Submission to Parliamentary Inquiry into Australia's Forestry Industry

By

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I'm responding to your call for submissions on the current and future prospects for the Australian forestry industry. I will restrict my comments to my areas of expertise namely value-adding, product innovation and the human resource needs of the forest products industry (brief CV attached).

Introductory remarks

Australia's forest products manufacturing industry faces challenges on many fronts as you are no doubt aware (changing wood resource, ageing plant and workforce, high wage costs and increasing competition). To meet these challenges and rebuild competitive advantage, industry will need to become much more innovative. Innovation will be the key to: (1) Increasing productivity to counter competition from low wage economies; (2) Effectively utilising fast-grown plantation eucalypts; (3) Developing new 'value-added' products and; (4) Adapting overseas technologies for use in Australia. The key role of innovation in building competitive advantage for manufacturing industries is widely recognised, and, as pointed out by Freeman (1995)[1], it relies heavily on a highly skilled workforce at all levels (shop-floor, technicians, managers), and access to a network of public and private sector agencies whose "activities and interactions initiate, import, modify and diffuse new technologies" at a national level. Today it is recognised that international networks (private sector multi-nationals and R & D consortia) also play an important role in innovation. It is less widely recognised that Australia's forest products industry relies heavily on series of innovations that exemplify the notion and importance of an innovation system.

Innovation and the development of Australia's forest products industry

A series of innovations helped to build Australia's forest products industry[2]. Other factors were important, but the innovations I now describe were critical to the development of the industry. These innovations arose as a result of the R & D of public sector agencies, often in collaboration with the private sector as follows:

1. Chemical pulping of eucalypts (collaboration of Western Australian Forestry Department and later CSIR [forerunner of CSIRO] with a variety of private sector partners including newspaper companies in Western Australia, Australian Paper in Geelong, Amalgamated Zinc Corporation [later Tasmanian Paper Proprietary Ltd] and a number of pulp and paper companies (APM, APPM, and ANM).

[1] Freeman, C. (1995). The national system of innovation in historical perspective. Cambridge J. Economics, 19, 5-24.

[2] Algar, W.H. (1988). Forestry and forest products. In Technology in Australia 1788 to 1988 (Chap. 4, 202-262). Australian. Acad. Tech. Sci & Eng. Melbourne.

Chemical pulping of eucalyptus is now the dominant process used world-wide for the manufacture of fine writing paper
2. High temperature drying of pine (CSIRO in collaboration with NSW and Queensland Forestry Commission Laboratories)
3. Machine stress grading of pine (New South Wales Forestry Commission Laboratory in Pennant Hills and Plessey, Australia)
4. Wood-fibre-reinforced cement composites (CSIRO and James Hardie)
5. Advanced breeding and selection technology for pine (CSIRO/State Forestry Services)

These innovations completely revolutionised Australia's wood processing industry and their importance cannot be overstated. The agencies responsible for these innovations also worked closely with the private sector to help with the introduction and widespread diffusion of numerous other wood processing technologies into Australia (wood composites and wood preservation technologies, for example). Often such technology diffusion was a far from trivial exercise as the technologies had to be adapted to Australia's raw materials and conditions. Australia, however, never developed higher centres of learning to support the forest products industry, unlike Europe and North America, but the CSIRO was heavily involved in training industry personnel, for example running courses in timber drying, composites manufacture, and wood science and technology. Furthermore, the national centres of forestry education, which were based at Australia's best universities (The ANU and Melbourne) gave courses on wood science and forest products technology to undergraduate students, and at various times employed specialist lecturers to teach these subjects. Australia's forest products industry employed some of the graduates from The ANU and University of Melbourne. Most of the graduates from The ANU and University of Melbourne, however, were employed as foresters by state forest services and private sector companies. Nevertheless, many of the key elements of an 'innovation system' to support the forest products industry were once present in Australia. The same is not true today.

Innovation system today

Many of the public sector institutions that served Australia's forest products industry well in the past have been disbanded or their capacity severely reduced. The closure of the CSIRO Forestry and Forest Products Laboratory in 2010 was met with disbelief around the world, especially as an international review of the organization in 2007 had clearly articulated its critical importance to the sector. Closure of the New South Wales Forestry Commission Laboratory in Pennant Hills, which once rivaled the CSIRO, occurred much earlier. Australia's national centre for forestry education at The Australian National University has lost all expertise in wood science and wood processing and no longer offers a degree in Forestry. Melbourne University still retains one academic in the wood science and processing area in the Department of Forest and Ecosystem Science, but it lost its professor of wood technology last year, and a replacement has not been made. The specialist in wood science and technology at the University of Tasmania, Centre for Sustainable Architecture in Wood (CSAW) has just resigned. None of the other universities that offer undergraduate degrees in Forestry in Australia employ specialist lecturers in wood science and wood processing. The continued existence of a specialist centre for wood technology in Queensland (QDPIF) and their recent investments in wood

composites and wood preservation facilities is a notable exception to the serious trend of the erosion of scientific capacity to support innovation by Australia's forest products industry.

Developments overseas

As the science and technology base to support Australia's wood processing industry has declined, other countries have strengthened theirs. For example, in the last 15 years Canada[3], Scotland, New Zealand and South Africa[4] have all created or re-established national centres of excellence to support their wood processing industries. Furthermore, Canada and New Zealand still retain national forest products laboratories in partnership with the private sector. Australia is now the only large industrialised country with a significant forest resource that lacks specialised centres to conduct R & D or educate professionals for its wood processing industry. The latter centres of higher learning create people who can fill managerial and technical roles within industry and drive change to ensure that industry remains competitive. In the long term their graduates become industry leaders and their strong technical background gives them an appreciation of the value of research and development. Without such a means for renewal and systemic change it's difficult to see how the forest products industry in Australia can thrive in the long-term. The industry is aware of this problem and offered support for the creation of a centre that would focus on the education of students for the industry (Roberts 2007)[5]. The majority of the CEO's of the larger companies across Australia indicated their willingness to support such a centre by providing significant on-going funding for student scholarships and paid placements in industry. Such a centre if correctly structured to meet industry's requirements for human talent would also satisfy many of their needs for short term R & D (via student placements in companies) and more strategic research (via Masters and Doctoral projects). R & D conducted at Universities, however, would need to be complemented by the efforts of research groups that focus on technology development and diffusion (the previous domain of CSIRO Forest Products Laboratory and the State Forestry Commission Laboratories).

Concluding remarks

It is clear from the way the Australian forest products industry developed in the past that the sector needs the focused support of a group of gifted scientists and technologists with the critical mass to develop new wood processing technologies and adapt technologies developed overseas to process Australian wood. There are a whole range of exciting new wood products being developed overseas of which the following look very promising: (1) Super high-strength, fire resistant and magnetic composites derived from cellulose nanofibres or microcrystalline cellulose (Sweden/Canada)[6]; (2) Woods modified with

[3] Barrett, J.D., Cohen, D.H. (1996). Wood products education, The Canadian strategy for renewal and growth. For. Prod. J. 46(9): 15-20.

[4] Evans, P.D., Macdonald, I., Rypstra, T., Mortimer, J., Wessels, C.B., Muller, R., Muller, B., Louw, J. (2010). South Africa's wood processing industry education strategy: A north south partnership to develop a globally competitive workforce for the 21st Century. International Wood Products Journal 1(1): 48-56.

[5] Roberts, R.J. (2007). The role of graduates and their education for the Australian wood processing sector – results from a forest industry survey. Forest and Wood Products Australia Report, FWPA PN06.5042.

[6] Eichhorn, S.J., Dufresne, A., Aranguren, M., et al. (2010). Review: current international research into cellulosic nanofibres and nanocomposites. J. Mat. Sci. 45, 1-33.

polymers or nanoparticles to enhance fire resistance and/or durability; (3) Thin films derived from pulp or pulp-mill waste (lignin) for packaging and biomedical applications; (4) Massive wood construction for energy efficient industrial or residential buildings; (5) Light-weight, hollow-core, composites for consumer products (to reduce transportation costs). There are also great opportunities to generate energy and synthesise bulk and specialty chemicals from wood using the concept of a biorefinery[7] (to replace those currently derived from oil).

Australia's forest product's industry also needs a centre that can educate technologists and managers to grasp new commercial opportunities that will arise from R & D and also to successfully overcome the challenges it currently faces. At present the Australian forest products industry, unlike other important manufacturing industries in Australia, lacks adequate support from public sector agencies to meet its human resource needs and its requirements for research and development. If steps are not taken to reverse this situation, costs to industry will rise as they are forced to develop in-house solutions to their R & D and human resources needs. Their competitors overseas are not in this unfortunate position and over time this will further increase their competitive advantage. I hope that your committee can bring this serious issue to the attention of government and seek to develop ways of better supporting Australia's very important forest products manufacturing industry.

Yours sincerely

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[7] Van Heiningen, A. (2006). Converting a kraft pulp mill into an integrated forest biorefinery. Pulp & Pap, Canada, 107, 38-43.

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Academic Qualifications

1980	B.Sc Hons (First Class (cum laude), Department of Wood Science, University of Wales, UK
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Career To Date

2009-	BC Leadership Chair, Advanced Forest Products Manufacturing Technology, Dept Wood Science, University of British Columbia, Vancouver, Canada
2007-08	Professor, Dept Wood Science, University of British Columbia, Vancouver, Canada
2001-07	Professor and Director, Centre for Advanced Wood Processing, University of British Columbia, Vancouver, Canada
2000-01	Director, Centre for Science and Engineering of Materials, The Australian National University, Australia
1998-01	Reader, The Australian National University, Dept of Forestry, Australia
1992-97	Senior Lecturer, The Australian National University, Dept of Forestry, Australia
1986-92	Lecturer, The Australian National University, Dept of Forestry, Australia
1984-86	Post-Doctoral Fellow (Industry), University of Abertay, Dundee, Scotland, UK

Selected Publications

Evans, P.D., Macdonald, I., Rypstra, T., Mortimer, J., Wessels, C.B., Muller, R., Muller, B., Louw, J. (2010). South Africa's wood processing industry education strategy: A north south partnership to develop a globally competitive workforce for the 21st Century. Int. Wood Prod. J. 1(1): 48-56.

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