

## Guest editorial

### Education, research and innovation: transforming forest management in the 21st century

I began my career about what is generally regarded as a generation ago in 1980 as a researcher in Tasmania. Forestry then seemed a relatively simple business: land use conflicts were low and the national park estate was small; there was little public scrutiny of forest practices; forest management agencies had considerable policy influence; wood supply (except in South Australia) was largely from public native forests; the establishment of the softwood plantation estate was in full swing; use of wood and demand for wood products in a growing population was increasing rapidly and public and political support for the industry was high. We had developed systems to effectively regenerate most of our eucalypt forests and built a considerable technological capability in softwood plantation management. There were many technical challenges, but these were considered rational and bounded with feasible solutions given sufficient resources and intellectual effort.

#### Transformations and challenges

However, there were growing signals for change: rising environmental consciousness was being expressed through intense public debate over the Gordon below Franklin dam and this would soon transfer to forest land use; the Routleys had undertaken their analysis of the impacts of converting native forests to pine plantations; concerns were being raised about the fate of rainforests in Australia and across the world; the forest industry was becoming connected into global markets through woodchip exports; and the incoming Hawke government increased our connection to global competition by dismantling tariff and trade barriers.

In those 30 years, the forest sector has transformed. Over 70% of our wood is now supplied from the plantation estate, the area of forests in national park has increased to over 22 million hectares, forest practices are highly scrutinised and there is probably a greater focus on biodiversity conservation and ecosystem services in native forests than there is on wood production. Plantation productivity per hectare has increased dramatically and we now have a significant eucalypt plantation resource to go alongside that of softwoods.

Much of this success in transforming the forest sector has been built on investment in research and a culture of innovation within management agencies or companies. Bright, well-educated people have been given the resources and freedom to try new ideas.

Pressures on forest managers have increased in that time. The use of wood in construction has declined and there is increased international competition in the wood products sector. There is more demand in society for recreation, conservation and aesthetic benefits from forests and increased pressure on declining water resources. The political standing and influence of the sector has decreased. Forest resources have been privatised or agencies

corporatised and these new entities have reduced costs and outsourced many operational functions, reducing incentives or capacity for innovation. Forest management problems have, in many cases, become more multi-dimensional, complex and less amenable to simple solutions.

People, especially in the Asia Pacific region, are becoming wealthier, more urbanised and better educated with different demands for forest goods and services. In the absence or unforeseen shocks, these social and economic trends will continue. Low-cost access to electronic communication and computing power will provide new pathways for education and dissemination of new technologies. Demand for wood products will increase but so will demand for ecosystem services. There will be increasing competition and rising prices for energy, labour and other inputs to management. The prospect of climate change is forcing a major rethink of the purpose of forests.

Forest managers and industry leaders therefore face a challenge: how can we provide for the continued transformation of forest management to meet a new set of social, economic and environment demands? How can education, research and innovation support this future transformation?

#### Education and training

Innovation requires highly-trained individuals. These have historically been trained at universities. The Australian university system has undergone major reforms since the 1980s. Student numbers have increased dramatically but funding per student and for infrastructure has declined. The number of students across the sector has increased, with rapid growth in full-fee paying international students, but the number studying forestry has dropped considerably. Government responses to recent inquiries into tertiary education and innovation are driving further change. There are welcome signals of increased funding but this will increasingly go to areas of student demand. Beyond some key disciplines, government has little interest in directing universities to provide, or students to study, particular programs. Government wants to increase participation, particularly from lower socio-economic sectors of society, and provide easier pathways from TAFE to university training. Universities want enough students in their programs to ensure they are financially viable, with highly motivated staff capable of teaching and research in an area of identified strength or 'mission'.

Industries, on the other hand, want technically competent, job-ready graduates that understand their sector, with 'soft' skills in people management, teamwork and community engagement. Students want interesting and engaging educational options leading to well-paid jobs with an optimistic future that make a positive contribution to our society and environment.

Forestry meets some of these requirements but, with demand-based funding arrangements, declining student interest is a significant problem. Reduced student interest in the discipline is partly due to a lack of awareness of the profession or a negative public perception of the sector among the largely urban-based incoming student population. The rise in alternative study options in environment and land management has also played a part and there is strong competition by and support provided for study in other disciplines, such as engineering. The forest sector is also not generally perceived as an engine of innovation providing a pathway for creative development or expanding opportunities.

Other changes are occurring in educational structures. Universities such as Melbourne are responding to demands for greater flexibility and breadth by creating broadly-based undergraduate programs, with professional training in post-graduate coursework programs (for example, the Master of Forest Ecosystem Science). This level of program has proved more attractive to students and the graduates, with their wider knowledge base and higher level of technical training, will potentially be better equipped to address the challenges facing future forest managers.

Reversing the overall decline in forestry enrolments is not something that universities can address alone. A comprehensive strategy is required, involving communication and commitment from across the sector, to provide the smart young people required to support future innovation and transformation in the forest sector.

## Research

Research a generation ago was largely undertaken by state forest management agencies, CSIRO and scientists directly employed by the industry. Research in these groups has generally decreased. State governments corporatised or privatised production forest assets and reduced research investment. The research agenda at CSIRO is increasingly driven by the large national flagship programs where forest-related research is based on its contribution to a bigger agenda, or where there is a willingness by the industry to make a significant coinvestment.

State government research funding is increasingly focused on 'big science' and infrastructure with higher potential social or economic benefits. Where they do invest in land management research it is generally restricted to specific legislative or policy responsibilities such as fire management, threatened species, water quality, biosecurity or climate change. Most state agency forest research has been integrated with larger agriculture research groups. In some cases new government–university partnerships have emerged, such as that between the Victorian Department of Sustainability and Environment and the University of Melbourne.

Universities more broadly have become bigger players in research. They are also placing increasing emphasis on 'research excellence'. Funding for research will be increasingly concentrated in institutions and disciplines that perform at the highest level according to agreed measures, such as publications in international refereed journals, citations and other forms of recognition by scientific peers. Providing appropriate incentives for research that leads to improved practice and industry innovation will be a major challenge in this environment.

There has been an overall increase in forest research funding from the Federal Government. This has been channelled through co-operative ventures such as research and development corporations (RDCs) or Cooperative Research Centres (CRCs). Each of these bodies has developed their own research management arrangements and research agenda. Following a recent review, the CRC program will continue with an expanded mandate and will provide future opportunities for the sector. RDCs are currently under review by government and subject to potential changes in their structure and operation.

In total, over \$100 million is invested nationally in forest research annually. While substantial, funding has declined by about 12% in real terms over the past 20 years and research funding 'intensity' (per dollar of turnover) has declined by about 10% over the last 10 years<sup>1</sup>. The forest sector needs a significant boost to return to previous levels of innovation investment.

In order to get the most out of our research investment, we need improved communication and coordination of research actors. Over the past three years, the Primary Industries Ministerial Council has been implementing a National Primary Industries Research, Development and Extension Framework (RD&E Framework) to enhance efficiency and effectiveness of RD&E efforts nationally, strengthen national research capabilities and address gaps in national capability. This has provided a timely opportunity to review research coordination and prioritisation in the forest sector. A recently completed report presents the case for a national forest research forum that brings together research funders, providers and users to develop a shared research and innovation agenda. If it is actively supported, this forum could become an effective mechanism to coordinate and promote the benefits of investment in research and innovation.

The forest management sector is a smaller part of the Australian economy, and perhaps the Australian psyche, than it was 30 years ago. Transforming the forest sector to meet the challenges of the next 30 years will require more effective integration of education, research and practice into a comprehensive innovation system. We will need to continue to bring new skills and partners to address future challenges in the sector, including social scientists, policy experts, economists and information and engineering specialists. This will require a commitment from all players to maintain and build a culture where education and research are highly valued and new ideas are embraced and adopted. With strong commitment and thoughtful design we can use our research resources effectively to support the transformation of forest management required to meet the needs of future generations.

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<sup>1</sup> Turner, J. and Lambert, M. (2009). Expenditure on Forestry Research and Forest Products Research in Australia 2007–2008, a report prepared for Forest and Wood Products Australia, Melbourne.