20 years of improvement in Australia’s forestry practices

National Association of Forest Industries
20 years of growing Australia’s forest industries

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Introduction

Significant improvements to all aspects of Australia’s forest industries have been delivered over the past 20 years. This is highlighted by a range of major achievements that support the sustainable management of forests and plantations to provide wood for the timber and paper industries, jobs for rural communities and improved environmental outcomes.

A new era in Australia’s forest management has commenced where the key forest values including biodiversity, ecosystem health and recreation are included in the management objectives. This is commonly known as ‘multiple-use’ forest management. These changes represent a substantial shift from the traditional focus of forest management which was primarily for timber production with the inclusion of some constraints to maintain environmental and social values.

Recreation is an important consideration in multiple-use forest management (Forestry Tasmania’s Tahune air walk facility)

Silviculture is the science, art and practice of sustainably managing forests to meet multiple objectives. New silvicultural strategies have been developed, with the management and harvesting approaches determined by the nature of the forests. The protection of biodiversity and cultural heritage are fundamental objectives of forest management, with surveys for flora and fauna undertaken prior to harvesting in public native forests. Greater consideration is now given to the protection of soil and water resources, as the basis for the detailed planning that underpins all forestry operations.

Technical improvements have flowed through to timber harvesting and processing. Modern computerised forest mapping and modelling technology have provided more accurate information on the resources available to forest managers and the timber industry.

Mechanical tree felling and timber extraction techniques have revolutionised harvesting, and advanced sawmilling and timber drying technologies have improved the utilisation and value of wood products.

The legislative and regulatory controls applied to forest management activities have become increasingly stringent. Strict codes of practice and legislated regulations now apply to all activities which take place in production forests. Independent certification of forest management has been an important development, providing consumers of wood products with reassurance that purchased products are sourced from sustainably managed forests.

Following increased reservation of native forest available for timber production, the advances in silviculture, harvesting techniques and processing technologies have been necessary for forest managers and the timber industry to maximise both environmental protection and the utility from harvested timber.

In the interests of the environment, society, and in securing its own future, Australia’s forest managers and the timber industry continue to make extraordinary efforts to maintain healthy, productive, and biodiverse forests.

Forests are the industry’s lifeblood. They provide the resources for an array of products which vary from the paper we write on to the chairs we sit on, to the floors we walk on and the homes we live in. Wood has a myriad of uses and is a truly renewable and environmentally friendly resource.

This publication provides a valuable insight into the improvements Australia’s forest managers and the timber industry have made in advancing and modernising forestry. As a consequence, Australia’s wood based products are sourced from forests managed in accordance with world’s best-practice environmental standards.
Improvements in silvicultural practices

Improvements in the management of Australia’s native forests and plantations have been driven by the need for forest managers to meet community expectations while maintaining timber supplies to industry and providing greater protection for the environment.

To achieve these outcomes, native forest and plantation managers are continuously identifying new silvicultural practices which provide a greater degree of balance between the many complex management objectives.

There are variations between Australian States in relation to permissible silvicultural and harvesting treatments that can be applied in native forests. The options include single-tree and group selection, thinning and clearfelling regimes.

Single tree selection harvesting is common in native forests in all states. Under this system, harvesting prescriptions prevent the removal of trees that must be retained for environmental purposes, such as those that may become wildlife habitat trees in the future. Some consideration is also given to maximising future timber production. Any trees judged capable of growing to a more valuable size in the next cutting cycle are also excluded from harvesting. Therefore, the trees that are removed under this system are a proportion of the trees that are of a suitable size for processing into timber products or are those that have to be removed as they are suppressing the growth of other trees.

Beyond single tree selection, many forms of Australian Group Selection (AGS) are practiced during the harvesting of native forests. AGS is effective for particular forest types, especially those forests that require large gaps in the canopy to stimulate effective regeneration of the forest ecosystem.

Thinning of even-aged regrowth native forests and plantations is also widely practiced throughout Australia. This system allows the removal of smaller trees and the retention of healthy vigorously growing trees. The reduction in competition between the remaining trees not only improves the health and growth of the forest but also leads to an increase in the economic value of the trees that are retained.

In many areas, the silvicultural approach to native forest management has moved away from a predominant focus on wood production. Forest managers must meet environmental, social and ecological guidelines in addition to meeting their wood supply targets on a regional or ‘landscape’ basis.

When determining the silvicultural treatment to apply to an area of native forest, forest managers must take into account the protection of ecosystems, soil characteristics, potential impacts on water yields and water quality, and the age, structure and the health of the forest prior to harvesting. As these factors are often highly variable across any forest, there is a need for flexibility in choosing the appropriate silvicultural treatment to be applied. As such, ‘site-specific silviculture’ is a valuable tool that is being adopted, reviewed and improved by forest managers.

This healthy and productive forest stand in Tasmania is a result of careful and appropriate silvicultural strategies

Commercial thinning of this regrowth Ash forest in Tasmania improves the health, vigour and productivity of the stand
Clearfelling remains an important silvicultural practice that is widely used in Australia’s plantation forests and is also carried out in native forests in Victoria and Tasmania. Clearfelling is required in wet eucalypt forests as a means of simulating natural disturbance that are similar to the impacts of major catastrophic events such as bushfires. It allows a large proportion of the available sunlight to reach the disturbed mineral soil and promote the successful germination of seeds. It is also important in maintaining and enhancing the timber producing capacity of the forest. The pattern of clearfelling adopted by forest managers and the size of the areas harvested is similar to ways bushfires affect the landscape and leave the forest with areas of trees at all stages in their growth cycle.

All of these harvesting treatments lead to changes in the structure of the forest. Single tree selection and AGS harvesting lead to the creation of structurally diverse multi-aged forests, whereas clearfelling encourages the growth of healthy, even-aged regrowth forests. The creation of younger forests through harvesting disturbance simulates an important natural ecological process and when combined with the protection of older forests in reserves, creates a healthy and ‘biodiverse’ matrix of forests across the landscape. Only in these forests can the full range of forest ecosystems and biodiversity be found.

The changes in silvicultural objectives, from primarily for timber production to addressing all key forest values must be supported by ongoing monitoring and assessment of the outcomes. In some native forests, particularly the wetter more productive forest types, the use of ‘selection logging with constraints’, while enhancing biodiversity values, has lead to slower tree growth and hindered natural regeneration in some places, as these forests require as much sun light as possible and soil disturbance for better regeneration and growth.

Widespread research and consultation will continue to ensure that the silvicultural operations adopted by forest managers will meet community and industry expectations based on the best available ecological and socio-economic information. Silvicultural systems trials, such as those applied at the Warra Long-Term Ecological Research Station in Southern Tasmania, are exploring some possible new silvicultural alternatives that could be employed in Tasmania’s wet eucalypt forests.
Wildlife corridors are commonly maintained throughout multiple-use native forests and plantations. These areas are protected from logging activities as they provide a connected and sheltered pathway for animals to move around the ‘landscape’.

For plantation managers, the protection of remnant vegetation, potential habitat trees and wildlife corridors provide the means for improving the biodiversity outcomes generated by commercial tree crops.

The protection of Aboriginal and European cultural heritage sites and values is another important consideration in modern day forest management. Prior to the commencement of logging operations, the relevant Aboriginal land council representatives and groups are consulted and the proposed logging area is inspected for cultural sites and artefacts of Aboriginal significance. Any sites or artefacts discovered are protected from logging activities by marking out harvest exclusion zones.
Protection of soil and water resources

The protection of soil and water resources is a fundamental objective of forest management in Australia. Extensive surveys are now commonly required to identify any potential risks to the soil and water quality in native forest and plantation areas prior to undertaking the planting and the harvesting activities.

Traditionally, less consideration was given to soil properties as a possible constraint on logging operations. Today, the industry’s knowledge of soil properties, in conjunction with the slope and rainfall data, will be used to determine inherent hazard level and precautions that need to be adopted during the harvesting and planting of trees.

Forest soil surveys are designed to estimate the potential for soil erosion to occur, the presence of dispersible soils, capacity for mass movement of the soil and the need for seasonal restrictions on timber harvesting or on the preparation of the soil prior to planting.

Seasonal restrictions on harvesting were relatively uncommon 20 years ago. Under the improved management regimes, harvesting may only be permitted in the drier months of the year if the predicted erosion hazard will exceed specified limits in the wetter months.

Another significant change has been the increased protection of riparian zones along all drainage lines and watercourses. Buffer zones, where harvesting is not allowed, are established around these areas to minimise erosion and filter any surface water that runs off the forests and plantations. These buffers vary in width depending on the size and extent of the drainage feature and the susceptibility of the area to erosion.

Road construction and maintenance has also changed significantly over the past 20 years. Particular attention is now paid to the alignment of roads around natural features in the landscape and to make sure that water is drained off the roads as quickly as possible. A higher frequency of drainage is stipulated for steeper roads and a much greater level of detail is now required to determine the sizes and the locations for effective drainage outlets.

Forest managers are responsible for rehabilitating the roads once the forestry operations are completed and roads are not permitted in certain types of forest or features with the potential for long-term water logging such as swamps.

Rubber flap drains are used by Forests NSW to effectively drain this road crossing. They are much preferred by log truck drivers to conventional steep ‘rollover’ drains

All new stream or river crossings are now constructed as bridges, culverts or causeways, as opposed to earth filled crossings, which were common practice 20 years ago. These road crossings must be adequately drained and only designated and approved crossings of streams are permitted.

The monitoring of water quality is another important consideration in the current management of native forests and plantations. Water quality monitoring stations are widely established for measuring the effects of harvesting and other forestry operations on catchment water quality. Plantation managers carry out frequent testing of water quality, both before and after chemical spraying.

Forestry Tasmania has numerous water monitoring stations to assess water quality in catchments where harvesting occurs.
Better harvesting and extraction techniques

The proportion of wood that is harvested by machines (or mechanical harvesting) in Australia has increased dramatically over the past 20 years, together with the introduction of new machinery for taking logs out of the forests.

There has been a sharp rise in the use of mechanical felling machines as opposed to manual tree felling with chainsaws. When compared to manual felling, mechanical felling has provided some significant productivity improvements which allow greater control over the direction each tree falls when harvested and have lead to overall improvements in worker safety. Manual felling is still important however in some native forests, particularly where machinery access is restricted, such as on steep slopes or rocky terrain, or where the trees are too large for mechanical felling.

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In the past, logging on steep slopes was viewed as being too difficult due to restrictions on machinery access and worker safety. The introduction of cable logging systems in both plantations and native forests now allow logging to occur on slopes previously considered too steep (generally where the slope is over 30 degrees) or too dangerous.

Cable logging involves the use of a metal tower and a machine, called a yarder, which pulls logs up the hills and onto the landings with a series of long cables. On steep slopes the yarder is positioned at the top of the hill, and the logs are usually pulled (yarded) uphill to the landing. The logs are lifted partially or completely off the ground to minimise any impacts on the soil.

Significant gains in worker safety and productivity are made by mechanically harvesting this Blue Gum plantation in Western Australia

Mechanical harvesting machines are able to cut trees at ground level, remove the limbs and bark, cut the logs into specified lengths and stack them in the forests. This is all done from the safety and comfort of the harvester’s enclosed cabin.

Recent advances in mechanical timber extraction techniques are providing a number of benefits to the industry, while limiting any damage to the surrounding environment. The use of mechanical forwarders to carry the logs to a specified area or log dump during plantation harvesting and native forest thinning operations, increases productivity and minimises the risk of soil erosion through ‘walk over’ extraction techniques. ‘Walk over’ means logs are suspended from the ground during extraction and are not dragged along the ground which might otherwise cause undue soil disturbance.

To improve the protection of forest soils, logging debris is layered on the ground and ‘walked over’ by the forwarders.

A forwarder delivers logs ready for transport in this Karri forest thinning operation in Western Australia

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Significant technological advances have been adopted for log transportation. Central tyre inflation for log trucks means that the driver can raise or lower the air pressure in the tyres, depending on the road conditions. This has led to reductions in road pavement wear and tear, and, minimises the potential for soil erosion along forest roads.
Greater accuracy in the estimates of the total timber resources standing in Australia’s production forests has become of critical importance to the timber industry. The resource assessment helps to plan the forest harvesting operations and the information on long-term wood supplies can be used to underpin investment in capital equipment for timber harvesting and processing.

In the past, the accuracy of predicting the availability of timber resources within Australia’s native forests was quite variable. Estimates of harvestable wood were often difficult to obtain given the variety of species, the highly variable stand conditions and site productivity across the native forest estate.

In response to these difficulties, forest managers now use sophisticated computerised forest mapping and modelling tools to analyse the full range of forest information that is currently available. This information assists with the planning and the scheduling of the forestry operations.

For example, predictions can be provided of the forest areas that will supply wood resources in 40 years time, with broader predictions available up to 200 years in the future.

The modelling is conducted at two levels using the new computer programs. Firstly, strategic level modelling provides a forecast of the long-term wood supply capacity of the forests, in terms of the wood products that will be harvested and the species to be harvested. Secondly, tactical level modelling identifies which compartments (or defined forest areas) will be harvested over the next 20 or 40 year period.

The results of this modelling work, such as the provision of operation schedules and the status of the forest condition over time, can be instantaneously represented on maps. These maps are extremely valuable, as they allow forest managers to take into account spatial constraints on the ground such as restrictions on harvesting between adjacent forest areas. Alternatively, the clustering of operations might support tactical level planning and thereby reduce the overall costs of supplying timber to the processing sectors of the industry. This level of detailed planning of forestry operations and the wood supply forecasts, better reflect the realities of modern day forest management.

Modelling the future volumes of potential wood supply helps predict any periodic fluctuations in the volumes, species and quality of logs supplied to industry, which is critical for future decision-making by both forest managers and the timber industry.

For instance, Forests NSW currently uses a computerised planning tool, known as Woodstock and Spatial Woodstock, to estimate future native forest growth rates and wood availability. These estimates are based on variations in the silvicultural approaches and the forestry practices to be employed by forest managers.

The models calculate how much timber is available, and where and when harvesting operations should be scheduled. This software also provides an estimate of the standing volume of timber and the condition of the forest can be ascertained at any point in time.
Timber utilisation and processing technologies

The efficient utilisation of timber and timber products has become an increasingly important economic and environmental issue over the past 20 years.

Technological advancements in processing and drying have greatly improved the ‘value adding’ with timber products. While there has been a significant decline in the average size of the logs available to sawmillers, with a decline in the larger denser logs and an increase in the smaller logs available from native forests and plantations, the timber industry has been actively developing new processing and drying technologies to better utilise the timber that is available.

A significant improvement has been the application of tighter specifications on the harvested logs. This ensures that the logs are taken to mills for processing into their highest value and most productive end uses. Modern mill designs, advanced sawing technologies and new drying techniques have increased the industry’s utilisation of lower grade forest resources. Lower grade sawlogs identified as below the sawmill quota grades, are now being processed into value-added timber products.

Modern sawing technologies have significantly improved sawmill productivity and timber utilisation

Advanced cutting techniques and saws are used to increase the recovery of sawn timber from the dense hardwood logs. Laser scanning is used in the mills to determine the optimal widths and lengths of timber to be cut from the logs, in order to maximise the yields of saleable timber products.

During the past 20 years the hardwood industry has moved away from supplying ‘green’ timber products. Advances in timber drying techniques means that a greater proportion of hardwood products are sold as higher-value appearance grade timber products from each grade of logs supplied to the mills.

Microwave timber drying and conditioning is an example of an evolving area of technology. This process has the capacity to relax the growth stresses in green sawn timber, to speed up timber drying, and to facilitate the uptake of preservatives.
Potential use of wood waste for bioenergy

Timber harvesting and processing generates ‘residues’, or wood waste, which is not suitable for higher quality end uses. As a result, there is a considerable volume of wood waste generated in Australia from native forests and plantations each year.

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Wood waste can be used to generate electrical power, steam, or liquid biofuels such as ethanol. At the present time, wood waste is being used to produce the heat and steam required for drying timber products.

In addition, wood waste could be used to generate electricity by direct combustion in dedicated power stations, or by mixing wood waste with other sources of biomass for use with coal in existing power stations.

One example of the potential for using wood waste to produce renewable energy is the Visy Pulp and Paper mill in Tumut (NSW) which has a 20 MW facility producing over 150,000 MWh of electricity per annum. All of this power is used on site. The mill uses wood waste from the pulping process, timber processing waste and paper recycling residues. These materials are burnt in specialised boilers to produce high-pressure steam. The steam passes through a 20 MW steam turbine and the lower temperature/lower pressure exhaust steam from the turbine is used to dry the paperboard.

At present, Australia uses just 2% of the existing wood waste to generate renewable electricity. Maximising the sustainable use of these wood waste resources could:

- Deliver $800 million of direct investment in renewable energy facilities;
- Supply renewable electricity to at least 400,000 houses;
- Create 2,300 new regional jobs; and
- Reduce greenhouse gas emissions by at least 2.2 million tonnes of CO$_2$ each year (which is the equivalent to taking more than 200,000 cars off the road).

In Australia, the forest and timber industry has the resources to produce 30% of the additional 9,500 GWh of electricity required to meet the Mandatory Renewable Energy Target (MRET) without harvesting one more hectare of trees. This equates to an improved use of the seven million tonnes of forest harvesting and timber processing residues currently available for renewable energy production.

Wood-waste is a by-product of harvesting and processing operations undertaken in accordance with ecologically sustainable forest management principles. It is anticipated that the proposed changes to the Renewable Energy (Electricity) Act and Regulations will support an increased use of wood waste as a fuel for generating renewable energy.

It is hoped that bioenergy from wood waste will continue to be embraced as part of a more balanced shift to renewable energy and a greenhouse-friendly alternative to using fossil fuels.
Legislative and regulatory frameworks

In 1992, the Commonwealth, State and Territory governments agreed on a consistent approach to forest management when they signed the National Forest Policy Statement (Tasmania signed onto this policy statement in 1995).

A major initiative in the National Forest Policy Statement was the requirement for completing Comprehensive Regional Assessments (CRA) of the forest resources in Australia’s major timber-producing areas.

The assessments provided the information to underpin the Regional Forest Agreements (RFA). The RFAs are 20-year agreements that balance the full range of environmental, social, economic and heritage values that forests can provide for current and future generations.

The primary outcomes from the ten RFAs completed in Australia include:

- The establishment of a world class system of conservation reserves,
- Provision of a secure resource base for the timber industry with increased opportunities for industry development and investment,
- And the establishment of management systems and processes for ecologically sustainable forest management.

The 10 agreements represent 20-year plans for RFA regions in New South Wales, Victoria, Western Australia and Tasmania. Within these RFA regions, 44% of the land area covered within native forest ecosystems is now in dedicated conservation reserves. 32% of the RFA areas cover private land. The remaining 24% is public land, of which only a portion is covered with forests that are available for timber production.

The National Forest Policy Statement and the RFAs provided the framework to support the native forest sector. In 1997, all Australian Governments together with the industry agreed to a national vision for the plantation sector entitled ‘Plantations for Australia: The 2020 Vision’. The aim of the vision is to raise Australia’s plantation area from 1 million to 3 million hectares by the year 2020.

Comprehensive codes of practice and legislated regulations apply to forestry activities in all States. The codes of practice ensure that commercial timber growing and harvesting operations are carried out on both public land and private land in a manner that:

- maintains an internationally competitive forest industry,
- is compatible with the protection of a wide range of environmental and cultural heritage values, and
- maintains a safe workplace.

Most importantly, the codes of practice support the integration of native forest management or tree plantations with the surrounding environment. These codes of practice are reviewed periodically and revised to reflect improvements in forest management that have been guided by the results of flora, fauna, soil and water monitoring programs.
Certification of forestry activities

Independent certification of sustainable forest management has developed around the world over the last ten years in response to certain markets demanding that imports of timber products are certified under an internationally accredited standard of certification.

Certified forestry operations have to meet strict requirements which demonstrate that the practices are sustainable and legal. Certification will become an increasingly important tool for timber exporting countries as more and more countries develop a preference for internationally-certified timber products. New green purchasing or procurement laws are being implemented in a number of industrialised nations as a means of preventing the importation of wood products harvested from illegally-logged forests.

Unfortunately, it appears that large areas of forest outside Australia are being managed badly, and some are simply exploited for wood with no thought to forest regeneration or the local environment. This may be especially so in countries with poor systems of law enforcement and governance, or with insufficient national wealth to fund high-quality forest practices.

There are two internationally accredited certification standards available to Australian forestry companies. They are the Australian Forestry Standard (AFS) and the Forest Stewardship Council (FSC) standard. Each of the two standards is part of an international network.

The AFS has been recognised and endorsed under the world’s most extensive network of forest certification systems. Called the Programme for the Endorsement of Forest Certification schemes (PEFC), this network provides a framework for the mutual recognition of national standards in around twenty of the world’s major wood producing countries.

FSC is not part of the PEFC network, but operates in many countries, and has established its own system of mutual recognition between its generic national and regional standards.

Certification is becoming more widely used and accepted in Australia. It has helped forest managers to introduce improvements in their forestry practices and ensure that the forest ecosystems will be maintained for the benefit of future generations.

Certification is being more widely adopted by the Australian forest industry as a credible demonstration that the forestry practices are both legal and sustainable. Organisations who have achieved certification include the Queensland, Tasmanian and South Australian governments’ forestry operations, as well as major private corporations such as Gunns Ltd, WA Plantation Resources, Midway and Timbercorp.

Chain of custody standards are also being developed and implemented at the present time. Chain of custody standards basically track timber products from their origins in a certified forest through to their end use by the consumer. It covers all intermediate steps such as harvesting, transportation, primary and secondary processing, manufacturing, distribution and sales. As such, it is an inventory control system that provides assurance to customers that the certified wood products they purchase have been sourced from a certified forest.

Certification is seen as ‘the way of the future’ for the Australian forest industries.

Labelling of timber products from the forest to the consumer is critical in meeting chain of custody standards

For more information:
National Association of Forest Industries (NAFI)
Phone: +61 2 6285 3833
Facsimile: +61 2 6285 3855
PO Box 239
Deakin West
ACT 2600
www.nafi.com.au

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