# Inquiry into the Australian forestry industry

## House of Representatives Standing Committee on Agriculture, Resources, Fisheries and Forestry

**Submission by**

**Dr Glen Kile[1] , Dr Sadanandan Nambiar[2] and Emeritus Professor Roger Sands[3]**

**March 2011**

## Summary

This inquiry has broad terms of reference. Our submission addresses a set of issues important for the forestry and forest products sector in Australia. These are related to resource development and production, forest management for carbon and water, biosecurity and the capacity and capability for research and development and innovation. We conclude that-

- The sustainability of the short rotation hardwood plantations established over the last two decades years is in doubt both in terms of maintaining the area and the productivity of the second rotation crops;
- Very limited areas of high quality managed for sawlog hardwood plantations have been established in Australia and this resource is at best only complimentary to the native forest sawlog supply;
- Fire and drought are the main factors affecting the carbon storage capacity of forests in Australia. Long service life wood products are important carbon stores;
- The impacts of plantation development on catchment water yields have often been exaggerated and forestry needs to be compared with other land uses on a consistent set of criteria;
- All forest management agencies need to be involved in the national biosecurity arrangements not just plantation forest managers;
- Research and development capacity and capability has been significantly down graded in recent years. Unless this is reversed, the Australian forestry and forest products sector will be out performed by its competitors.

---

[1] former Chief of CSIRO Forestry and Forest Products and former Managing Director of Forest and Wood Products Australia-FWPA

[2] former Chief Research Scientist CSIRO Forestry and Forest Products and Honorary Research Fellow CSIRO Ecosystems Science and former Director FWPA

[3] former Professor of Forestry University of Canterbury

# 1. Eucalypt plantation resource

## (a) *Pulp wood (short) rotation*

Eucalypt plantations in Australia have expanded to around 990 000 ha over the last two decades, compared to the approximately one million ha of softwood plantation. Most of these eucalypt plantations were established for wood chip (fibre) production on short rotations under managed investment schemes (MIS). These plantations are now being harvested and this will increase in scale over the next few years.

The collapse of several of the largest MIS companies and subsequent developments has raised serious questions about the sustainability of this resource. Questions revolve around the dramatic drop-off in new plantings, the increasing harvest and potential non replacement of the existing plantations, lower productivity of the second rotation stands, and some of the harvesting practices being employed which would degrade future plantation productivity. A part of the existing plantation will not be reestablished and there is a risk that the production from large parts of the remainder will be reduced because of nutrient and water resource depletion, unless scientifically based and sound management practices are deployed as matter of urgency. These matter have been argued in Attachment 1 (Australian Forestry, December 2010).

*We point out that future investments in plantation forestry should be guided, not simply by short-term profit and tax advantages, but by the principles of sustainable forestry. The present structure of the MIS arrangements has clearly induced some perverse outcomes.*

### Will a pulp mill(s) in Australia promote sustainable hardwood plantation forestry?

Learning from our long-term experience with the softwood industry in Australia, we believe that regional/local processing and value adding of wood not only enhances regional economies but also underpins the motivation for productive and sustainable forestry. The best illustration of this is in Green Triangle where industry has developed highly productive radiata pine plantations on poor soils with endemic stress (water deficits and fire). A driving reason is the need to deliver logs to local processing facilities over decades (O'Hehir and Nambiar 2010). In contrast, management of blue gum plantations in the same region is being driven by the immediate access to the export chip market and uncertainty of the future market.

*We argue that an environmentally sound pulp mill(s) fully based on plantation wood in major nodes of plantation development such as South Australia, Tasmania or Western Australia would help promote sustainable eucalypt plantation forestry in Australia.*

## (b) Managed for sawlog (long rotation) plantations

Hardwood plantations (mostly eucalypts, apart from small areas of tropical hardwoods including teak and mahogany) have been promoted as a replacement for native forest sawlogs for appearance grade products (sawn timber and

veneer). Indeed this was an objective that underpinned the Government policy that supported MIS schemes. However, plantations managed for sawlogs do not appear commercially feasible under these arrangements.

Attempts to develop a substitute resource for native forest sawlogs have been pursued, to some extent in Tasmania, NSW, and Queensland. However this has largely been done through State and Commonwealth investment as part of the compensation response for reductions in access to native forest resources. There has been some small-scale private investment. At best this plantation grown sawlog resource, in its present state of development, can only be a complimentary to the native forest resource and not a replacement (Nolan et al. 2004).

Depending on the environment, species and silviculture employed, rotations for solid wood products are likely to be 20-35 years. In the current programs there has sometimes been only short-term investment. These have suffered from poor growth rates due to an inadequate knowledge base, and lack of follow-up silviculture required to produce high quality sawlogs. In addition the properties of the potential sawlogs are different from the mature native forest resource and the current processing schedules and technology require further development to enable profitable processing.

In Australia eucalypts in plantations are obviously grown in the presence of their indigenous pest and pathogens. These impact on productivity and potentially wood quality and increase costs. Severe pest attack has already led to the abandonment of some plantations in at least one State. The threat is greater to longer rotation plantations grown for appearance wood products where late rotation attack by wood boring insects or canker pathogens may severely downgrade wood quality and consequently commercial viability.

Currently Australia lacks any coherent national managed for sawlog plantation policy or investment strategy even if this was a good forest industry development policy. Our extensive native forests and our scientific understanding of them, allow us to manage some portions of them sustainably over long rotations to produce hardwood wood products of diverse character and properties to meet market needs. Ever more restrictive access to native forests in response to environmental group pressure is a serious and avoidable threat to the remaining native sawlog industry and regional jobs for no measurable environmental benefits. The shortfall in hardwood supply and products are increasing imports of timber to Australia including alleged illegal timber.

*In our view there is no scientific reason for not utilizing some parts of our native forests for wood production (including the intensification of regrowth management) therefore minimizing the need for the subsidized development of long rotation managed for sawlog hardwood plantations.*

*If Australia is to continue the current fragmented policy with the hope of maintaining a hardwood industry there is significant opportunity for government to review the policy and incentives (e.g. taxation, carbon pricing and offsets) that can apply for the establishment of new plantations. Such policy needs to favour the*

*establishment of longer rotation, sawlog rich plantations that are commercially viable and of sufficient scale to support regional processing and economies.*

## 2. Forest management for carbon and water

### (a) Carbon

Forests have one of the greatest carbon densities (amount of carbon stored per unit area) of any vegetation type. Consequently any management regime that holds this density intact or increases it would help to reduce carbon dioxide concentrations in the atmosphere. This will happen in native forests if fire is properly managed and forests remain healthy and productive. This will also be the case in native forests and plantation forests managed for timber production providing regeneration or replanting is adequate and well managed. Wood is grown using solar energy (photosynthesis) at no cost. By contrast other building materials (e.g. cement, steel and aluminum) use large amounts of process energy (usually by burning fossil fuels) in fabricating the raw product and consequently have a much larger carbon footprint (Lawson 1996). Timber is about 50% carbon and this carbon is not only stored in the forest but remains in timber structures remote from the forest. Fire and drought are the main factors determining the capacity of Australian forests to store carbon and this will be impacted by future climate uncertainty (Moroni 2011). Plantations are an effective source of carbon sequestration and hence credits in carbon trading.

*In summary, sustainable timber harvesting from native and plantation forests should be promoted with confidence. Sustainably managed native and plantation forests can be carbon positive and provide an environmentally superior building material to its competitors.*

### (b) Water

2010 and 2011 (so far) have been wet years over much of Australia but droughts will return. Australia is predominantly a dry country and productivity of both agriculture and forestry almost always will be limited by insufficient water. Forests provide higher quality water than alternative forms of land management. This is particularly important in the large areas of native forests surrounding Australia's major cities. However, forests use (transpire) more water than most alternative non-irrigated land uses (e.g. grazing). The rapid expansion of eucalypt plantations from the mid 1990's raised concern on the impact of plantations on catchment water yields. This concern was exacerbated by the extended drought during the period from mid 1990s-2009 in many areas. Large-scale plantation forests were singled out as an intercepting land use in the National Water Initiative (Council of Australian Governments 2004). Plantation developments are restricted by water regulations in South Australia.

Currently plantations are established as a mosaic with other land uses rather than the "wall to wall" plantations of the past. Often the area of plantations in a catchment is not large enough to have a significant impact on water. For example, in the Murray Darling Catchment, plantations are responsible for just 2.5% of consumptive use (Murray–Darling Basin Authority, 2010). However there are some small sub-catchments containing a relatively large area of

plantations where plantations will have an impact. Plantations also have an impact in areas where there are relatively large areas of plantations established on relatively shallow soil profiles overlaying groundwater systems (e.g. the green triangle area of SE South Australia) (Benyon et al. 2006) and the Gnangara mound near Perth (Xu 2008).

Unfortunately, agricultural enterprises have assumed impacts from plantations where there are none and have overstated impacts in those regions where plantations are known to have some impact. The reason for this is incomplete and poor information on water use by the range of land users sharing water with plantation forestry at temporal and spatial scales necessary for determining policy and making decisions on water allocation. Clearly it is in the national interest to maximize overall value by analyzing trade-offs between alternate land uses.

*Government can assist in three ways*

- *assist in getting agriculture and forestry working together on these issues rather than in adversarial frameworks;*
- *encourage continued collection of hydrological data from catchments having a range of land uses that include forests and to consolidate this into national data sets with universal access. All too often many years of collecting data have been devalued or rendered useless by breaks in data collections precipitated by cost cutting;*
- *invest in the construction of appropriate reliable models of water use by all interceptors, not just plantations, that managers can use for making decisions on water allocation at a catchment and regional scale.*

*Government funding options, such as through the National Water Commission, need to be at the very least maintained and preferably enhanced.*

## 3. Biosecurity

Increasing trade and people movements increase the risk of the introduction and establishment of exotic pests and pathogens in Australia. A recent example in the forest sector is that of myrtle rust discovered in Australia in 2010 and which has now been declared non-eradicable. Whilst this pathogen will probably be a much greater threat to natural ecosystems than commercial forestry it is indicative of the biosecurity risk for forestry and other plant industries.

Over the last decade there has been progress in the development of industry government partnerships in biosecurity responses to breaches of the border, cost sharing for agreed eradication programs where technically feasible and cost effective. The plantation forestry sector is only partially integrated into these arrangements at present and it would be very desirable to complete this integration by industry signing the Emergency Plant Pest Response Deed (EPPRD).

*Commercial native forest managers are not part of the industry – government partnership on biosecurity even though native forests may be sites for incursions*

*that could damage the forest themselves and potentially other industries. Conservation forest managers are further removed from involvement in formal biosecurity arrangements. This creates a gap in biosecurity responsibility that Governments have not yet resolved. The proposed National Environmental Biosecurity Response Agreement (NEBRA) needs to be expedited to ensure all native forest managers accept their biosecurity responsibilities.*

## 4. Research and development investment and capacity for innovation

The last decade and particularly the last five years have seen a steady decline in investment in forest and forest products research and development capability and capacity. This has occurred in all State Governments, CSIRO, and Universities and in industry. Short sighted cost cutting that targets research capability as the first target has become all too common. Australia is barely sustaining its capability in some critical areas such as genetics, forest health, and soil management where it was once world leading. State Governments that in the past had substantial research capacity have greatly diminished or moved away from this role or forest research has been moved into larger primary industries science units more remote from the research users and starved for funds. CSIRO has eliminated its forest products research capacity, which once provided leading expertise marked by many innovations (e.g. the Silviscan technology for rapid automated measurement of wood properties). This was partly because the industry was seen to be unwilling to contribute enough to the costs of R and D, and the shifting priorities of CSIRO through its Flagship programs. Industry co-investment is an issue for industry to consider via its levy payments to Forest and Wood Products Australia which remain at around 0.2% of GVP, much less than for many other primary industries.

Industry processes and manufacturing technology are now in the hands of international suppliers and for forest products research Australia will be increasingly dependent on overseas providers. The two remaining nodes of forest products expertise – Agrisciences Queensland and University of Tasmania (neither of which have secure funding) have some capacity for sawing, drying and veneering studies that is critical for any hope in profitably utilizing plantation grown material for appearance products. In the products area we thus have some capacity for incremental improvements but little for real homegrown innovation. The situation for forestry research is marginally better as small groups of high-class expertise exist in a number of organizations but even this is under threat from changing priorities, cutbacks and the low level of co-investment by the industry.

The only organization left capable of bringing some mobilization of resources and focus on key science questions for the industry is the CRC for Forestry but the future of this organization is not guaranteed beyond 2012. Its termination would be a further significant loss in terms of expertise and national coordination.

*Unless the rapidly declining R&D capacity in Australia is arrested and reversed the opportunity for the industry to maintain and grow will be lost to international*

*competitors. Further more, sustainable forestry in our dry environment with the capacity to deal with climate change requires continuous new knowledge and tools for decision-making.*

## References


Benyon R, Theiveyanathan T and Doody T (2006) Impacts of plantations on groundwater in south-eastern Australia. *Australian Journal of Botany* 54: 181-192.

Council of Australian Governments. (2004). Intergovernmental Agreement on a National Water Initiative between the Commonwealth of Australia and the Governments of New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory. http://www.nwc.gov.au/resources/documents/Intergovernmental-Agreement-on-a-national-water-initiative.pdf, item 55. (Current 23 March 2011).

Lawson, B. (1996). Building materials, energy and the environment: towards ecologically sustainable development. Royal Australian Institute of Architects.

Moroni, M T, (2011). The role of forest management in greenhouse gas mitigation: a contextual framework for Australia. CRC for Forestry, Tasmania, FWPA No. PRC162-0910.

Murray–Darling Basin Authority (2010). Guide to the proposed basin plan: overview. Murray–Darling Basin Authority, Canberra.

Nolan, G., Greaves, B., Washusen, R., Parsons, M. and Jennings, S. (2004). Eucalypt plantations for solid wood products in Australia – A Review. FWPRDC Report PN04.3002

O'Hehir, J F and Nambiar, EKS (2010) Productivity of three successive rotations of P. radiata plantations in South Australia over a century. *Forest Ecology and Management* 259:1857-1869

Polglase, P and Benyon, R (2008). The impacts of plantations and native forests on water security: review and scientific assessment of regional issues and research needs. Forest and Wood Products Australia Limited.

Xu, C. 2008. Effects of rainfall, pines and abstraction on Gnangara Mound Water Level Decline. Water Corporation of Western Australia, ISBN 1 74043 446 3.

**Attachment 1 (from Australian Forestry December 2010)**

**Guest editorial**

## Sustainability of eucalypt plantations in Australia is failing

It took about 130 years to develop pine plantations in Australia from a block planting of 250 ha in South Australia in 1878–1879 to more than one million hectares today. In contrast, about one million hectares of eucalypt plantations have arisen in farmlands in just the last 20 years. This new resource, dominated by bluegum (Eucalyptus globulus), was largely developed by managed investment schemes (MIS). Today its future is in a precarious state as several MIS companies have fallen into bankruptcy, mainly because those investments were riding on business models fraught with high risk and in structures that rewarded fast profits—not profit through sustainable forestry. Australians have invested, in addition to the generous tax support to MIS, hundreds of millions of dollars in eucalypt plantation research through three successive Co-operative Research Centres (CRCs), CSIRO, state governments, universities and companies. In return, we have substantial knowledge about the opportunity for and risks of eucalypt plantations in our environments, as well as several useful decision-making tools and management prescriptions. There is also a wealth of knowledge from, and well-founded experience of, sustainable management in the softwood sector to draw upon. Altogether we are well placed to practice sustainable plantation forestry. But what are the realities of blue gum forestry, now and in the immediate future? Is this resource on track to sustainable forestry? I argue, sadly, that three interrelated issues pose serious threats to sustainability.

First, consider the productivity of the first-rotation plantations. The levels of production achieved in the first rotation are, in many cases, at the lower end of the potential, and significantly less than the overzealous 'predicted production' figures in the glossy MIS prospectuses. Moreover, as discussed below, industry may not be sustaining even those low to modest levels of production in subsequent rotations. The low to modest growth rates in the first rotation at many sites were no surprise: those stands were established with stock from genetically unselected seed, and knowledge about prospective sites and silvicultural systems required for good management was in its infancy. Some plantations grew at an MAI of 20 m3 ha–1, and others even reached 30 m3 ha–1 on a very few sites where the land (site) was fertile (thanks to decades of hard work and investment by farmers in legume-based farming that had enriched the resources of soil nitrogen and phosphorus) and profiles were deep and held adequate supplies of water. The rush to acquire land and inflated land prices pushed plantations to sites unsuitable for short-rotation commercial forestry (where stands are now languishing at an MAI of 10 m3 ha–1 or less), and a dearth of cash limited appropriate silviculture. The high volumes promised to thousands of grower investors have been and remain on shaky ground. 'Commercial sensitivity' has prevented proper reviews of reality, but not loud whispers of concern in gatherings of foresters. The second issue is that large areas where growth rates are uneconomic will be deforested in the coming years—and this process has begun. The extent to which this proceeds will be evident only when the fate of troubled MIS plantations is determined. Some industry leaders have suggested, in private, that up to 50% of the land under some MIS groups may go out of forestry.

If such plantations are harvested with eyes set solely on minimizing the harvesting costs (as is the case now), we may be left with a legacy of serious adverse impacts on the land and perhaps water. There is no reason that the land that grew trees cannot be or should not be converted to other sustainable land uses. The question is, will the impending harvesting and site clearing be done in ways that conserve site resources (see below) for the next cycle of land use, or will the whole-stand harvesting practices significantly degrade the land? And where will Australia's future hardwood supply come from?

The third major issue is about the productivity of plantations that are already in the second rotation and those approaching a second rotation. Blue gum chips have been exported from Western Australia during the last ten years, and most harvested areas have been re-planted. As had been observed in Gippsland, Victoria, earlier (P. Whiteman, pers. comm.), the second-rotation plantations in Western Australia are growing more slowly than those in first rotation ('2R decline'), and such losses in volume may range from 20% to 50%. Despite the critical importance of this rapidly-emerging scenario, the widespread 'sensitivity' of the subject inhibits presentation of reliable data and transparent analysis. There are of course reasons for this decline. Research in Western Australia has shown that first-rotation plantations may consume all available soil water stored to varying soil depth (having been accumulated when the land was under pasture), and second-rotation stands, in many cases, may start life facing soil-water deficits. In low- to medium-rainfall zones this deficit may be 1000–1500 mm (D. White and D. Mendham, CSIRO, pers. comm.). Under such conditions, trees grow slowly or die. The drought prevalent in the past decade has induced endemic water stress. In Australian environments, 50–80% of the variation in productivity can be attributed to site / soil factors that determine soil water availability (D. White, pers. comm.). Deployment of improved germplasm will not overcome the effects of endemic water stress on growth. New silvicultural approaches (e.g. reduced stocking) and / or longer periods of inter-rotation fallow to allow soil water recharge will be essential in the future.

Another cause of the decline in growth is harvesting practices that caused near-complete loss of above-ground pools of organic matter and the nutrients in them. Pressure to reduce costs is driving management decisions, and harvesting operations are a well-known target for cost cutting. Whole trees are dragged by the harvesting machines—often down-slope and baring soil along the way—to the roadside where the slash is piled and burnt. Alternatively, slash is windrowed and burnt. I have seen evidence of soil loss in this type of operation recently. In all cases, these practices will degrade the site, depleting it of the organic matter and nutrient reserves significant for long-term productivity. The amount of organic matter (slash + litter) at blue gum sites after harvest may range from 50 to 80 t ha–1. Slash and litter contain large amounts of nutrients including 350–500 kg ha–1 nitrogen, 20–35 kg ha–1 phosphorus, 140–250 kg ha–1 potassium, and appreciable amounts of other elements including calcium, magnesium and micro-nutrients (Nambiar, unpublished). If the operation transported surface soil, losses would be even greater. The total nitrogen in the slash and litter may account for 30% of the total pool of that nutrient on some Australian sites. These nutrient pools (transferred beyond the planted area and largely lost in fire) were gathered by the trees from the soil profile over their life cycle. The productive capacity of soil inherited by the foresters is the legacy of decades of careful legume-based farming by the farmers. Apart from the direct loss in fire and displacement, windrowing and burning will accelerate nitrogen mineralization 40-fold (compared to pre-harvest), permitting nitrogen losses via leaching or surface run-off, especially if the soil is exposed by improper harvesting practice. By deforestation and burning slash and litter at the conclusion of every rotation cycle, plantation forestry would also add to greenhouse gas emissions and forgo some of its carbon neutral or positive credentials.

Despite the seriousness of the issue and some industry-supported research-in-progress, there is neither a quantitative assessment of the extent of these problems nor a concerted approach to address them, even within industry-partnered cooperative research programs. In stark contrast, when second-rotation decline threatened the pine industry in the 1960s in the Green Triangle of South Australia and Victoria, the foresters in the then SA Woods and Forests Department—followed by those in the then Forests Commission of Victoria—published their evidence of decline based on sound inventory data and encouraged others (e.g. CSIRO) to collaborate to find ways to solve the problem. This leadership paved the way to positive outcomes.

Advocates of 'efficient harvesting technology' (measured in the narrowest sense of 'productivity' as dollars per unit volume harvested at roadside) and those promoting total

biomass harvest (for energy production) tend to hold the view that the losses due to displacement and removal of organic matter and nutrients can be replaced by the application of fertiliser. A detailed discussion on this is beyond the scope of this article, but I emphasise that it is impossible to replace the losses using fertilisers and return the nutrient capital to levels anywhere near the initial levels. It is not possible for biological, economic, energy and environmental reasons. Plantation harvesting practices in Australia must comply with principles of sustainability. If not, a single harvesting operation (over a few hours) followed by poor site preparation (over a few days) in 15-year-old blue gum plantations can deplete the fertility (built up over decades) of many sites to levels so low as to significantly affect future production in the next and or subsequent rotations. This is unacceptable but avoidable. I fear, given the current financial crisis of MIS ventures, that thousands of hectares of plantations may be felled (deforested) during the next five years with little regard for sustainable land use, and that may penalise the next generation of the forest industry.

There are very few soils in the world, especially in the old land mass that is Australia, which can cope with the loss of critical site resources at every harvest in 15-year plantation cycles and then support sustainable forestry. The most critical single factor that caused the widespread and severe second-rotation decline in pine was the inter-rotation management practices (slash burning, windrowing and repeated cultivation) of that time. Harvesting, site preparation, planting and early silviculture can pose a high risk to ecosystem processes and functions, but they also provide a window of opportunity to implement science-based best practice. It is a waste of resources to plant genetically-improved seedlings on sites that are progressively depleted of organic matter, nutrients and water. Practices that conserve site resources are used extensively (and profitably) in pine forestry in Australia (but disappointingly not across the whole country) and by pulp-rotation hardwood forestry operations in countries as diverse as Brazil, the Congo and Indonesia.

A sustainable forestry business can only be built on increasing and sustainable wood production, conservation of site resources, maintenance of the properties (and processes) of the natural resource base, due care for the environment and reasonable profit to the investors. These values must be in balance and in harmony. If Australia's eucalypt plantations are significantly declining in production after a single short rotation and the soil is degraded because of short-sighted management, what will be the enduring achievements of our science and management?

Apart from the question of sustaining production discussed here, several issues loom for the future of hardwood plantation forestry in Australia. These include the unfulfilled expectation that this resource would provide high-value logs for solid-wood industries and thus help to reduce the economic effect of declining log supply from native forests. Access to native forests is clearly shrinking year by year, but what are the prospects of supplying quality logs from hardwood plantations in the next decade? The time has come for a prompt and open discussion on sustainable management of eucalypt plantations in Australia—to consider and chart the way forward for the eucalypt plantation estate so that the forest industry can legitimately claim to be sustainable.

Sadanandan Nambiar
Canberra
Email: sadu.nambiar@csiro.au