ForestGALES

A knowledge transfer case study by Forest Research, the Forestry Commission's Research Agency.

ForestGALES
A PC-based wind risk model for British forests

About Forest Research

Forest Research provides research, development, surveys and related services, to private and public sector clients, on a wide range of topics related to forestry and woodlands. With a staff of 280, FR provides authoritative advice in support of the development and implementation of the government's forestry policies.

An overview of Forest*GALES- a PC based decision support system*

As 1987's memorable 'Great Storm' reminded us, Britain's climate can be exceptionally windy. This is particularly true of the uplands, where much of the UK's 20th Century forest expansion occurred. Britain's forest managers, perhaps more than their counterparts elsewhere in the world, need to manage woodlands so as to minimise the risks of storm damage.

By the early 1990's Forest Research had already completed much work on individual aspects of tree stability, such as methods of cultivating soils, and managing young trees. A range of management techniques had been developed, but many were costly and could only be applied to high-risk sites. However, forest managers' tools to select those sites and forest types particularly at risk - and in need of these special treatments - were poor and over-simplistic.

It became clear that there was broad industry support to develop an integrated, quantitative model that would forecast the probability of damage under different scenarios. A move away from clear-felling, and to retain older forests for recreation and biodiversity purposes, was creating new forms of forests. Predictions were needed for these novel situations, as there was no relevant actual/past experience.

Forest Research staff set about improving the mathematical modelling of storms, using field experiments, past data sources, and wind tunnel research findings. The results of the multi-disciplinary team working were integrated into a model known as Forest*GALES,* which reflected their new understanding of wind damage effects at various spatial scales. Forest*GALES* (Geographical Analysis of the Losses and Effects of Storms in Forestry) provides calculations of the risk of wind damage (whether by overturning of the tree or snap of the main stem) for selected combinations of location, site type, tree species, and tree size. The complexity of the information necessitated a new approach to technology transfer, and the project was envisaged as a Personal Computer (PC) application from the beginning.

Forest*GALES* was launched in 2000 and has achieved high penetration within its target market of UK commercial forestry users. It has largely succeeded in overcoming a significant cultural barrier; namely, that the quantification of risk makes day-to-day management appear more complicated than when using the previous simple prescriptions. The model continues to be developed; the second version is about to be released and further improvements are planned. Forest*GALES* has also won respect in the international research community.

Nature of Innovation

Paper publications and the provision of personal advice were the traditional means of technology transfer between researchers and forest managers. However, the complexity of the scientific information integrated within Forest*GALES*, and the interactivity required to support the decisions being made by the managers, meant that this traditional approach was no longer appropriate. PC-based software needed to be developed. FR's goal was to make the best scientific knowledge available to practitioners without the need for specialist expertise or training. The industry's widespread familiarity with Geographic Information Systems (GIS) and PC-based systems facilitated the development of the model. Software was programmed to provide a familiar Windows-style front-end, to assist acceptance. The structure of the computer programme enabled the model calculations to be upgraded to reflect new research findings, without requiring changes to its operation. Scientific knowledge from a variety of sources were integrated to provide a simple-to-use and accessible tool for forest managers – initially as a stand-alone programme, and in due course within a GIS.

Identification of Market Opportunities

The need for a predictive model for UK commercial foresters was clear from dialogue between researchers and practitioners: researchers were aware of the inadequacy of the existing tools for representing new knowledge; and users identified the new types of decision for which they required support. A series of regional seminars summarised the state of scientific knowledge and confirmed user interest in a new, quantitative model. A Steering Group was then established to develop the project in a way which would be accepted by commercial forestry managers. Pricing was set at a level acceptable to the market.

Overseas sales of the software were not a specific objective. It was felt that the investment in the necessary climate datasets, coupled with the need to characterise other tree species, would not result in commercially profitable software. However, Forest Research did benefit from international collaborative research opportunities which resulted from publicity about ForestGALES.

Non-forestry organisations, such as risk insurers and wind energy developers, showed interest in the methodology; enquiries from these sectors produced small amounts of income. However, practical and political factors precluded Forest Research from marketing its intellectual property to these sectors more aggressively and establishing appropriate pricing within unfamiliar industrial sectors remains challenging.

Route to Market

The Forest*GALES* Steering Group comprised leading UK forest industry representatives. Regular meetings informed the project's overall development, guided the commissioning department's specification, helped plan the dissemination, and resulted in the project being widely championed across the industry. A wider user group, comprising practitioners, beta-tested the model, to inform the design of the software 'front-end' and the user manual.

Collaboration with Other Organisations

Collaboration and partnership were extremely important, because of the need to integrate fundamental knowledge from a broad range of disciplines. Much was achieved through informal contact with scientists in other institutions in Britain and abroad. However, crucial to our success was an EU-funded 4th Framework project, 'STORMS', involving research institutes in Britain, Portugal, Sweden and Finland. This supported the development and validation of a major part of Forest*GALES*. Funding from the British Council enabled Forest Research to link with scientists in New Zealand and Australia, who evaluated Forest Research's approach.
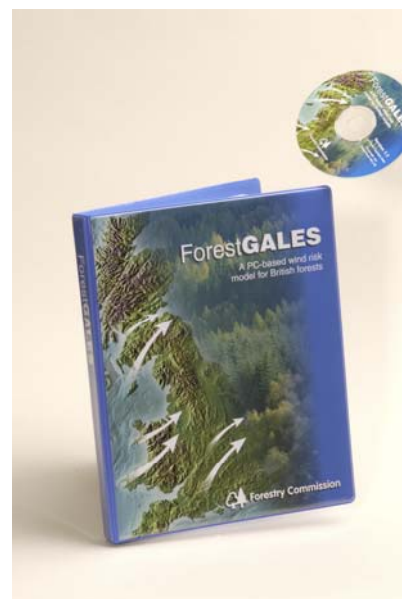
Dissemination

Throughout the life of the project, dissemination of early results has been the key to gaining wide acceptance of Forest*GALES* within the industry. The Steering Group encouraged Forest Research to present the vision to senior management groups within the industry (to champion the product), to hold seminars targeted at practitioners (who would use the product), and to write popular articles about Forest*GALES* in trade journals (to raise the profile of the work). The product launch was accompanied by regional training courses, promotional seminars, further trade press articles and the launch of Forest*GALES* web pages.

The science underpinning Forest*GALES* has been publicised through peer-reviewed papers at international conferences and in research journals. As a result, aspects of the approach are being adopted in Canada, New Zealand, Finland, Germany and France.

Further information

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- For information about Forest Research:
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- This case study was developed by Chris Quine, Barry Gardiner and Alison Melvin, © Forest Research, 2004.