of forest research outputs, and support for investment by both the state and the private sector. The COFORD Council should therefore be continued as a consultative body on forest research and to address wider development issues (where research outputs and researchers can provide key inputs). In this context it is important that the council has a strong input from private sector forestry and industry in general.

Funding is of course a fundamental issue; without state intervention the level of research is unlikely to be sufficient to impact on long-term competitiveness, and will certainly not support the need to understand and guide public goods provision. The current level of both state and private investment runs to around €12 million per annum, a relatively modest figure, given the scale of the sector and developing information needs. Given the current state of the public finances, an increase in research expenditure is unlikely, but at the same time it is essential that levels of investment are at least maintained, not only for research to continue to support policy, practice and standards development, but to build and secure the human capital and expertise that has been developed over a long period of time.

Research themes and priorities are constantly changing, but in a sector with a long-term perspective such as forestry it is important to secure and support the extended investigations and monitoring that are essential to address many of the thematic areas that are funded under the current COFORD programme. For this reason, the national system of forest research should seek ways to establish long-term thematic programmes in a number of key areas, based in third-level and state research institutions.

Ireland has a competitive advantage in growing renewable wood fibre. The main research imperative and investment should be in this direction, as in the future oil-based products and minerals will inevitably become increasingly scarce and costly

(Campbell 2004). The provision of public goods from forestry will also continue to be an important area for forest research, which will require continued national investment.

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