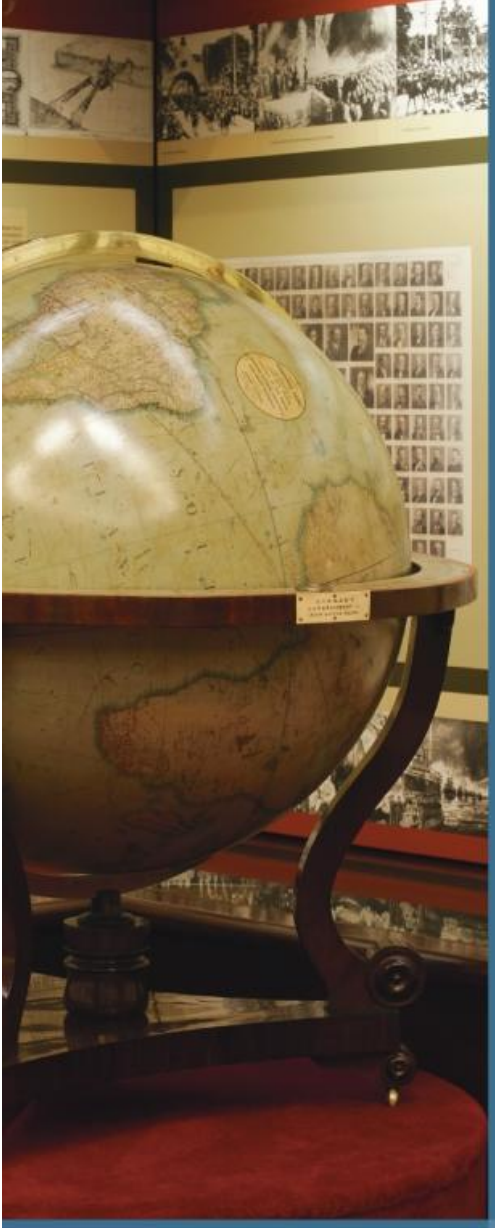

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Plantation forestry in NSW: regulatory regimes and future prospects

Briefing Paper No 12/2010

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Plantation forestry in NSW: regulatory regimes and future prospects

by

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CORRECTION NOTE

Please note that, in light of readers' comments, several minor corrections have been made to sections relating to farm forestry in NSW.

ACKNOWLEDGEMENT

The author would like to acknowledge the contribution of John Wilkinson. John contributed substantially to the historical overview of plantation forestry in NSW and the section on timber industry facts and figures.

SUMMARY

This briefing paper presents an overview of plantation forestry in NSW. Plantation forestry characteristics covered in this paper include: legislative, policy and administrative arrangements; industry facts and figures; research into plantation species and products; and forestry education and training.

An historical overview of plantation forestry

Plantation forestry began in NSW in 1882. The *Forestry Act 1916* was introduced as part of NSW's timber self-sufficiency policy. **[2.1]**

More recently, significant plantation forestry reforms commenced with the 1992 National Forest Policy Statement. In 1997, the Commonwealth Government launched Plantations for Australia: the 2020 Vision. The Vision aimed to treble the plantation estate between 1997 and 2020. Legislation instrumental to achieving the Vision includes the Commonwealth *Managed Investments Act 1998*, the NSW *Plantations and Reafforestation Act 1999*, and several recent amendments of Commonwealth income tax assessment legislation. **[2.2]**

Commonwealth policy and legislative framework

Commonwealth involvement in forestry regulation and administration is based on its participation in several international environmental instruments. Several Commonwealth policies provide a framework for plantation forestry. These include: Plantations for Australia: the 2020 Vision; the Farm Forestry National Action Statement; and the National Climate Change and Commercial Forestry Action Plan. Three areas of Commonwealth law are also of particular importance: the *Environment Protection and Biodiversity Conservation Act 1999*; the *Corporations Act 2001*; and income tax assessment legislation. **[3.0]**

NSW legislative framework

Forestry in NSW is regulated according to forestry type and land tenure. There are two categories of plantation in NSW. First, plantations on public land are regulated by the *Forestry Act 1916*, Forestry Regulation 2009, *Plantations and Reafforestation Act 1999* and Plantations and Reafforestation (Code) Regulation 2001. Second, plantations on private land are regulated by the *Plantations and Reafforestation Act 1999* and Plantations and Reafforestation (Code) Regulation 2001. Several other statutes also impact upon plantation forestry.

Two types of farm forestry exist in NSW. Plantations smaller than 30 hectares on private land are defined as 'exempt farm forestry' in the *Plantations and Reafforestation Act 1999*. Exempt farm forestry may be regulated by the *Plantations and Reafforestation Act 1999* and the Plantations and Reafforestation (Code) Regulation 2001. 'Private native forestry', the second type of farm forestry, is regulated by the *Native Vegetation Act 2003* and Native Vegetation Regulation 2005. **[4.0]**

Administering plantations in NSW

Plantations on public and private land are both administered by a plantation plan, as required under the Plantation and Reafforestation (Code) Regulation 2001. Plantations on public land are also administered by regional-scale Ecologically Sustainable Forest Management plans. Each type of plan must be consistent with relevant regulatory instruments, including: inter-governmental agreements; regulations; policies; codes of practice; and, in some cases, voluntary non-government certification standards. **[5.0]**

'Exempt farm forestry' may be regulated and administered under the *Plantations and Reafforestation Act 1999*. 'Exempt farm forestry', which is not authorised by the *Plantations and Reafforestation Act 1999*, must acquire relevant approvals under the *National Parks and Wildlife Act 1974* and the *Threatened Species Conservation Act 1995* (s 48). Private native forestry is administered by a Private Native Forestry Property Vegetation Plan under the *Native Vegetation Act 2003*. This Plan is a legally binding agreement between the landowner and the NSW Department of Environment, Climate Change and Water. **[5.0]**

Plantation forestry in NSW: location and characteristics

Forests cover 33% of NSW. Of the total 26.5 million hectares of forests in NSW, 393,182 hectares are plantation forests. Six Australian plantation areas are located at least partially in NSW: Northern Tablelands; North Coast; Central Tablelands; Southern Tablelands; Murray Valley and East Gippsland-Bombala. In 2009, the NSW Government owned 247,015 hectares of the total plantation estate, the remainder being privately owned. Accurate data on farm forestry in NSW is more difficult to obtain. As of 2007, there were 27,950 hectares of farm forestry in NSW. **[6.1]**

In 2009, 287,820 hectares of NSW plantation forests were softwoods, the majority of which were Radiata pine. Growth in plantation forestry since the late 1990s has primarily involved hardwood species. A large proportion of hardwood plantations are located in the North Coast region of NSW. Eucalypts make up the majority of hardwood plantation forests, the most common of which are as follows: Blackbutt, Dunn's white gum, Flooded gum and Spotted gum. **[6.1]**

Plantation forestry in NSW: volumes, values and forecasts

Roughly two-thirds of all logs harvested in NSW in 2008-09 were sourced from plantation forests. Plantation logs were worth $220 million in 2008-09. Although NSW log production between 2002-03 and 2008-09 was roughly constant, there was a significant decrease in hardwood logs sourced from native forests (463,000 m^3) that was only partially covered by an increase in plantation hardwood logs (97,000 m^3), During this same period, the volume of softwood plantation logs harvested rose by 401,000 m^3. **[6.2.1]**

Forests NSW generated $263 million in forest sales revenue in 2008-09. Between 1999-00 and 2008-09, Forests NSW has reduced its reliance on native forests for forest products such as sawlogs, veneer logs and pulpwood. This reduction has been offset by increased production from hardwood and softwood plantations. Forecast future plantation log supply varies substantially between

regions and by year. Future log supply is also highly dependent on rates of plantation establishment. **[6.2.1]**

Timber production in NSW: producers and products

Forest products are made into an assortment of timber products. For example, in 2007-08 approximately 50% of all Forests NSW hardwood was made into floorboards, and over 70% of Forests NSW softwood ended up as house framing. **[6.2.2]**

In the last five to ten years, different sectors within the wood products industry have experienced varying fortunes. In 2006-07, there were 184 hardwood sawmills and 26 softwood sawmills in NSW. The majority of the hardwood sawmills are quite small, processing less than 3,000m^3/yr, and are located in regional areas of NSW. Whilst sawnwood production from softwood logs rose by 346,200m^3 between 2003 and 2008, hardwood sawnwood production fell by 110,400m^3 during the same period. The pulp and paper sector is one of the largest sectors in the wood products industry. However, the following sector-specific economic indicators have declined Australia-wide since 2005: the value of exports and domestic demand; the number of establishments; and total employment. **[6.2.2]**

Timber production in NSW: imports and exports

In 2008-09, Australia had an export deficit of $2.1 billion in forest and wood products. Of $4.4 billion in imports, $2.867 billion was spent purchasing paper products. The largest NSW imports were sawnwood products (totalling $104.5 million) and miscellaneous forest products (totalling $177.3 million). **[6.2.3]**

In 2008-09, Australia exported $2.3 billion in forest and wood products, down 5.2% relative to the previous year. The most important NSW exports were wood chips ($108.4 million) and sawnwood ($69.8 million). Only 6% of exported Australian sawnwood was the value-added dressed sawnwood, the remainder being roughsawn. **[6.2.3]**

Plantation forestry in NSW: domestic and overseas markets

Australia's annual log harvest volume fell by 10.7% in 2008-09. Domestic demand was weak. For example, total dwelling commencements fell by 17%. As a result, sawnwood and wood-based panel consumption and production declined in all categories except veneer production between 2007-08 and 2008-09. **[6.2.4]**

The value of Australian forest and wood product exports fell in 2008-09, largely as a result of a significant drop in the value of woodchips, packaging and industrial paper. According to ABARE, uncertainty surrounds future demand from Australia's major trading partners. Japan ($860.5 million) and China ($390.4 million) are Australia's two most significant export markets. Other important markets include: New Zealand; South Korea; Malaysia; Taiwan; and Hong Kong. **[6.2.4]**

Plantation forestry in NSW: employment

According to the 2006 census, 38,410 people were employed in forest product related industries in NSW. A total of 2,511 businesses were operating in the industry at the time. The largest employers were wood structural fitting and component manufacturing, and paper product manufacturing companies. **[6.2.5]**

Plantation forestry in NSW: current issues

Private investment in plantation forestry sharply declined in 2009-10 due to the collapse of four Managed Investment Scheme companies. Together, these companies had owned a significant proportion of the NSW plantation estate. As a result, industry and government stakeholders are currently debating the suitability of the Managed Investment Scheme approach to plantation forestry. Proposed investment alternatives include: tax-based incentive mechanisms; government investment; and indirect government policies such as market regulations. Other issues facing the industry as identified by industry stakeholders include: the general failure of farm forestry to become a significant contributor to the supply of softwood and hardwood timber; and inadequate investment into expanding softwood plantations, long rotation hardwood plantations for sawlogs, and value-adding industries. **[6.3]**

Plantation forestry in NSW: research and development

Several Commonwealth and NSW government bodies invest in forest and wood products research. However, State government R&D investment has generally declined in recent years. For example, between 2007-08 and 2008-09, Forests NSW R&D investment fell from $7.6 million to $4.6 million. Current government-funded research topics include: forestry and climate change; forestry and water quality and yield; biosecurity; and product development and use. **[7.1]**

Between 1981 and 2002, the focus of tree species research changed from exotic plantation species to native plantation species. Exotic species research has focused primarily on pine and, to a lesser extent, cypress species. No recent research has been conducted on exotic species such as Douglas fir, Californian redwood or Western red cedar. Two types of research are currently conducted: genetic improvement programs; and species trials. **[7.2]**

Genetic improvements can be achieved by two methods: breeding for certain traits; and creating hybrid species. A literature review identified research on improving over 20 species of eucalypt and several native and exotic pine species by selective breeding in the eastern States of Australia. At least 17 eucalypt species have also been crossed to create hybrids with superior combinations of qualities than the parent species. **[7.2.1]**

A large number of species have been trialled for large-scale plantations and farm forestry. A literature review identified 39 native and exotic species that had been, or are currently being trialled for large-scale plantations and farm forestry. An additional 76 native and exotic species had been, or are currently being trialled for farm forestry plantings. **[7.2.2]**

A 2001 study of the economic viability of plantations in NSW estimated that the amount of NSW land suitable for plantation establishment ranges from 160,000 hectares to 425,000 hectares. Plantation viability depends on a large number of factors. It can be improved by such factors as: alternative species; improved genetic material; advanced establishment techniques; and markets for environmental services. **[7.3.1]**

The economic viability of farm forestry also depends on a large number of factors. For example, market opportunities differ substantially by region and by forest or timber product. A large number of potential and current farm forestry products are identified in the literature, including: bioenergy; biofuel; carbon sequestration; engineered strand timber; pulp & paper; and veneer. **[7.3.2]**

Plantation and farm forestry management involves engaging with several environmental issues, including: biodiversity; carbon sequestration; pesticide use; and water consumption. Issues such as pesticide use require compliance with the relevant regulatory regime. Water use falls under this category in South Australia. However, other States, including NSW, currently do not regulate water use by plantations. Issues such as carbon sequestration and biodiversity are positive environmental outcomes from plantation forestry. However, verifiable and rigorous accounting methodologies and an appropriate and stable policy framework are required in order for plantation owners to benefit economically from these environmental services. **[7.4]**

Education and training for the forestry sector

In NSW, there is a current skills shortage in the forest and wood product industries. Three categories of forestry education are identified in the literature: community education; knowledge based education (primary, secondary and tertiary); and vocational education and training. Each type of education currently exists in NSW. However, according to the industry, each type of education needs improvement in order to address the shortage of skilled workers and raise community awareness of the benefits of forestry. **[8.0]**

1.0 INTRODUCTION

The first NSW government plantations were established in 1882. Three species of acacia were planted for their bark: Black wattle; Two veined hickory; and Broad-leaved wattle.[1] Since that time, plantation forestry in NSW has undergone significant changes with regard to ownership arrangements, tree species grown and products produced.

Plantation forestry is an important component of forestry in NSW. The forest regulatory regime has undergone major reform in the past 20 years. The 1992 National Forest Policy Statement has been instrumental in setting the direction of the reform process. The Statement set an overarching forestry framework within which plantation forestry occupied a key role. Significant reductions in the area of native forest available for harvesting have been largely offset by a rapidly increasing plantation estate. Plantations for Australia: the 2020 Vision, founded on a government-industry partnership, aimed to triple the plantation estate between 1997 and 2020. Since the release of the 2020 Vision, NSW and Commonwealth regulatory reform has focused on regulating plantation forestry and increasing private investment in the industry.

In 2010, plantation forestry provides many economic, social and environmental benefits for NSW. According to the 2006 census, over 38,000 people are employed in the NSW forest and wood products industry. In 2004-05, the industry was estimated to have generated more than $5.7 billion in sales and services income. Currently, almost two-thirds of the logs supplying the industry are sourced from plantation forests. Industry research and development is focused on maintaining and increasing the benefits NSW derives from plantation forestry. Topics researched include: trialling new species; maintaining and improving environmental sustainability; and investigating new opportunities such as biofuels, bioenergy, carbon sequestration and biodiversity credits. Another area of promise identified in the literature is the potential for small-scale plantations and private native forestry to contribute to both the broader forest industry and farm resilience. However, the recent decline in research and development investment, together with a shortage of skills and labour, have been identified by the industry as significant challenges for the future.

This paper starts with an historical overview of plantation forestry in NSW. Commonwealth and NSW legislative, policy and administrative arrangements are subsequently outlined before key plantation forestry facts and figures are identified. The next section summarises select aspects of a large body of research on alternative tree species, industry opportunities, the economic viability of plantations, and key environmental issues associated with plantation forestry. Finally, a summary of education and training provisions for the industry is presented before a brief concluding statement.

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[1] Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp.

2.0 HISTORICAL OVERVIEW

2.1 Developments in NSW to the 1980s

The timber industry has a long history in NSW, dating back to the settlement of the colony. By the 1840s, commercial timber merchants had established themselves in the major towns, with around 20 sawmills in operation a decade later. According to John Dargavel, it was not until the "third quarter of the nineteenth century" that the "modern timber industry started".[2] Between 1880 and 1902 the number of sawmills in NSW increased from 243 to 331.

In 1902 the main timbered areas of NSW were divided into nine regions.[3] There followed, in 1909 and 1916, the first dedicated Forestry Acts, consolidating the management of State forests and timber reserves. The landmark *Forestry Act 1916* provided for a total of two million hectares of State forests and established a Forestry Commission of three members (a Chief Commissioner and two others), with the power to develop and market forest products. In addition:

> The 1916 Act provided much more stringent control over the harvesting of the forest than before through a 'Special License' system, whereby a sawmill had an area of forest allocated to it, usually for a term of five years.[4]

The Commission developed a policy of State "self-sufficiency in wood through intensive management of the native resources and a vigorous softwood plantation program".[5] The first attempt at a commercial coniferous plantation in NSW was at Tuncurry in 1912, following the report of the Royal Commission of Inquiry on Forestry in 1908, which advised "the planting of exotic softwood trees of commercial value on suitable lands throughout the State". By 1919 the Government had adopted a forestry policy "including afforestation with softwoods of poorly timbered unproductive lands with a view to making the NSW of the future independent of imported supplies".[6] The emphasis focused

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2 Dargavel, J., 1995. *Fashioning Australia's Forests*, Oxford University Press, Melbourne, 312pp.

3 Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp. In the early 1990s the regions were as follows, from north to south: Richmond Tweed; Northern; North West; Mid North Coast; Central West; Hunter; Illawarra; South East; Murrumbidgee; Murray (Poyry, M.G., 1995. *The Economic Impact of the New South Wales Timber Industry*, Margules Groome Poyry, Melbourne.

4 Carron, L., 1985. *A History of Forestry in Australia*, Australian National University Press, Canberra, p 24.

5 Carron, L., 1985. *A History of Forestry in Australia*, Australian National University Press, Canberra, p 49.

6 Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp.

on planting radiata pine in the Bathurst region (around Lithgow, Oberon and Orange) and in the Albury region (around Batlow, Tumbarumba and Tumut).[7]

In the mid-1930s, with around 30 plantations in operation at varying levels of success, planting was suspended, only to be reactivated after World War II. From 1946 loan funds were made available by the NSW Government for the development of plantations. However, it was in the 1960s that the establishment of plantations received a major boost, following, in the words of TC Grant:

> agreement between the State and Commonwealth Governments for provision of Commonwealth Financial Assistance for a period of five years from 1st July 1966 for an enlarged planting programme.[8]

In 1963 the Menzies Federal Government established the Australian Forestry Council (AFC), consisting of the Federal and State forestry ministers. The AFC declared a year later that a major aim of its activities would be to make "Australia self-sufficient in softwood timber by the year 2000".[9] Subsequently, the Holt Federal Government obtained passage of the *Softwood Forestry Agreements Act 1967*. Further to this Act, the Holt Government provided loans to meet the additional cost of all new planting in excess of 3,278 hectares per annum. The agreement ran for 5 years, from 1967 to 1972. The McMahon Federal Government passed the *Softwood Forestry (Further Agreement) Act 1973*, extending the assistance for a further 5 years, from 1971 to 1976.[10] During the period of the Fraser Federal Government, the scheme was extended up to 1982.[11] In 1982, the Commonwealth Government passed the *Export Control Act 1982* by which it regulated timber exports.

Over the 16 year period of the softwood agreements, the total amount of softwood plantation in Australia increased from 170,000 hectares to 900,000 hectares.[12] During the period from 1967 to 1976, a total of 76,005 hectares of

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7 Drielsma, J.H., O'Hara, A.J., Wilson, R.V., 1990. Lessons from New South Wales Experience in Dargavel, J. and Semple, N. (eds.), *Prospects for Australian Forest Plantations*., Australian National University, Centre for Resource and Environmental Studies, Canberra, 510pp.

8 Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, p157.

9 Carron, L.T., 1990. A History of Plantation Policy in Australia in Dargavel, J. and Semple, N. (eds.), *Prospects for Australian Forest Plantations*., Australian National University, Centre for Resource and Environmental Studies, Canberra, 510pp.

10 Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp.

11 Catton, C., Gerrand, A., Joseline, A., Miller, R., Stephens, M., Wood, M., 2002. Impact of Incentives on the Development of Forest Plantation Resources in the Asia-Pacific, paper presented at the *Nineteenth Session of the Asia-Pacific Forestry Commission*, Mongolia, August 2002, 15pp.

12 Catton, C., Gerrand, A., Joseline, A., Miller, R., Stephens, M., Wood, M., 2002. Impact

softwood was planted in NSW.[13] In 1982, with the Wran Government in office, the NSW Forestry Commission released its Exotic Softwood Plantation Policy in which it stated that its aim was to:

> implement a program of softwood plantation establishment and management designed to bring existing individual government projects to a level capable of sustaining raw material supplies to efficient, competitive and integrated forest products industries.[14]

By the late 1980s the area planted to softwood in NSW had increased substantially (see Table 1).

Table 1: Coniferous Plantations in New South Wales: 1967 to 1987[15]

Date	Forestry Commission (hectares)	Private (hectares)
1967	49,209	8,989
1987	166,435	60,561

2.2 Plantation forestry in NSW: 1990 to 2010

Developments in plantation regulation and management between 1990 and 2010 have been driven by a number of factors: a gradual transformation of State forests into national parks to reduce native forest harvesting; the need to guarantee timber supply for national consumption and export purposes; and the potential for plantations to provide environmental benefits, including addressing land degradation problems on farmland. Figures 1 and 2 provide a timeline of plantation forestry in NSW between 1990 and 2010. Key Commonwealth and NSW legislation, policy and parliamentary inquiries are identified, as are the sections of this paper in which they are discussed in more detail.

The conversion of State forests to national parks has significantly reduced the amount of state land from which forest resources can be accessed. This process commenced with the Commonwealth Government's 1992 National Forest Policy Statement (NFPS) that was released in response to almost twenty years of campaigning by environment organisations and a series of international environmental conventions (see Figure 1). Working with the States, Regional Forest Agreements (RFAs) were established which divided Australia into 12

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of Incentives on the Development of Forest Plantation Resources in the Asia-Pacific, paper presented at the *Nineteenth Session of the Asia-Pacific Forestry Commission*, Mongolia, August 2002, 15pp.

13 Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp.

14 Carron, L., 1985. *A History of Forestry in Australia*, Australian National University Press, Canberra, p.20.

15 Ord, K., 1990. Appendix C: Plantation and Forest Sector Statistics, in Dargavel, J. and Semple, N. (eds.), *Prospects for Australian Forest Plantations*., Australian National University, Centre for Resource and Environmental Studies, Canberra, 510pp.

regions.[16] The overall goal was to create a comprehensive, adequate and representative reservation system to protect old-growth forest and wilderness values by the end of 1995.[17]

In 1995, the newly elected Carr Government commenced regional assessments of forest resources in the coastal regions of NSW. At the end of 1995, to help workers and businesses affected by the NFPS, the Keating Government, in conjunction with the States, introduced a Forest Industry Structural Adjustment Package (FISAP). In 1997, the Commonwealth Minister for Primary Industries, John Anderson, officially launched a policy entitled Plantations for Australia: the 2020 Vision (Plantations 2020). Its aim was the trebling of plantations in Australia to 3 million hectares by the year 2020. Legislation instrumental to the policy's implementation included the Commonwealth *Managed Investment Act 1998* and the NSW *Plantations and Reafforestation Act 1999*.

Between 1999 and 2001 three Regional Forest Agreements were signed between the Federal and NSW Governments, covering the North East, Eden and Southern regions of NSW.[18] Plantation developments in the early 2000s included: the introduction of the Plantations and Reafforestation (Code) Regulation 2001; an update of the Plantations 2020 policy; and a Commonwealth parliamentary inquiry into Plantations for Australia: the 2020 Vision. Farm forestry management also changed. Plantations on farms continued to be regulated under the *Plantations and Reafforestation Act 1999* and Code, whereas private native forestry became regulated under the *Native Vegetation Act 2003* (NSW) and Native Vegetation Regulation 2005 (NSW).

2005 to 2010 saw several major developments in the plantation sector (see Figure 2). In NSW, the *Plantations and Reafforestation Amendment Act 2010* was passed in November 2010. The importance of plantations as a timber source increased with the protection by the Keneally government of 107,000 hectares of river red gum forests on the Lachlan, Murrumbidgee and Murray rivers.[19] Around the same time, however, the viability of plantations in Australia was placed in some doubt with the collapse of several Managed Investment Scheme companies, commencing with Timbercorp in April 2009. The findings of a Commonwealth parliamentary inquiry into agribusiness Managed Investment Schemes were released in September 2009, followed by the amendment of Commonwealth income tax assessment legislation in 2010.

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16 Prest, J., 2003. *The Forgotten Forests: The Environmental Regulation of Forestry on Private Land in New South Wales between 1997 and 2002*, PhD Thesis, University of Wollongong.

17 Dargavel, J., 1995. *Fashioning Australia's Forests*, Oxford University Press, Melbourne, p.239.

18 URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

19 Minister for Climate Change and the Environment, 2 March 2010. *Media release: NSW Government Approves Key NRC Recommendations*.

Figure 1: Plantation forestry in NSW: 1992 to 2004

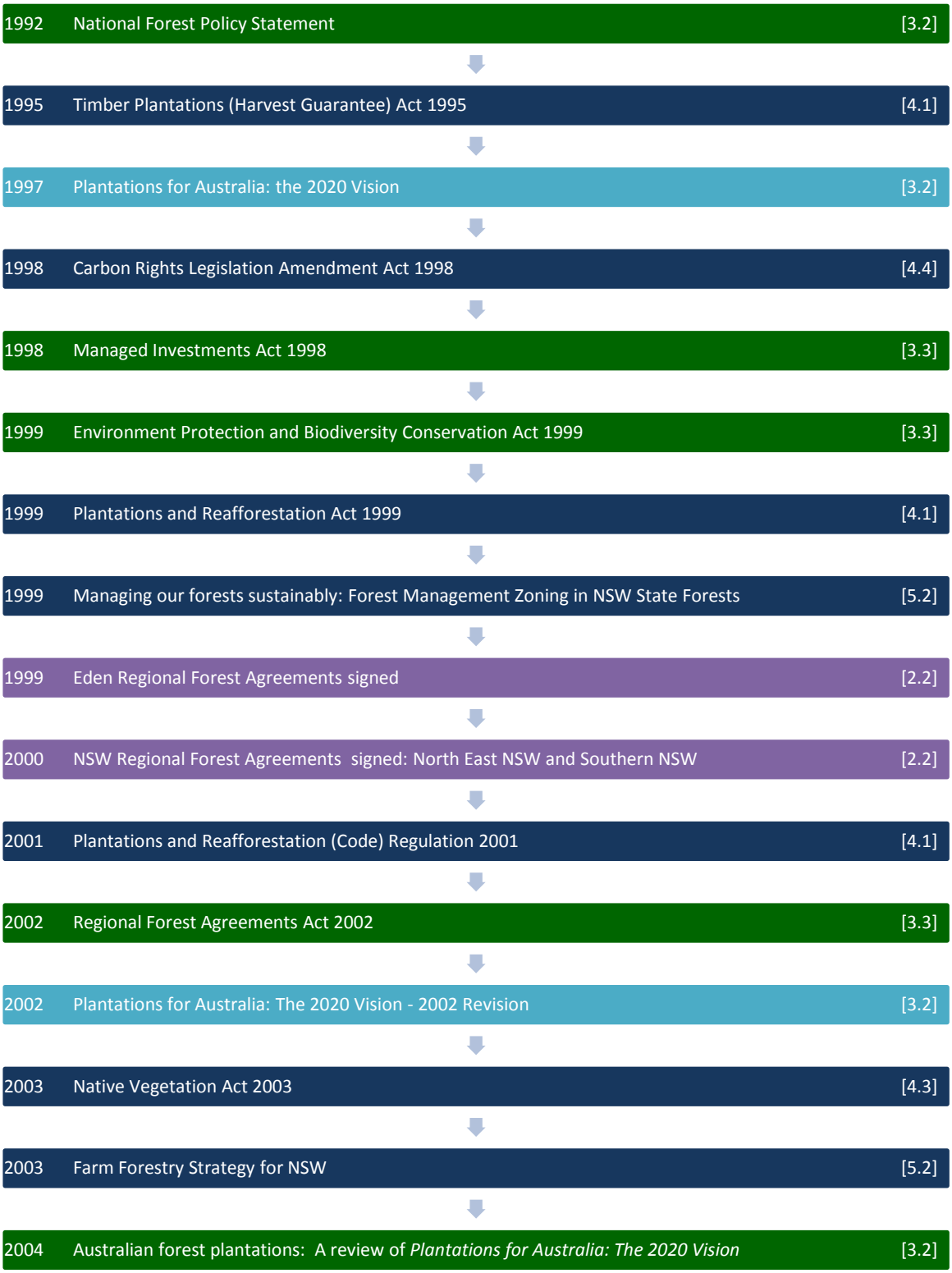
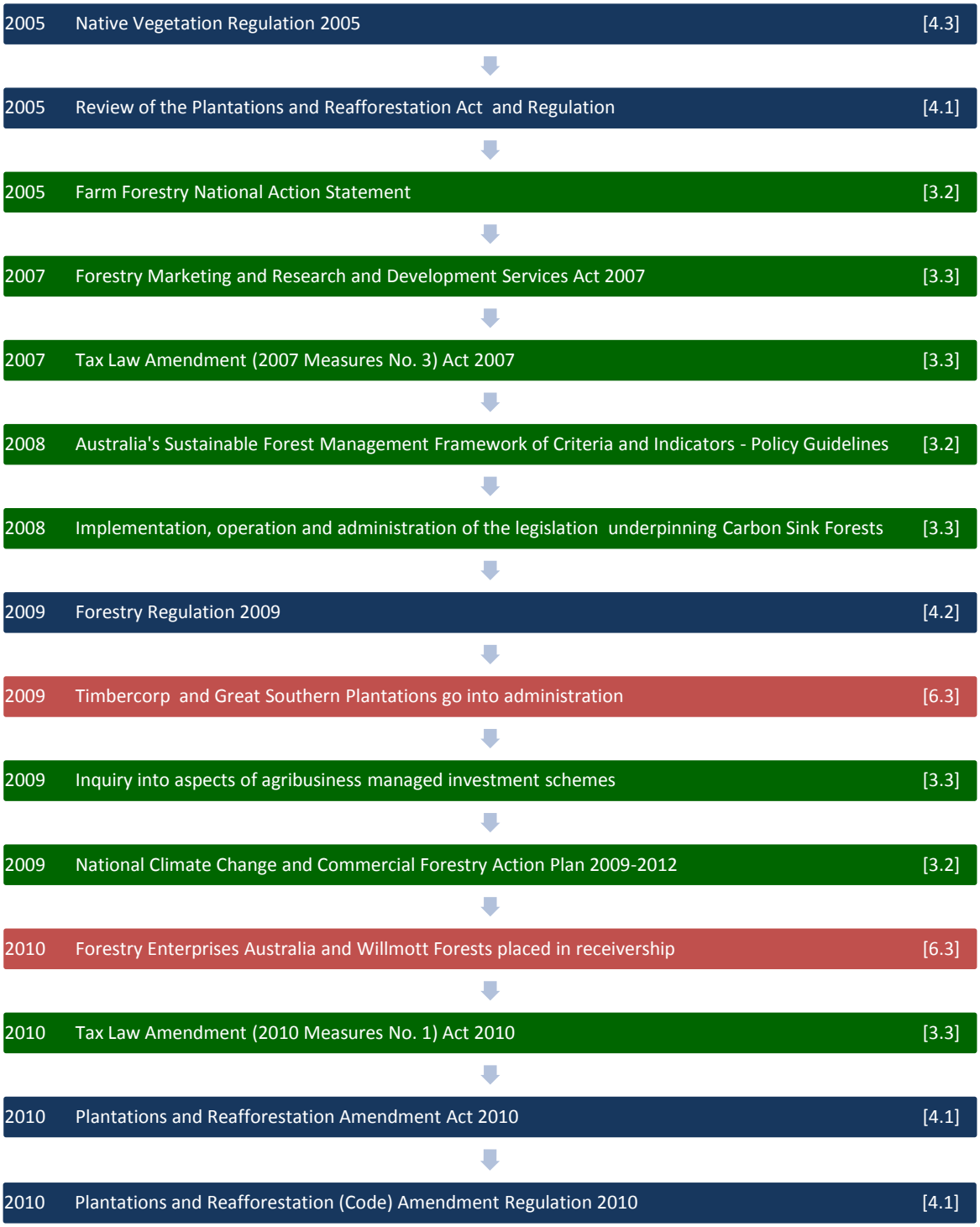


Figure 2: Plantation forestry in NSW: 2005 to 2010



3.0 COMMONWEALTH POLICY AND LEGISLATIVE FRAMEWORK

The Commonwealth Government plays a key role in plantation forestry. On 24 June 2009, the Commonwealth Minister for Agriculture, Fisheries and Forestry, Tony Burke, released a ministerial statement which committed the Commonwealth Government to: addressing skills and training shortages; investing in value-adding; dealing with climate change; and tackling illegal logging.[20] This section identifies relevant international instruments and outlines the Commonwealth legislative and policy arrangements.

3.1 International instruments

Several international instruments operate in this area (see Table 2), two of the most important being: the Convention for the Protection of the World Cultural and Natural Heritage; and the Convention on Biological Diversity. The *Australian Heritage Council Act 2003* and the *Environment Protection and Biodiversity Conservation Act 1999* were both passed to implement the Commonwealth Government's obligations under these conventions.

Table 2: International instruments of significance for Australian forestry[21]

Date	Title	International body
1972	Convention for the Protection of the World Cultural and Natural Heritage	United Nations Educational, Scientific and Cultural Organization
1992	Convention on Biological Diversity	United Nations
1992	Global Statement of Principles on Forest Conservation	United Nations
1992	Statement of Forest Principles	United Nations
1992	Agenda 21	United Nations
1995	Santiago Declaration (Montréal Process)	Montréal Process Working Group
1997	Kyoto Protocol to the United Nations Framework Convention on Climate Change	United Nations
2000	IPF/IFF Proposals for Action	Intergovernmental Forum on Forests
2001	Collaborative Partnership on Forests	Economic and Social Council of the United Nations
2006	International Tropical Timber Agreement	International Tropical Timber Organization
2007	Non-Legally Binding Instrument on All Types of Forests	United Nations

[20] Tony Burke, 24 June 2009. *Preparing our Forest Industries for the Future*, House of Representatives, Commonwealth Government Hansard.

[21] Sources: Department of Agriculture, Fisheries and Forestry, 2010. *International and Regional Forums*, accessed 10/11/2010; Farrier, D., Stein, P. (eds) 2006. *The Environmental Law Handbook: Planning and Land Use in NSW*, 4th ed. Redfern Legal Centre Publishing: Sydney, 748pp.

The principal international instrument relevant to Australian forestry policy is the 1992 Statement of Forest Principles. It includes the right of nations to develop their forests in accord with their own needs and encourages the development of national strategies on the sustainable development and use of forests.[22]

3.2 Commonwealth policy framework

Timber plantation establishment, maintenance and harvesting, and the sale of timber products, are regulated by Commonwealth legislative instruments, policies, strategies and programs. The following policies are of particular importance: the 1992 National Forest Policy Statement; Plantations for Australia: the 2020 Vision; the 2005 Farm Forestry National Action Statement; Australia's Sustainable Forest Management Framework of Criteria and Indicators 2008 – Policy Guidelines; and the National Climate Change and Commercial Forestry Action Plan 2009-2012 (see Figures 1 and 2).

3.2.1 The National Forest Policy Statement

The 1992 National Forest Policy Statement is a policy to which the Commonwealth, State and Territory Governments are signatories. It consists of a Vision and eleven National Goals.[23] One goal is specifically concerned with plantations:

- To expand Australia's commercial plantations of softwoods and hardwoods so as to provide an additional, economically viable, reliable and high-quality wood resource for industry.

In addition to this goal, the Statement sought to increase plantation development on cleared agricultural land in order to rehabilitate degraded lands, diversify farm income and create carbon sinks. The governments also committed to enhancing plantation research and development, and to addressing tax disincentives.

3.2.2 Plantations for Australia: the 2020 Vision

Plantations for Australia: the 2020 Vision (Plantations 2020) is a strategic partnership between the Commonwealth, State and Territory Governments and the plantation timber growing and processing industry. It was launched in 1997 by the then Commonwealth Minister for Primary Industries, John Anderson.[24]

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22 Thompsons Legal Online, 1999. *Environment and Natural Resources* [14.10.8]

23 For a more detailed summary of the National Forest Policy Statement, see the Research Service publication: Smith, S., 1999. *Forests in NSW: An Update*, Briefing Paper No 2/99.

24 The initial industry partners were the Australian Forest Growers, the National Association of Forest Industries and Plantations Australia.

Plantations 2020 was updated in 2002 following a review by the Private Forestry Consultative Committee.[25] A set of actions was identified by which the vision, target and principal goals could be achieved (see Box 1).[26] The actions sought to address: policy; regulation; investment growth; social and environmental factors; and monitoring and review. The overarching principle of Plantations 2020 is to "enhance regional wealth creation and international competitiveness through a sustainable increase in Australia's plantation resources, based on a notional target of trebling the area of commercial tree crops by 2020."[27]

Box 1: Plantations for Australia: the 2020 Vision – Vision, Target and Principal Goals

VISION

The sustainable expansion of the plantation forest estate will be achieved with significant private investment. By 2020, the expanded plantation forest estate will provide Australia's plantation-based processing industries with the capacity to:

- Operate in the global marketplace;
- Be internationally competitive; and
- Be commercially oriented – market driven and market focused in all their operations.

Returning trees to the landscape as a profitable crop can also significantly benefit rural and regional communities and the environment

TARGET

The Vision has a notional target of trebling the effective area of Australia's plantations between 1997 and 2020

PRINCIPAL GOALS

- Increased plantation resources to supply processing industries or build new market opportunities for a greater range of forest products
- Enhanced domestic value-adding
- Recognition and delivery of environmental services from commercial tree crops through their strategic location and optimal management
- Enhanced international competitiveness
- Industry recognised as a leader in the fields of commercial tree crop investment, growth, management, marketing and processing
- Plantations complementing other industries and employment sectors such as environment, agriculture and rural tourism

An Australian Senate inquiry into Plantations 2020 released its findings in 2004. Seventeen recommendations were made, the most significant concerning: the plantation prospectus industry (Managed Investment Schemes); research and extension services; plantation water consumption; and taxation incentives for long rotation plantations. The Howard Government supported these recommendations in July 2007.[28] However, along with reporting on the progress made since 2002, the most recent review of Plantations 2020 identified continuing concerns on all these fronts.[29]

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25 The review of Plantations 2020 was requested by the Forestry and Forest Products Committee, an advisory committee to the Primary Industries Ministerial Council, in 2001. The review was conducted by the Private Forestry Consultative Committee, which comprised government and industry private forestry bodies.

26 Box 1 source: Plantations 2020, 2002. *Plantations for Australia: The 2020 Vision – 2002 revision*.

27 Plantations 2020, 2002. *Plantations for Australia: The 2020 Vision – 2002 revision*.

28 Australian Government, 27 July 2007. *Australian Government Response to the Senate Inquiry into Australian Forest Plantations*.

29 Plantations 2020, November 2008. *Plantations for Australia: The 2020 Vision – A Progress Report by the 2020 Vision Partners*. See also section 6.3.

3.2.3 Farm Forestry National Action Statement

Complementary to Plantation 2020, but only released in August 2005, is the Farm Forestry National Action Statement (see Box 2).[30] According to this Statement, farm forestry is intended to achieve at least three objectives. First, it provides income diversification for farmers and resources for regional industries. Second, it can improve the condition and sustainability of natural resources by addressing resource degradation issues such as water quality. A third objective is the re-establishment of trees in the landscape, which also sequesters atmospheric carbon.

Box 2: Farm Forestry National Action Statement: Vision and Action Imperatives

VISION

The National Action Statement vision is to increase the adoption of commercial tree growing and management as a widely accepted part of Australian farming and as a component of regional natural resource planning for the production of wood and non-wood products, and natural resource management benefits.

ACTION IMPERATIVES

- Develop appropriate, integrated and consistent Australian, State, Territory and local government policies for farm forestry
- Coordinate actions and build relationships to support farm forestry
- Recognise and, where possible, quantify farm forestry's economic, environmental and social benefits and costs
- Promote the development of markets for farm forestry products and services

3.2.4 Australia's Sustainable Forest Management Framework of Criteria and Indicators – Policy Guidelines

Australia's Sustainable Forest Management Framework of Criteria and Indicators provides policy guidelines for the management of Australia's forests. It details seven criteria and 44 indicators, based on the international Montréal process criteria and indicators. These criteria and indicators were developed in the context of contemporary Commonwealth and State legislation and policies including the 1992 National Forest Policy Statement. The intention of the framework is to "ensure forest management meets the broad range of associated environmental, cultural, social and economic values essential to sustainable forest management".[31] In NSW, the criteria and indicators are applied to public native forests and plantations through regional Ecologically Sustainable Forest Management plans (see section 4.2).

3.2.5 National Climate Change and Commercial Forestry Action Plan

The National Climate Change and Commercial Forestry Action Plan was endorsed by the Natural Resource Management and Primary Industries Ministerial Councils on 6 November 2009. It seeks to enable three sectors to respond to climate change: timber plantations, including farm forestry; wood

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30 See Department of Agriculture, Fisheries and Forestry, August 2005. *Farm Forestry National Action Statement*.

31 Department of Agriculture, Fisheries and Forestry, April 2008. *Australia's Sustainable Forest Management Framework of Criteria and Indicators – Policy Guidelines*, Department of Agriculture, Fisheries and Forestry, Canberra, p5.

production from native forests; and processing facilities that rely on raw material from production forests, including sawmills, board plants and pulp and paper mills. The plan will be complemented by a nationwide forest vulnerability assessment, to be conducted by the National Climate Change Adaptation Research Facility.

This Plan's principal objective is to "assist the forestry sector to respond to climate change through adaptation and mitigation, underpinned by research and development and communication". In order to do so, the Action Plan:

> identifies knowledge gaps in the area of forestry and climate change; pinpoints potential obstacles that industry may face in its efforts to respond to climate change; identifies areas which require attention; and provides a series of actions classifying areas of work which are fundamental in the context of addressing the impacts of climate change.[32]

The implementation of the Action Plan will be overseen by the Primary Industries Ministerial Council.

3.3 Commonwealth legislative framework

A raft of Commonwealth legislation applies to NSW plantation forestry. Most of this legislation has only minor bearing upon actual plantation operations. The most important areas of Commonwealth legislation are the relevant sections of Tax law and Corporations law. This section summarises the key components of Commonwealth Tax law and Corporations law, and identifies the relevant sections of other Commonwealth legislation.

3.3.1 Environment Protection and Biodiversity Conservation Act 1999 and the Regional Forest Agreements Act 2002

Regional Forest Agreements (RFAs) have established a regime under which all forestry operations on public land, including timber plantation operations, undertaken in accordance with an RFA do not require Commonwealth approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This is established by sections 38 and 40 of the EPBC Act and section 6 of the *Regional Forest Agreements Act 2002* (RFA Act). Section 6 of the RFA Act also exempts wood harvested in accordance with an RFA from being regulated by the *Export Control Act 1982*.

Where an RFA does not exist, a timber plantation does require approval under Part 3 of the EPBC Act, but only if it is likely to have a significant impact on a

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[32] Natural Resource Management and Primary Industries Ministerial Councils, 6 November 2009. *National Climate Change and Commercial Forestry Action Plan 2009-2012*.

matter of national environmental significance or Commonwealth land. The EPBC Act promotes the conservation of biodiversity by providing protection for listed species and protected areas.[33]

3.3.2 Tax law and Corporations law

In 2009, over 35% of all Australian plantations were owned by Managed Investment Schemes, slightly more than the proportion owned by all Australian governments.[34] The term Managed Investment Scheme (MIS) describes a variety of structures based on collective investment in a common enterprise. MIS can include: managed funds; public unit trusts; limited partnerships; property trusts; serviced strata schemes; and agricultural schemes, including forestry, horticulture and viticulture.

Agribusiness MIS are operated by a Responsible Entity (RE), in accordance with the scheme's constitution and the conditions attached to their Australian Financial Services Licence, as granted and administered by the Australian Securities and Investments Commission (ASIC) under section 912A of the *Corporations Act 2001*. The *Managed Investments Act 1998* introduced the single RE structure in place of the previous dual party structure, where responsibility was shared between a funds manager and trustee.[35] This Act was instrumental in responding to a deficit of wood products in the late 1990s by creating a retail investment structure that allowed investors to take a personal income tax deduction for investing in reforestation through MIS.[36]

Forestry MIS are taxed according to the *Income Tax Assessment Act 1936* (ITAA 1936) and the *Income Tax Assessment Act 1997* (ITAA 1997). Two components of the legislation provide for the tax deductibility of any forestry MIS investment.

First, under Division 35 of ITAA 1997, if a business activity does not pass one of four objective tests of commerciality, then expenditure and losses must be

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33 For more detailed summaries and analysis of the EPBC Act 1999 and the RFA Act 2002, see the Commonwealth Research Service publications: Guest, K., Michaelis, F., McCormick, B., March 1999. Environment and Protection Biodiversity Conservation Bill, Bills Digest No. 135 1998-99 and Martyn, A., March 2002. Regional Forest Agreements Bill 2002, Bills Digest No. 91 2001-02.

34 Bureau of Rural Sciences, 2010. *Australia's Plantations: 2010 Inventory Update*. For more information on MIS plantation forestry ownership figures, see section 6.1. See section 6.3 for more detail on the recent collapse of several MIS companies.

35 Parliamentary Joint Committee on Corporations and Financial Services, September 2009. *Inquiry into aspects of agribusiness managed investment schemes*, Commonwealth Government.

36 NewForests, September 2010. *Rationalizing Timberland Managed Investment Schemes: The Changing Landscape of Australia's Forestry Investment Sector*, Market Outlook: September 2010.

deferred until a test is passed, or unless the Tax Commissioner grants discretion to not defer the losses. Timber plantations qualify for the 'Commissioner's discretion' because of the long lead time between planting and harvesting. Consequently, business losses can be claimed in the years they occur rather than having to be carried forward until the enterprise passes one of the four tests of commerciality.

Second, two concurrent amendments to these laws were introduced in 2007. They are summarised by the object of Division 394 of ITAA 1997, which was added to ITAA 1997 by the *Tax Law Amendment (2007 Measures No. 3) Act 2007*:

(a) Permitting investors to deduct amounts paid under a forestry scheme in the year of payment, if certain conditions are met (for example, that it is reasonable to expect that the manager of the scheme will spend at least 70% of investors' contributions, on a market value basis, on activities that establish, tend, fell and harvest trees); and
(b) Allowing secondary market trading of interests in such schemes, while minimising tax arbitrage and providing tax certainty for investors.

In other words, Division 394 guarantees upfront tax deductibility for investment in a forestry MIS and increases the liquidity of MIS forestry, thereby providing further incentives for investing in long rotation sawlog plantations.[37]

The most recent amendment to ITAA 1997 occurred as a result of the collapse of two MIS companies in 2009. The *Tax Laws Amendment (2010 Measures No. 1) Act 2010* inserted subsection 394-10(5A), which excludes the investor from having to pay capital gains tax on a capital gains tax event should the event occur outside the investor's control. Situations considered to be outside of the investor's control include the insolvency of the manager of the MIS.[38]

3.3.3 Other Commonwealth legislation

A raft of other Commonwealth legislation applies to plantations (see Box 3).[39] Two pieces of legislation merit attention: the *Forestry Marketing and Research and Development Services Act 2007*; and subdivision 40-J of ITAA 1997.

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37 Cummine, A., March 2009. MIS forestry will shape Australia's future wood potential, *Australian Farm Journal*, March 09.

38 ITC Limited, 22 December 2009. *Technical Bulletin: Tax Protection for Forestry MIS Investors*.

39 Box 3 Source: Plantations 2020, June 2007. *Plantations for Australia: The 2020 Vision – Establishing Plantations in Australia: A Review of Legislative and Regulatory Frameworks*.

The *Forestry Marketing and Research and Development Services Act 2007* established Forest & Wood Products Australia (FWPA). FWPA is a not-for-profit company limited by guarantee under the *Corporations Act 2001*. It is charged with developing the competitiveness of Australia's forest industries through the development of an enhanced R&D, marketing and promotional company. Funding is provided by the Commonwealth Government and industry, with marketing and promotional activities funded solely by industry.[40]

The *Tax Laws Amendment (2008 Measures No. 2) Act 2008* introduced amendments to the ITAA 1997 that provide for tax deductibility for the cost of establishing carbon sink forests. A Senate Committee inquiry into the amendments found that the tax deductions "represent a valuable policy addition that will promote greenhouse gas reductions".[41] However, it is worth noting that non-Government members posted a number of dissenting reports, based on concerns about the potential negative social and economic impacts of planting carbon sink forests. Any carbon sink forests planted in NSW would be regulated under the NSW legislative framework which centres around the *Plantations and Reafforestation Act 1999* (NSW).

Box 3: Other Commonwealth legislation relevant to plantations

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*: preserves and protects areas and objects of particular significance3 to Indigenous people in accordance with their tradition
- *Export Control Act 1982*: controls the export of various regulated products, including unprocessed wood and woodchips
- *Forestry and Timber Bureau Act 1930*: provides for certain administrative, research and education functions at the Commonwealth level that have been transferred to DAFF, the CSIRO and the Department of Forestry at the ANU (now the Fenner School of Environment and Society)
- *Forestry Marketing and Research and Development Services Act 2007*: establishes a new industry owned company – Forest and Wood Products Australia – and establishes the mechanism by which the Commonwealth Government makes payments to Forest and Wood Products Australia
- *Income Tax Assessment Act 1997 (subdivision 40-J):* provides for tax deductibility for the cost of establishing carbon sink forests
- *Native Title Act 1993*: provides a mechanism to determine whether native title exists and what the rights are that comprise that native title
- *Quarantine Act 1908*: provides the comprehensive system of control to prevent the introduction into Australia of diseases or pests affecting human beings, animals or plants

40 Lorimer, C,. Hicks, P., May 2007. *Forestry Marketing and Research and Development Services Bill 2007*, Bills Digest no. 147, 2006-07, Parliamentary Library.

41 Senate Standing Committee on Rural and Regional Affairs and Transport, September 2008. *Implementation, operation and administration of the legislation underpinning Carbon Sink Forests*.

4.0 NSW LEGISLATIVE FRAMEWORK

In NSW, plantations are regulated under different statutes, alongside other types of forestry. This makes for a complex legislative regime. Three major Acts regulate NSW forests according to forest type and land tenure. Plantations on public and private land are regulated by the *Plantations and Reafforestation Act 1999*. Private native forestry, a type of farm forestry, is administered under the *Native Vegetation Act 2003*. Native forests on Crown-timber lands are administered by the *Forestry Act 1916*. This section outlines each component of the legislative regime, highlighting key aspects of relevance for plantation forestry before ending with a brief summary of legislation of minor importance.

4.1 The Plantations and Reafforestation Act 1999

The most important regulatory instruments for plantation forestry in NSW are the *Plantations and Reafforestation Act 1999* and the Plantations and Reafforestation (Code) Regulation 2001. These instruments regulate all plantations on public and private land. This section provides a summary of each instrument.

4.1.1 Plantations and Reafforestation Act 1999: summary

In March 1999, Premier Carr established a Plantations Task Force to recommend initiatives that would encourage increased private investment in plantation forestry. Not long after the establishment of the taskforce, the *Plantations and Reafforestation Act 1999* was enacted, replacing the *Timber Plantations (Harvest Guarantee) Act 1995*.[42] Limitations of the previous legislation led to the introduction of an Act intended to provide a "comprehensive approach to plantation establishment, management and harvesting activities."[43] According to the Second Reading Speech:

> apart from providing a boost to the investment in plantations as an additional future wood supply for timber industry, the bill will enable New South Wales to capitalise on the growing interests of private investors in newly emerging markets for plantation products and associated services. These include: reducing dry land salinity, improving soil and water quality, repairing degraded land and sequestering carbon to help combat global warming.[44]

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42 All plantations authorised under the *Timber Plantations (Harvest Guarantee) Act 1995* are now authorised under the *Plantations and Reafforestation Act 1999*. For a more detailed summary and analysis of the *Timber Plantations (Harvest Guarantee) Act 1995* and the process leading up to its enactment, see the Research Service publication: Smith, S., 1996. *Forestry in NSW*, Briefing Paper No 2/96.

43 *NSW Parliamentary Debates*, 18 November 1999 (Second Reading Speech)

44 *NSW Parliamentary Debates*, 18 November 1999 (Second Reading Speech)

Five key sections of the *Plantations and Reafforestation Act 1999* will continue in force after the commencement of the *Plantations and Reafforestation Amendment Act 2010*. These are: general provisions; plantation authorisations; a plantations and reafforestation code; the protection of unique or special wildlife values; and the identification of applicable and non-applicable environmental and planning legislation.

The *Plantations and Reafforestation Act 1999* has four objects, the implementation of which must be consistent with the principles of ecologically sustainable development:[45]

(1) To facilitate the reafforestation of land; and
(2) To promote and facilitate development for timber plantations on essentially cleared land; and
(3) To codify environmental standards, and provide a streamlined and integrated scheme, for the establishment, management and harvesting of timber and other forest plantations; and
(4) To make provision relating to regional transport infrastructure expenditure in connection with timber plantations.

Plantations may exist on privately owned land or Crown-timber lands. A plantation is defined as an area of land on which the predominant number of trees or shrubs forming, or expected to form, the canopy are trees or shrubs planted:

(a) For the purpose of timber production, or
(b) For the protection of the environment (e.g. for the purpose of biodiversity conservation or for the purpose of acquiring or trading in carbon sequestration rights), or
(c) For any other purpose other than the production of food or any other farm produce other than timber (s 5).

Plantations have to be authorised under the *Plantations and Reafforestation Act 1999*. An authorisation is required before carrying out "plantation operations" in any plantation established after the commencement of the Act, or any proposed plantation. "Plantation operations" include establishment, management or harvesting operations. Authorisations are intended to:

(a) Provide a streamlined and integrated process for obtaining approval to establish timber and other forest plantations, and
(b) Guarantee harvesting operations on timber plantations, and
(c) Apply codified environmental standards to establishment, management and harvesting operations on plantations (s 8).

[45] According to the *Protection of the Environment Administration Act 1991*, Ecologically Sustainable Development requires the effective integration of economic and environmental considerations in decision-making processes.

Plantations that existed prior to the commencement of the Act in December 2001 do not require authorisation unless the plantation is re-planted.

4.1.2 Plantations and Reafforestation (Code) Regulation 2001: summary

Introduced in 2001 was the Plantations and Reafforestation (Code) Regulation 2001. This was made further to section 29 of the Act and applies to authorised plantations on private or Crown-timber lands (s 3). Matters which the Code may deal with are set out in s 27 of the Act, as follows:

- The conservation and management of native vegetation;
- The prevention of soil erosion and the control of sediment;
- The protection of rivers and lakes;
- The conservation of native animals and plants, and their habitat;
- The conservation of fish and marine vegetation, and their habitat;
- The conservation of threatened species, populations and ecological communities, and their habitats;
- The protection of Aboriginal relics and places;
- Plantation operations on Crown roads;
- Bush fire hazard reduction and the construction and maintenance of fire trails;
- The control of plant diseases in plantations;
- Harvesting plans for plantations; and
- The carrying out of works ancillary to harvesting operations on plantations (s 27).

The Code streamlines the application process for plantation operations. Hence, the following legislation or sections of legislation do not apply to authorised plantations:

- The *Environmental Planning and Assessment Act 1979*;
- Threatened species offence provisions and stop work orders under the *National Parks and Wildlife Act 1974* and the *Threatened Species Conservation Act 1995*;
- A controlled activity approval under the *Water Management Act 2000*;
- Specified sections of the *Heritage Act 1977* related to listing;
- Specified sections of the *Local Government Act 1993* relating to orders;
- The *Fisheries Management Act 1994*; and
- The notice provisions of the *Soil Conservation Act 1938*.

However, in certain cases authorisations may be required under the following statutes:

- Licences and approvals under the *Water Management Act 2000*;
- Environment protection licences under the *Protection of the Environment Operations Act 1997*;
- Excavation permits under section 141 of the *Heritage Act 1977*; and

- Authorities in connection with Aboriginal relics or places under the *National Parks and Wildlife Act 1974* (s 19).[46]

In addition, a species impact statement may be required of the applicant if the Minister is of the opinion that it would be needed were the plantation to be approved under Part 4 of the *Environmental Planning and Assessment Act 1979*. This provision applies to both complying and non-complying plantations, as discussed below. When deciding whether or not to authorise the plantation, the relevant Minister must take the species impact statement into account, along with other relevant matters, including the likely social and economic consequences of granting or refusing the application.

Three categories of plantation operations are identified in the Act:

- exempt farm forestry;
- complying plantations;
- and non-complying plantations.

'Exempt farm forestry' is defined to mean:

- a forestry area of less than 30 hectares;
- where clearing of native vegetation or protected land is exempt from any requirement for development consent under the *Native Vegetation Act 2003*; and
- the amount of harvested timber falls within that allowed by the Code for exempt farm forestry (s 6).

Section 9 of the Act provides that exempt farm forestry may be authorised, but is not required to be authorised, under the Act. Section 47 stipulates that unauthorised 'exempt farm forestry' does not require development consent under the *Environmental Planning & Assessment Act 1979*. However, unauthorised 'exempt farm forestry' does require approval under the *National Parks and Wildlife Act 1974* and the *Threatened Species Conservation Act 1995* (s 48).

Complying plantations are plantations whose establishment complies with the Code (s 13). A species impact statement under the *Threatened Species Conservation Act 1995* is therefore not required, but an application for authorisation must still be made. If the plantation complies with all conditions in the Code, the Minister must grant an authorisation. If a plantation does not meet all the standards set out in the Code, but the Minister decides that special circumstances exist, the plantation may be approved as a non-complying plantation (s 14). Assessment for such a plantation is more detailed: the applicant must provide a statement outlining the extent of proposed compliance with the Code and a statement of environmental effects for those plantation

[46] According to Industry & Investment NSW, to date, no such authorisations have been required.

operations that do not comply. A species impact statement may also be required. If an authorisation is granted it is likely to be subject to conditions required to mitigate any non-complying aspects.

Part 5 of the *Plantations and Reafforestation Act 1999* deals with the possible loss of rights to carry out plantation operations including harvesting. Authorisations contain a condition by which the owner or manager of a plantation must notify the Minister as soon as they become aware that plantation operations have or are likely to have an impact on unique or special wildlife values. Unique or special wildlife values are defined as any endangered species, endangered ecological community or species presumed extinct according to the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994*. In such a case, the Minister must commission a report into: the existence of unique or special wildlife values; the extent to which plantation operations are likely to have an adverse impact; whether or not plantation operations must be prevented, suspended or modified; and the extent of any direct financial loss that may arise. Should any financial loss be incurred as a result of a Ministerial direction to suspend, cease or modify plantation operations, section 36 provides for compensation under certain conditions:

- Compensation is available if harvesting operations are delayed, restricted or precluded altogether by Ministerial direction;
- Compensation is available only to an owner or manager of the authorised timber plantation;
- The amount of compensation is to be determined by agreement between the Minister and the owner or manager, and if agreement cannot be reached, by an independent arbitrator; and
- Compensation is not payable unless the direction giving rise to the compensation is complied with.

4.1.3 Plantations and Reafforestation Amendment Act 2010: summary

The *Plantations and Reafforestation Amendment Bill 2010* was introduced on 1 September 2010 and was enacted without amendment on 4 November 2010. The Bill had three objects:

- To clarify the authorisation and ownership provisions with respect to plantations,
- To expand the powers of entry and inspection and the power to obtain information with respect to plantations,
- To make a number of other minor and consequential amendments to the Act.

On commencement, three sections (17A, 17B and 17C) will be inserted into the *Plantations and Reafforestation Act 1999* to address the first object. In effect, these sections will require a new plantation authorisation under the Act only when both the "ownership and the management of part of the plantation

changes. In those circumstances a new authorisation will be required for each part of the land on which plantation operations will continue".[47]

As for the second object of the Bill, minor amendments to sections 58 to 60 will extend compliance officer powers to all plantations, rather than only 'authorised plantations', as is currently the case. Further amendments deal with the appointment of authorised officers and the investigation of compliance with the Act. These alterations will achieve the following:

- Provide for the appointment of authorised officers;
- Permit an authorised officer to enter a plantation for the purpose of investigating compliance with the Act and Code;
- Enable an authorised officer to exercise certain investigatory powers;
- Provide for the Director-General to require the owner or manager of a plantation to give relevant information or produce relevant documents;
- Provide for offences for obstructing authorised officers, failing to comply with requirements and providing false or misleading information;
- Provide for the exclusion of personal liability of authorised officers; and
- Provide that proceedings for an offence under the Act or regulations may be commenced within 2 years after the date on which evidence of the alleged offence first came to the notice of an authorised officer (ss 61, 61A, 61B, 61C, 61D and 64).

A significant proposed amendment contained in a draft exposure Bill, released in 2009, and not included in the 2010 version related to the compensation for damage to local roads by plantation harvesting trucks through an alternative transport contribution system. Strong objections to the proposal were raised by industry, community and council stakeholders. Council and community objections concerned the complexity of the scheme and the viability of implementing it. Industry objected for three reasons: no other agricultural industries are subject to similar charges; the contribution requirements would make the NSW plantation industry uncompetitive; and the proposal would duplicate charges to be imposed on heavy vehicles under the Commonwealth's Road Reform Plan. The Road Reform Plan, which is being developed by the Council of Australian Governments, is intended to direct heavy vehicle levies directly to State and local governments. In light of considerations, the NSW Government omitted the proposed amendment from the 2010 Bill.[48] The relevant sections of the *Plantations and Reafforestation Act 1999* – Part 5 and objective (d) – will be retained in their current form until the national reforms are implemented.[49]

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47 *NSW Parliamentary Debates*, 1 September 2010 (Second Reading Speech)

48 *NSW Parliamentary Debates*, 1 September 2010 (Second Reading Speech)

49 Industry & Investment, September 2010. *Better Regulation Statement Update: Public Consultation Outcomes, Amendments to the Plantations and Reafforestation Act 1999 and Plantations and Reafforestation (Code) Regulation 2001*.

The Plantations and Reafforestation (Code) Amendment Regulation 2010 was made in December 2010. The amending regulation has three objects:

(a) Make provision in respect of fire roads and other bush fire hazard reduction measures on plantations;
(b) Make further provision for the regulation of plantation operations, including in respect of roads, soil, drainage, water the preservation of vegetation and record keeping; and
(c) Make other miscellaneous changes in respect of plantations.

4.2 The Forestry Act 1916

The *Forestry Act 1916* relates to plantation forestry insofar as it empowers Forests NSW, a public trading enterprise within Industry & Investment NSW, to establish, maintain and harvest timber plantations. Since 2001, however, any plantation established by Forests NSW must conform with the *Plantations and Reafforestation Act 1999*.[50] In addition, Forests NSW is required to implement the Regional Forest Agreements through an Ecologically Sustainable Forest Management plan and licence the activities required to establish, maintain and harvest timber plantations according to the Forestry Regulation 2009. The remainder of this section identifies the key details of the Act and Regulation.

Native forests on Crown-timber lands are administered by the *Forestry Act 1916*.[51] This Act provides for:

- establishment of a Forestry Commission;
- classification of land to which the Act applies;
- licences by which forest resources may be accessed;
- royalties payable to the Commission; and
- carbon sequestration rights.

The Forestry Commission is known today as Forests NSW. Forests NSW is charged with conserving and utilising the timber on Crown-timber lands to the best advantage of the State, whilst providing natural resource environmental services and preserving and enhancing the quality of the environment (s 8). It operates as a public trading enterprise within Industry & Investment NSW, according to powers and duties established in section 11 of the Act. The most relevant of these powers and duties to plantation establishment, management and harvesting are as follows:

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50 The *Plantations and Reafforestation Act 1999* came into effect in December 2001 with the gazettal of the Code.

51 Crown-timber lands, as defined in the Act under section 4, include: (a) leased Crown land (b) Crown lands exceeding two hectares that is subject to a licence to occupy or permissive occupancy, and (c) purchase-tenure lands over which, for a certain time, the Crown retains a right to remove timber (under profit à prendre rights).

- control and management of State forests, timber reserves and flora reserves in the public interest, which may include the establishment, maintenance and improvement of plantations of indigenous and exotic tree species;
- harvesting of timber or other forest products;
- sale of timber or other forest products;
- conversion of timber into products such as logs, wood-chips or wood-pulp;
- construction and operation of sawmills;
- research into forest management and timber;
- acquisition of forestry rights on non-Crown land;
- establishment and maintenance of timber plantations on behalf of investors; and
- harvesting and marketing timber grown on behalf of investors.

Forests NSW may classify public land under its jurisdiction as one of three classes: State forests; timber reserves; or flora reserves. Timber reserves are Crown land temporarily reserved for forestry purposes (s 4). Under the Forestry Regulation 2009, State forests must be managed in accordance with an approved management plan (an Ecologically Sustainable Forest Management Plan). The management plan must:

- be consistent with any relevant integrated forestry operations approval under the *Forestry and National Park Estate Act 1998*;
- specify the ecologically sustainable forest management strategy to be applied; and
- detail the conditions under which any timber, products or forest material may be taken from the forest (cl.5).

A series of licences provided for and regulated by the *Forestry Act 1916* and the Forestry Regulation 2009 allow for timber harvesting on Crown-timber lands. Three licences enable the taking of forest products of economic value: timber licences; product licences; and forest materials licences. These licences contain conditions that must be met, and typically describe:

- the area of land;
- the type of timber that can be cut;
- the quantity of timber to be cut; and
- the royalty payable (the price of the timber).

All contractors and operators involved in timber harvesting must possess a contractor's licence or an operator's licence. In the case of land-clearing on Crown-timber lands, clearing licences permit killing, destroying or ringbarking trees of minimal economic value.

4.3 Farm forestry in NSW

'Farm forestry' refers to two types of forestry on farmland: 'exempt farm forestry' as defined in and regulated by the *Plantations and Reafforestation Act 1999*; and 'private native forestry'. Private native forestry (PNF) is regulated by the *Native Vegetation Act 2003* and the Native Vegetation Regulation 2005.[52] PNF must comply with the relevant PNF Code of Practice under the *Native Vegetation Act 2003*. The Code provides guidelines for ecologically sustainable forest management.[53] Two administrative instruments are required under the code: a PNF property vegetation plan (PVP); and a forest operation plan.[54]

A PNF property vegetation plan (PVP) is a legally binding agreement between a landowner and the Department of Environment, Climate Change and Water (DECCW). PNF PVPs are intended to provide landowners with security to plan and invest, and can remain in force for up to 15 years. They also streamline the approval process, avoiding the need for separate approvals under the *Threatened Species Conservation Act 1995*.[55] Each PNF PVP consists of a map of the property marking what areas cannot be logged and a declaration that PNF operations will accord with the PNF Code of Practice.[56] A forest operation plan is also required prior to the commencement of forest operations. The plan must contain maps that identify: the areas to be harvested; infrastructure associated with management and harvesting activities; and the location of any populations or communities listed under the schedules of the *Threatened Species Conservation Act 1995*. A written component is also required within which details of land ownership and a description of the forest and any forest management activities must be contained.[57]

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52 Until recently, it was also regulated by the *Environmental Planning and Assessment Act 1979* where Local Environment Plans could possibly require development consent prior to clearing vegetation for the purpose of farm forestry. According to the Standard Instrument for LEPs released in 2006, native vegetation clearing is now not to be regulated by LEPs where the *Native Vegetation Act 2003* applies.

53 Department of Environment, Climate Change and Water, November 2009. *Private native Forestry Code of Practice Fact Sheet No. 1*.

54 Department of Environment, Climate Change and Water, 2010. *Private native forestry*, accessed 5/11/2010.

55 Department of Environment, Climate Change and Water, November 2009. *Private Native Forestry Code of Practice Fact Sheet No. 2*.

56 Environmental Defenders Office NSW, September 2008. *Rural Landholder's Guide to Environmental Law in NSW*.

57 See for example: Department of Environment, Climate Change and Water, 2007. *Private Native Forestry Code of Practice for Cypress and Western Hardwood Forests*.

4.4 Other NSW legislation

Several other statutes have some bearing on plantations in NSW (see Box 4). Legislation exists in NSW to encourage investment in forestry through purchase and trade in statutory 'forestry rights' and 'carbon sequestration rights'. These extend the common law device of 'profits à prendre'. Profits à prendre are a right to take natural resources from another person's land. The *Conveyancing Act 1919* creates rules for trade in 'forestry rights': the right to enter land owned by another and establish and/or maintain and harvest a crop of trees. These rights apply to native forests and plantations as the Act does not distinguish between the two. The *Carbon Rights Legislation Amendment Act 1998* amended the *Conveyancing Act 1919* to establish 'carbon sequestration rights'. It also amended the *Forestry Act 1916* to enable the Forestry Commission to acquire and trade in such rights.

Box 4: Other NSW legislation relevant to plantations

- *Conveyancing Act 1919*: establishes 'forestry' and 'carbon sequestration' rights
- *Noxious Weeds Act 1993*: provides for categorisation of noxious weeds and specifies the extent of control required for each category
- *Occupational Health and Safety Act 1983*: legislates for a safe work environment, and the use of safe equipment and adherence to safe working practices
- *Pesticides Act 1999*: provides for the use of pesticides (including herbicides) to ensure compliance with label conditions
- *Timber Marketing Act 1977*: enacts procedures to ensure appropriate quality in the grading and sale of timber
- *Visy Mill Facilitation Act 1997*: facilitates the establishment and operation by Visy of a Kraft pulp and paper mill in southern NSW

5.0 ADMINISTERING PLANTATIONS IN NSW

Three administrative regimes apply to plantations in NSW: (a) Commonwealth Government; (b) NSW Government; and (c) self-regulation, according to one of three forest certification schemes available in Australia. The legislative frameworks for the Commonwealth and NSW Governments have already been summarised; this section details the administrative framework of each government and outlines the administration of plantations according to size and tenure. Plantation administration may also be subject to a voluntary certification scheme at the discretion of the plantation owner and/or manager.

5.1 Commonwealth administrative framework

The Commonwealth bodies involved in administering plantation forestry in NSW are identified in Table 3. Three of these bodies have purely advisory and consultative roles: the Forest and Wood Products Council; the Forest Industry Leaders Ministerial Roundtable; and the Forestry and Forest Products Committee, which is an advisory committee to the Primary Industries Standing Committee that in turn advises the Primary Industries Ministerial Council.

The Department of Agriculture, Fisheries and Forestry is the lead Commonwealth forestry agency. It is responsible for developing and implementing policies and strategies of relevance to plantations. It also administers funding for forestry research and development (see section 7.0).

Regional Development Australia (RDA) plays a key role in connecting Commonwealth and NSW Government policies and programs with communities in order to plan for and promote regional development and economic growth. Fourteen RDA committees cover the whole of NSW, and are jointly funded and administered by the Commonwealth and NSW Governments. RDA Committees located in areas where forestry is a key industry are involved in promoting plantation and farm forestry. For example, RDA Northern Inland NSW recently released a regional plan that identifies forestry as a key industry. In addition, in its previous incarnation as the Northern Inland Regional Development Board, it worked with the now defunct Northern Inland Forestry Investment Group to produce several research papers on market opportunities for plantation and farm forestry.

The Northern Inland Forestry Investment Group was one of 18 Private Forestry Development Committees that operated as part of Plantations 2020. These committees encouraged further plantation establishment in their region to provide for industry expansion and international competitiveness.[58] However, funding for these committees recently ceased.[59]

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58 Plantations 2020, no date. *Private Forestry Development Committees*, accessed 23/11/10.

59 Northern Inland Forestry Investment Group, August 2010. *What's happening in private forestry?* NIFIG newsletter.

Table 3: Commonwealth administrative bodies and their roles[60]

Administrative body	Roles
Australian Securities and Investment Commission	• Regulates Managed Investment Schemes according to the *Corporations Act 2001*
Australian Taxation Office	• Regulates taxation of Managed Investment Schemes according to the *Income Tax Assessment Act 1936* and the *Income Tax Assessment Act 1997* • Produces Tax Rulings and Product Rulings that regulate the taxation of Managed Investment Schemes
Department of Agriculture, Fisheries and Forestry	• Administers the Forest Industries Climate Research Fund and the Forest Industries Development Fund • Implements Australia's Sustainable Forest Management Framework of Criteria and Indicators; the Farm Forestry National Action Statement; the National Climate Change and Commercial Forest Action Plan 2009-2012; the National Forest Policy Statement; and the National Indigenous Forestry Strategy
Forest and Wood Products Australia	• Invests in effective and relevant R&D in order to improve the competitiveness and sustainability of the Australian forest and wood products industry through innovation
Forest and Wood Products Council	• Liaises between the Minister and stakeholders in the forest and wood products industry • Facilitates cooperation between different sectors of the forest and wood products industry • Gives advice and information to the Minister in relation to the implementation of the Forest and Wood Products Action Agenda (2000) and other government-industry initiatives
Forest Industry Leaders Ministerial Roundtable	• Provides a forum for senior executives of forest industry companies to exchange information with the Minister
Forestry and Forest Products Committee	• Provides authoritative policy and strategic advice to help drive sustainable national and regional development by optimising the full range of goods and services from forests and related industries • Provides advice regarding the role of forests in sustainable landscapes and industry development (and associated promotion and market development)
Regional Development Australia committees	• Community consultation and engagement • Regional planning and promotion of Government programs • Community & economic development

Two administrative bodies regulate forestry Managed Investment Schemes: the Australian Securities and Investment Commission (ASIC); and the Australian Taxation Office (ATO). ASIC regulates these schemes in respect to the *Corporations Act 2001*. The ATO regulates these schemes in respect to the *Income Tax Assessment Act 1936*, the *Income Tax Assessment Act 1997*, and relevant ATO Tax Rulings and Product Rulings.

[60] Sources: Department of Agriculture, Fisheries and Forestry, 2010. *Annual Report 2009-10*; Department of Agriculture, Fisheries and Forestry, 2010. *Forestry*, accessed 16/12/2010.

5.2 NSW administrative framework

Industry & Investment NSW and Forests NSW administer plantation forestry in NSW. The Department of Environment, Climate Change and Water (DECCW); administers private native forestry in NSW (see Table 4).

Table 4: NSW administrative bodies and their roles

Administrative body	Roles
Department of Environment, Climate Change and Water	• Administers the *Native Vegetation Act 2003* and the *Native Vegetation Regulation 2005* • Administers Private Native Forestry Property Vegetation Plans: legally binding agreements between the Department and landholders carrying out private native forestry • Administers Regional Forest Agreements
Forests NSW (Forests NSW is a public trading enterprise within Industry & Investment NSW)	• Administers the *Forestry Act 1916* and Forestry Regulation 2009 • Administers licences for forestry operations on public land to which the listed legislation applies • Fulfils statutory requirements under the *Forestry Act 1916* (see section 4.2 of this paper) including establishing, maintaining and harvesting plantations on public land • Implements Ecologically Sustainable Forest Management plans; the NSW Forest Management Policy; and Managing our forests sustainably: Forest management zoning in NSW State Forests.
Industry & Investment NSW	• Administers the *Plantations and Reafforestation Act 1999* and the Plantations and Reafforestation (Code) Regulation 2001 • Implements the Farm Forestry Strategy for NSW.

Industry & Investment NSW administers the key plantation forestry regulative instruments: the *Plantations and Reafforestation Act 1999* and the Plantations and Reafforestation (Code) Regulation 2001. Industry & Investment NSW also implements the Farm Forestry Strategy for NSW.

Forests NSW manages all forests on public land in NSW. In late 2005, Forests NSW became part of Primary Industries Trading, a public trading enterprise within the Department of Primary Industries. In 2009, Forests NSW became a part of the 'super' department, Industry & Investment NSW. A new administrative model was adopted in 2009 where, in order to re-establish plantations on more than 17,000 hectares of public land, Forests NSW entered commercial agreements with Willmott Forests and Forest Enterprises Australia (FEA). Under each agreement, Forests NSW agreed to licence the use of Forests NSW land to Willmott Forests and FEA and establish and manage 4,500 hectares of plantation forestry for each company. Each company owns the trees, and acts on behalf of private growers under an MIS.[61] Both of these companies have subsequently been placed into receivership.

DECCW regulates private native forestry under the *Native Vegetation Act 2003* and administers the Regional Forest Agreements. Private native forestry is

61 NSW Department of Primary Industries, 2010. *Annual Report 2008-09*.

regulated by legally binding agreements between landholders and DECCW, called Private Native Forestry Property Vegetation Plans. Regional Forest Agreements are implemented through Ecologically Sustainable Forest Management plans.[62] Although DECCW monitors the implementation of Regional Forest Agreements, the responsibility for implementing Ecologically Sustainable Forest Management plans lies with Forests NSW.

5.2.1 Managing our forests sustainably: Forest Management Zoning in NSW State Forests

NSW State Forests are managed according to zones established by the policy, Managing our forests sustainably: forest management zoning in NSW State Forests. Released in 1999, this policy establishes eight zones that are compliant with the National Forest Reserve Criteria established under the 1992 National Forest Policy Statement (see Box 5).[63] Forest management zoning is a two tier classification system. In the first tier, each part of every State Forest is classified into one of eight zones. Each zone has an activities table to provide guidance for forest management under three headings: 'Activities not permitted'; 'Activities permitted with standard conditions'; and 'Activities permitted with special conditions'. In the second tier, each zone may be classified for its 'special values'. These values recognise particular natural or cultural features or specific forest uses and may be applied to the zone as a whole or to an individual site within a zone.[64]

Box 5: NSW Forest Management Zones and activities permitted in plantation zones

ZONES

(1) Special protection
(2) Special management
(3) Harvesting exclusions and special prescription
(4) General management
(5) Hardwood plantations
(6) Softwood plantations
(7) Non-forestry use
(8) Areas for further assessment

ACTIVITIES PERMITTED IN PLANTATION ZONES

All forest management activities are permitted, including: establishment; infrastructure development and maintenance; prescribed burning; production of plantation timber and other forest products; gravel/hard rock quarrying; recreation; grazing; beekeeping; and mineral and petroleum exploration.

Zones 5 and 6 apply to hardwood plantations and softwood plantations respectively (see Box 5). These zones are intended to ensure that plantations are managed in a sustainable manner to maximise the plantation value and productivity by appropriate intensive management regimes consistent with good forest practices, as provided in approved codes of practice. All forest management activities are permitted within zones 5 and 6 (see Box 5).

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62 Ecologically Sustainable Forest Management plans also function as plans through which NSW Forest Agreements, as established under the *Forestry and National Park Estate Act 1998* (NSW), are implemented.

63 Box 5 source: State Forests of NSW, 1999. *Managing our forests sustainably: Forest Management Zoning in NSW State Forests*.

64 State Forests of NSW, 1999. *Managing our forests sustainably: Forest Management Zoning in NSW State Forests*.

5.2.2 Farm Forestry Strategy for NSW

Industry & Investment NSW is responsible for implementing the Farm Forestry Strategy for NSW. The strategy has the following vision: "In NSW, farm forestry is regarded as a mainstream farm enterprise delivering commercial and environmental benefits".[65] A set of actions and desired outcomes is identified in the strategy. These actions are designed to provide a stable regulatory and legislative environment that supports farm forestry. The actions also involve identifying and developing effective farm forestry support services and competitive markets for farm forestry products.

5.2.3 Ecologically Sustainable Forest Management plans

Eleven Ecologically Sustainable Forest Management (ESFM) plans are in operation across NSW (see Box 6). Each plan provides a blueprint by which all Forests NSW regions are managed on a five-yearly basis. Broad strategies, performance indicators and measurable outcomes for forest management are identified in each plan. Each ESFM plan applies to plantation and native forests managed by Forest NSW. Ten strategic areas are identified within each ESFM plan according to which the forests in each region are managed: natural heritage; Aboriginal cultural heritage; non-Aboriginal cultural heritage; nature conservation; forest health; sustainable timber supply; economic development; social development; forestry operations; and consultation, monitoring and reporting.

Box 6: Ecologically Sustainable Forest Management plans in NSW

- Eden Region
- Hume Region
- Macquarie Region
- Monaro Region
- North East Region – Lower
- North East Region – Upper
- Northern Region
- Riverina Region
- Southern Region – South Coast
- Southern Region – Tumut
- Western Region

5.3 Forest certification in Australia

Certification to forest management standards is an important component of all forest management in NSW. Three forms of forest certification are available in Australia:

(1) The International Standards Organisation (ISO) 14001 standard;
(2) The Forest Stewardship Council Woodmark standard and SmartWood standard; and
(3) The Australian Forestry Standard (which is endorsed by the Programme for the Endorsement of Forest Certification).[66]

Forest certification can be defined as:

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65 State Catchment Management Co-ordinating Committee, 2003. *Farm Forestry Strategy for NSW*.

66 Crawford, H., September 2006. *A review of forest certification in Australia*, Forest and Wood Products Research and Development Corporation, Project Number: PN05.1025.

> the voluntary process by which planning, procedures, systems and performance of on-the-ground forestry operations are audited by a qualified and independent third party against a predetermined standard. Forest operations found to be in conformance with the given standard are issued a certificate.[67]

In other words, forest certification is a means of encouraging and demonstrating sustainable forest management. As argued by Crawford (2006), each standard available for certification requires "comprehensive and rigorous treatment of a wider range of forest management values than has traditionally been the focus of forest management organisations. Each of the certification standards requires measures that go well beyond legal compliance."[68]

A related form of certification is Chain of Custody certification. This can be acquired from the same three standards, and certifies the movement of forest products from certified forests, through the production chain and ultimately to the end consumer. Chain of Custody certification therefore "provides an inventory or tracking system that connects responsible forest management practices with consumer decisions."[69]

Forest certification applies to plantation management in NSW at several levels:

- NSW Ecologically Sustainable Forest Management plans have been developed to "reflect a continuous improvement program based on adaptive management, compliance monitoring, corrective actions and management review that conform to ISO 14001 and Australian Forestry Standard requirements";[70]
- Forests NSW maintains certification to the Environmental Management System ISO 14001:2004 and Australian Forestry Standard (AS4708-2007), thereby allowing its customers to gain Chain of Custody to AS 4707 certification for their products, an important step in securing long term domestic and export markets;[71] and

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67 Crawford, H., September 2006. *A review of forest certification in Australia*, Forest and Wood Products Research and Development Corporation, Project Number: PN05.1025: p6.

68 Crawford, H., September 2006. *A review of forest certification in Australia*, Forest and Wood Products Research and Development Corporation, Project Number: PN05.1025: p5.

69 Crawford, H., September 2007. *Chain of custody in the forest products industry: A practical Guide*, Forest & Wood Products Australia, Project Number: PN07.1055: p1.

70 Forests NSW, 2008. *Ecologically Sustainable Forest Management: Monaro Region NSW*, Minister's message.

71 Forests NSW, January 2009. *FNSW Australian Forest Standard (AS 4708:2007) and EMS (ISO 14001:2004) Manual*.

- Private growers can acquire certification under at least one of the three schemes identified.

5.4 Administering plantations on public land in NSW

Figure 3 presents a snapshot of plantation regulation and administration in NSW on public land. Forests NSW administers plantations according to the 5-year ESFM plan and the plantation plan. Industry & Investment NSW authorises plantations according to the Code and the plantation plan.

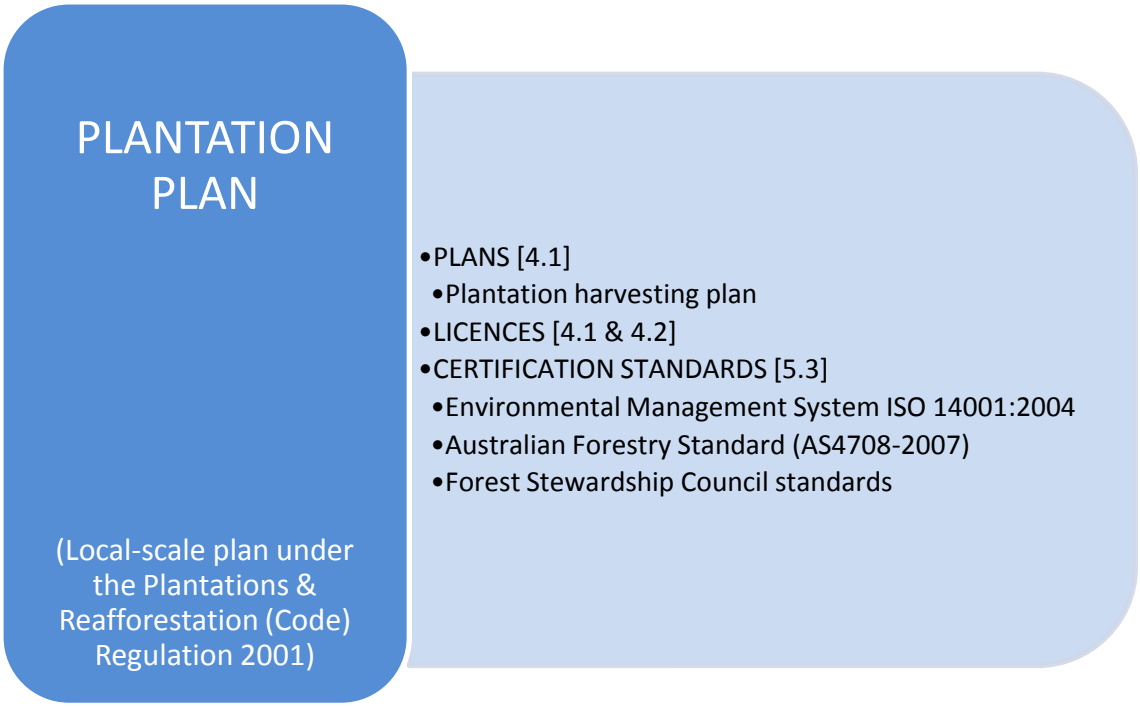
Figure 3: Administering plantations on public land in NSW

Legislative instruments, policies and third-party certification standards of relevance for the content and implementation of each plan in Figure 3 are identified on the right hand side (the relevant section of this paper in which they are discussed is noted in square brackets).

5.5 Administering plantations on private land in NSW

Figure 4 presents a snapshot of plantation regulation and administration for plantations on private land in NSW. Distinct from plantations on public land, plantations on private land do not come under Ecologically Sustainable Forest Management plans. Essentially they are regulated in three ways: plantation plans approved by Industry & Investment NSW under the Plantations & Reafforestation (Code) Regulation 2001; licences or authorisations, where applicable for environmental or heritage reasons; and third-party certification standards (the relevant section of this paper in which they are discussed is noted in square brackets).

Figure 4: Administering plantations on private land in NSW

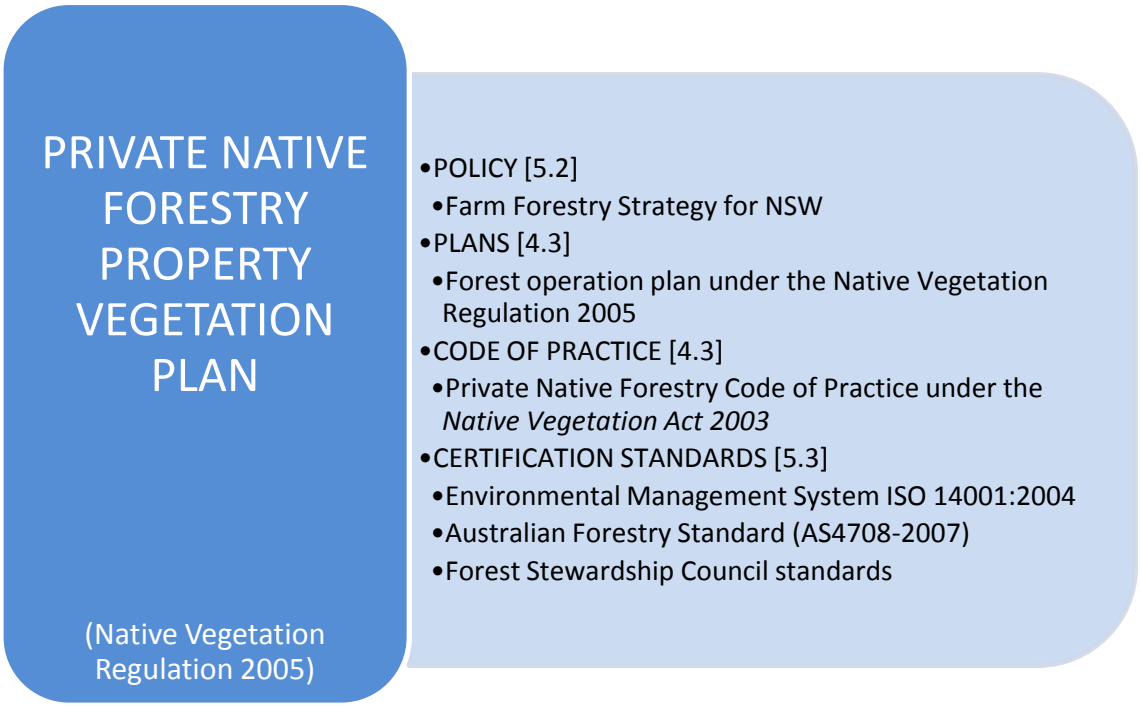


5.5 Administering farm forestry in NSW: Private Native Forestry

Private native forestry (PNF) is administered under the *Native Vegetation Act 2003* by the NSW Minister for Environment, Climate Change and Water. Figure 5 provides a snapshot of PNF administration in NSW. The key instrument by which PNF is administered in NSW is the legally binding Private Native Forestry Property Vegetation Plan (PNF PVP). The content and implementation of a PNF PVP is governed by a set of administrative instruments identified on the right hand side of Figure 5 (with the section in which they are discussed in this paper

being noted in square brackets). PNF Codes of Practice have been developed for four regions or forest types in NSW: Cypress and Western Hardwood Forests; Northern NSW; River Red Gum Forests; and Southern NSW.[72]

Figure 5: Administering farm forestry in NSW: Private Native Forestry



[72] Department of Environment, Climate Change and Water, 25 October 2010. *Private native forestry*, accessed 24/11/2010.

6.0 PLANTATION FORESTRY IN NSW: CHARACTERISTICS AND ISSUES

Presented in this section of the paper is an overview of the plantation forestry industry in NSW. The location and characteristics of NSW timber plantations are first identified. This is followed by a survey of the statistical and other factual evidence available on such matters as the markets for NSW timber/wood products, employment in the industry and the major products produced. The section concludes with a brief account of timber plantation investment and Managed Investment Schemes, and a summary of issues facing the industry as identified by the industry.

6.1 Plantation forestry in NSW: location and characteristics

This section contains information on the distribution and characteristics of plantations and farm forestry in NSW.

6.1.1 Plantations

Plantations in NSW comprise only 0.43% (0.34 million ha) of NSW's total land area (see Table 5). In comparison, all NSW forests cover 33% of NSW's total land area. 19.2% of NSW's forests are currently held in formal nature conservation areas, whereas 75.1% is available for timber harvesting.

Table 5: Forestry in NSW: the big picture[73]

Description	Australia	NSW	Forests NSW
Total land area (million ha)	770	80	2.4
Total forest area (million ha)	149	26.5	2.4
Forests as a percentage of total land area	19%	33%	99%
Native forest area (million ha)	147	26.2	2.1
Native forest area in formal nature conservation reserves (million ha)	22	5.1	0.02
Area of forest available for timber harvesting (million ha)	113	19.9	1.3
Multiple-use public native forests (million ha)	9.4	2.1	2.1
Net plantation forest area (million ha)	1.82	0.34	0.28

Plantations in Australia are located in one of fifteen National Plantation Inventory regions (see Figure 6). Of these areas, the following six are located at least partially within NSW: Northern Tablelands; North Coast; Central Tablelands; Southern Tablelands; Murray Valley; and East Gippsland-Bombala.

[73] Forests NSW, 2009. *Forests NSW Facts and Figures 2008-09*. Note that, according to the Bureau of Rural Sciences (see Table 6), in 2009 there were 393,182 hectares of plantation forests in NSW.

Figure 6: National Plantation Inventory regional boundaries[74]

Table 6 provides a breakdown of plantations in NSW by type and ownership. Softwood plantations comprise the majority of NSW plantations. However, the hardwood plantation estate has been growing at a faster rate than the softwood plantation estate in recent years. Most of this growth has been fuelled by private investment, as is demonstrated in the change in private ownership between 2008 and 2009 by 12,928 hectares.

74 Bureau of Rural Sciences, 2010. *Australia's Plantations: 2010 Inventory Update*. For detailed maps of each region, see Bureau of Rural Sciences, 2004. *Plantation Information Network: Regional Profiles*, accessed 24/11/2010.

Table 6: Total NSW plantation area by type and ownership: 2008 to 2009[75]

Category	2008	2009
Plantation type		
Hardwood	81,667	92,541
Softwood[1]	285,566	287,820
Other categories	2,821	2,821
Total	370,054	383,182
Ownership		
Public	246,815	247,015
Private	118,434	131,362
Joint[2]	4,805	4,805
Total	370,054	393,182

Notes: (1) Includes areas of mixed hardwoods and softwoods and areas for which tree species were not reported (2) This includes some small areas for which ownership details were not reported.

Table 7 contains the most current figures for types of plantations according to the National Plantation Inventory regions. Again, it must be noted that, in this case, the following regions are only partially located in NSW: Northern Tablelands; North Coast; Murray Valley; and East Gippsland-Bombala. The most significant area for hardwood plantations is the North Coast, whereas it has one of the lowest areas of softwood plantations. In contrast, the majority of softwood plantations are located in the Murray Valley region.

Table 7: Total plantation area by National Plantation Inventory region: 2009[76]

Region	Hardwoods	Softwoods	Other categories	Total
Northern Tablelands	1,933	14,871	314	17,118
North Coast	86,296	16,069	984	103,349
Central Tablelands	984	80,474	0	81,458
Southern Tablelands	416	21,602	1	22,019
Murray Valley	6,761	188,705	106	195,572
East Gippsland-Bombala	4,633	42,823	266	47,721
Total	101,023	364,544	1,671	467,237

There has been a significant increase in the NSW plantation estate since 2001. Industry & Investment NSW collates plantation data on a regional basis using the boundaries of all thirteen NSW Catchment Management Authorities (CMA). As Table 8 demonstrates, the distribution of plantations established since 2001 across NSW varies considerably. As previously observed in Table 7, the majority of hardwood plantations have been established in the Northern Rivers region of NSW (roughly equivalent to the North Coast region in Table 7). The Northern Rivers region of NSW also had the highest area of new plantations in NSW. After the Northern Rivers region, the Murray and Murrumbidgee regions have seen the largest increase in plantation area. Hardwood and softwood

75 Bureau of Rural Sciences, 2010. *Australia's Plantations: 2010 Inventory Update*.

76 Bureau of Rural Sciences, 2010. *Australia's Plantations: 2010 Inventory Update*.

plantations form the majority of those planted between 2001 and 2010. However, there has been a gradual increase in environmental plantings since 2005-06, the largest number of which were planted in 2009-10.

Table 8: Types of plantation established in NSW by Catchment Management Authority region since 2001[77]

CMA	Hardwood	Softwood	Other	Enviro	Total
Border Rivers	5,393	0	0	0	5,393
Central West	187	4,673	19	5,247	10,126
Hawkesbury	33	28	0	0	61
Hunter Central	10,600	2,344	10	40	12,994
Lachlan	15	2,261	2,142	11,410	15,828
Lower Murray Darling	0	0	0	0	0
Murray	319	23,700	7	14	24,040
Murrumbidgee	942	22,754	27	411	24,134
Namoi	524	0	0	0	524
Northern Rivers	65,270	3,633	5,220	15	74,138
Southern Rivers	2,572	10,291	59	0	12,922
Sydney Metro	0	247	0	0	247
Western	0	0	0	516	516
Total	85,855	69,931	7,484	17,653	180,923

Another approach to exploring the differential distribution of plantations across NSW is to compare the number of plantations established since 2001 by Local Government Area. Table 9 identifies the fourteen Local Government Areas with the largest number of plantations established since 2001.

Table 9: Plantations established in NSW by selected Local Government Areas since 2001[78]

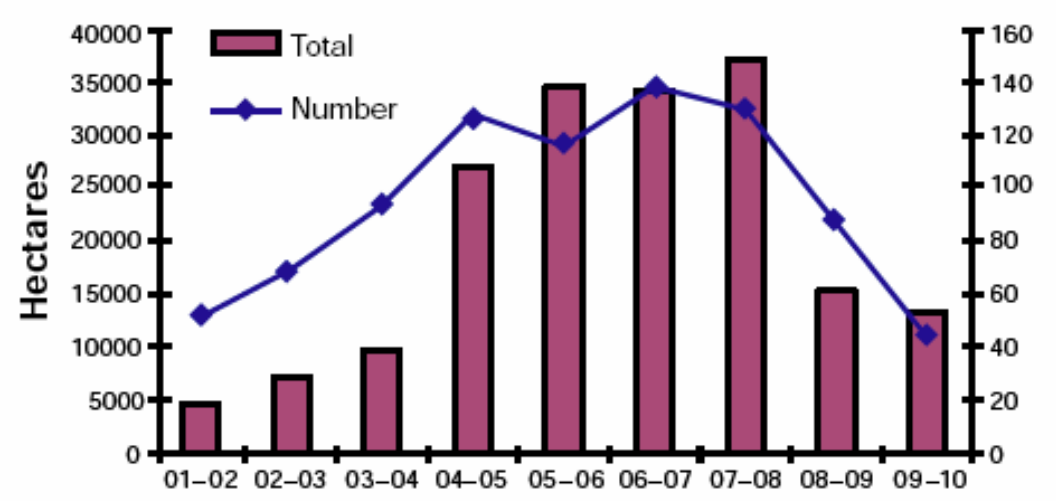
Local Government Area	Catchment Management Authority region	Number of plantations established since 2001
Kyogle	Northern Rivers	98
Greater Hume	Murray	90
Clarence Valley	Northern Rivers	51
Tumbarumba	Murray	50
Richmond Valley	Northern Rivers	42
Byron	Northern Rivers	41
Bombala	Southern Rivers	40
Tenterfield	Northern Rivers/Border Rivers	31
Wagga Wagga	Murrumbidgee	29
Tweed	Northern Rivers	27
Tumut	Murrumbidgee	25
Oberon	Central West	22
Bellingen	Northern Rivers	20
Ballina	Northern Rivers	20

77 Garrard, W., October 2010. *Profile of plantation authorisations: 1 December 2001 to 30 June 2010*, Industry & Investment NSW, Wollongbar Primary Industries Institute.

78 NSW Department of Primary Industries, September 2010. *Register of Plantations Authorised under the NSW Plantations and Reafforestation Act 1999*.

During the period 2001 to 2010, Industry & Investment NSW authorised 856 plantations. These plantations cover an area of 181,576 hectares. From the peak year of 2007-08, during which time over 130 plantations totalling 37,042 hectares were authorised, there has been a substantial decrease in the number of plantations authorised in NSW (see Figure 7). In 2009-10, only 44 plantations totalling 13,131 hectares were authorised. The most significant reason for this decrease is the recent collapse of four MIS companies (section 6.3.1).

Figure 7: Plantation establishment by number and area[79]



The most recent data available for the species grown in *all* NSW plantations is from 2005 (see Table 10). Of a total of 332,988 hectares grown at the time, the vast majority were planted with Radiata Pine (259,248). The two most common hardwood species established were the *eucalyptus* species Blackbutt and Dunn's White Gum. MIS hardwood plantations are generally planted with one of three species: Blue gums (*eucalyptus globulus*); Flooded gums (*eucalyptus grandis*); and Shining gums (*eucalyptus nitens*).[80]

Table 10: Tree species grown in NSW plantations in 2005[81]

Species	Area (ha)
Hardwood species	
Acacia spp. (Wattle)	218
Araucaria spp. (e.g. Hoop pine)	922
Corymbia maculata (Spotted gum)	4,963
Corymbia spp. (e.g. Lemon-scented gum)	4,380
Eucalyptus cloeziana (Gympie messmate)	1,264

79 Garrard, W., October 2010. *Profile of plantation authorisations: 1 December 2001 to 30 June 2010*, Industry & Investment NSW, Wollongbar Primary Industries Institute.

80 Mackarness, P., Malcolm., B., 2006. Public policy and managed investment schemes for hardwood plantations, *Extension Farming Systems Journal*, 2(1): 105-116.

81 Bureau of Rural Sciences, 2005. *Plantation Information Network: Database*, accessed 25/11/2010.

Eucalyptus dunnii (Dunn's white gum)	12,235
Eucalyptus globulus (Tasmanian blue gum)	281
Eucalyptus grandis (Flooded gum)	8,403
Eucalyptus nitens (Shining gum)	2,309
Eucalyptus pilularis (Blackbutt)	15,197
Eucalyptus regnans (Mountain Ash)	2
Other eucalyptus	5,536
Other hardwood	1,982
Softwood species	
Other Pinus	1,172
Other softwood	1,102
Pinus caribaea (Caribbean pine)	1,388
Pinus elliottii (Slash pine)	2,723
Pinus pinaster (Maritime pine)	370
Pinus radiata (Radiata pine)	259,248
Pinus taeda (Loblolly pine)	3,012
Southern pine (collective name for either Slash, Caribbean or Loblolly pine)	6,020
Other	
Mixed species	7
Unknown	254
Total	332,988

A more recent study has identified the areas of eucalypt plantations in subtropical eastern Australia by species and ownership (see Table 11). Subtropical eastern Australia stretches from just south of Townsville, Queensland to just south of Coffs Harbour in NSW. It has an average annual rainfall greater than 700mm. Government-established plantations include Forests NSW and Forestry Plantations Queensland owned plantations. According to Table 11, the most common eucalypts grown in this area are Dunn's white gum, Spotted gum, Blackbutt, and a hybrid of Flooded gum and River red gum. The majority of Dunn's white gum and the Flooded gum/River red gum hybrid are grown by MIS companies. Government, on the other hand, has invested primarily in Spotted gum, Dunn's white gum, and Blackbutt.

Table 11: Eucalypt plantations in subtropical eastern Australia: 2007[82]

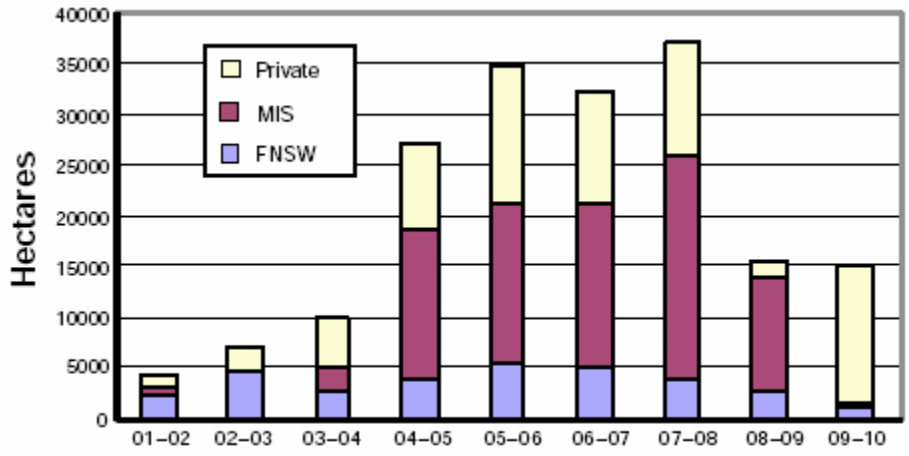
Species	Pre-1994	1994-2007		Total
	Govt (ha)	Govt (ha)	MIS (ha)	
Dunn's white gum (E. dunnii)	0	8,899	23,178	32,076
Flooded gum x River red gum (E. grandis x E. camaldulensis)	0	0	23,701	23,701
Spotted gum (Corymbia spp.)	0	14,753	7,221	21,973
Blackbutt (E. pilularis)	11,438	5,071	1,525	18,033
Flooded gum (E. grandis)	4,500	2,660	2,735	9,895
Gympie messmate (E. cloeziana)	0	2,850	0	2,850
Western white gum (E. argophloia)	0	1,278	0	1,278
Eucalyptus spp.	2,584	1,048	635	4,268
Unknown	1,818	0	0	1,818
Total	20,340	36,559	58,995	115,893

82 Nichols, J. D., Geoff, R., Smith, B., Grant, J., Glencross, K., 2010. Subtropical eucalypt plantations in eastern Australia, *Australian Forestry*, 71(1):53-62.

Ownership of plantations authorised under the *Plantations & Reafforestation Act 1999* can be broken down into three groups: Managed Investment Schemes (45%); individuals and other plantation companies (38%); and Forests NSW (17%). Note that this differs substantially from ownership figures for *all* NSW plantations – Forests NSW owns 62.8% of all NSW plantations, a figure which includes those plantations established before the 1999 Act (see Table 6).

Growth in plantation establishment has been driven by private investment (see Figure 8). In 2010, there were 286 MIS-funded plantations covering an area of 82,636 hectares. However, MIS-funded plantation establishment virtually ceased in 2009-10. Individual and private investment in plantation establishment has continued despite the MIS collapse.

Figure 8: Plantation establishment by ownership: 2001 to 2010[83]



6.1.2 Farm forestry

Accurate data on farm forestry plantations is scarce. Table 12 provides estimates of farm forestry plantations in NSW. According to the research, farm forestry appears to have been more successful when external direct investment into plantation establishment and management has been acquired. Government joint venture programs have been the basis of a large proportion of farm forestry plantations in NSW. Funding has also been provided by MIS: MIS plantations considered farm forestry are leased from landowners and the leased areas form part of a working farm with other active agricultural enterprises. The figures in Table 12 include estimates of MIS plantations.[84] The total farm forestry plantation area in 2007 was 27,950 hectares. In comparison, the total area of private native forests in NSW potentially available for timber production is

83 Garrard, W., October 2010. *Profile of plantation authorisations: 1 December 2001 to 30 June 2010*, Industry & Investment NSW, Wollongbar Primary Industries Institute.

84 URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

8,523,000 hectares.[85]

Table 12: Estimated areas of farm forestry plantations in NSW: 2007[86]

Region	Farm forestry plantations (ha)
North Coast	7,632
Northern and Central Tablelands	2,760
Murray Valley	9,011
Southern Tablelands	7,641
South East NSW	906
Total	27,950

6.2 Plantation forestry in NSW: industry characteristics

Timber plantations form part of a much larger timber industry in NSW. According to Industry & Investment NSW, the NSW timber processing industry is estimated to have generated sales and services income of more than $5.7 billion in 2004-05.[87] Facts and statistics on timber plantations and the timber industry are presented here. Particular attention is given to: plantation production figures; producers and products; imports and exports; domestic and overseas markets; and employment.

6.2.1 Plantation forestry in NSW: volumes, values and forecasts

Total NSW log production volume has remained roughly constant between 2002 and 2009 (see Table 13). However, production from native forests has decreased markedly during this period by 463,000m^3. The decrease in hardwood logs sourced from native forests has only been partially covered by plantation hardwood sources. The value of log production during this period rose by $45 million, most of which is attributable to plantation softwood logs.

Table 13: Volume and value of NSW log production: 2002 to 2009[88]

Log production	Volume of log production (thousand cubic metres)		Value of log production ($m)	
	2002-03	2008-09	2002-03	2008-09
Native forest hardwood	1,904	1,441	126	128
Plantation hardwood	131	228	5	12
Plantation softwood	3,304	3,705	163	208
Total	5,340	5,374	294	348

85 URS Forestry, July 2008. *Farm Forestry Area and Resources in Australia*, RIRDC publication No 08/104.

86 URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

87 Industry & Investment NSW, 2010. *Timber*, accessed 08/12/2010.

88 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

Total Forests NSW revenue in 2008-09 from forest sales was $262,893,000.[89] Table 14 identifies the volume of timber harvested during 2008-09 in comparison with the 1999-00 timber harvest. Over this ten year period, total production of sawlogs and veneer logs remained roughly constant while the production of preservation plantation softwood and total pulpwood increased. An increase in hardwood and softwood plantation production compensated for a reduction in the amount of native forest harvested for sawlogs, veneer logs and pulpwood.

Table 14: Volume of timber harvested by Forests NSW: 1999 to 2009[90]

Product	1999-00	2008-09
Sawlogs and veneer logs (m^3)		
Native forest hardwood sawlogs	786,774	556,244
Hardwood plantation sawlogs	55,466	114,382
Cypress pine sawlogs	101,881	55,175
Plantation softwood sawlogs	1,648,790	1,894,454
Plantation softwood veneer logs	70,919	26,237
Native forest hardwood veneer logs	10,600	7,513
Hardwood plantation veneer logs	2,819	9,196
Total saw logs and veneer logs	2,677,249	2,663,202
Poles, piles and girders (m^3)		
Native forest hardwood	28,432	28,136
Plantation hardwood	5,479	10,116
Total poles, piles and girders	33,911	38,252
Round timber (m^3)		
Preservation plantation softwood	56,422	87,054
Pulpwood (tonne)		
Native forest hardwood pulpwood	503,546	427,871
Plantation hardwood pulpwood	82,660	83,777
Plantation softwood pulpwood	636,058	1,081,236
Total pulpwood	1,222,264	1,592,884
Other		
Fencing/landscape/sleepers/firewood (m^3)	7,575	73,010

It is difficult to forecast future plantation log supply, especially given the possibility for significant variation in production between years and the long lead times required before harvesting. Table 15 presents forecast estimates according to the National Plantation Inventory regions. These figures demonstrate the potential for substantial differences between years. For example, a decline of 99,000m^3 in softwood sawlogs from the Northern Tablelands is expected between 2040-45 and 2045-49. According to Table 15, slightly more than half of the forecast log supply by region and type will be the same or less in 2045-49 than 2010-14.

89 Forests NSW, November 2009. *Forests NSW Annual Report 2008-09: Social, Environmental and Economic Performance*.

90 Forests NSW, November 2009. *Forests NSW Annual Report 2008-09: Social, Environmental and Economic Performance*.

Table 15: Forecast plantation log supply by National Plantation Inventory region: 2010 to 2049[91]

Year	Hardwood (Thousand cubic metres per yr)		Softwood (Thousand cubic metres per yr)	
	Pulpwood	Sawlog	Pulpwood	Sawlog
Northern Tablelands				
2010-14	7	6	93	310
2040-44	26	21	83	321
2045-49	9	10	59	222
North Coast NSW				
2010-14	121	72	29	125
2035-39	330	493	53	188
2045-49	168	212	63	189
Central Tablelands NSW				
2010-14	n/a	n/a	576	708
2025-29	n/a	n/a	576	708
2045-49	n/a	n/a	576	708
Southern Tablelands NSW				
2010-14	n/a	n/a	83	76
2035-39	n/a	n/a	104	110
2045-49	n/a	n/a	79	73
Murray Valley				
2010-14	62	1	1,161	2,057
2030-34	52	4	918	2,827
2045-49	47	102	1,332	2,530
East Gippsland-Bombala				
2010-14	102	n/a	483	343
2035-39	107	n/a	313	340
2045-49	90	n/a	318	332

Note: Three periods were chosen for each reason for this Table: 2010-14, 2045-49 and the year in which production is forecast to peak for both hardwood and softwood.

6.2.2 Forest & wood products industry in NSW: producers and products

A significant number of NSW sawmills are in small country towns. The *Seeing Report* (a supplement to the Forests NSW annual report), identifies the country sawmills that are customers of Forests NSW (see Table 16).

Table 16: Selected sawmill customers of Forests NSW: 2008-09[92]

Sawmill	Location	Type	Capacity (m^3)
Adams Sawmill	Bonville (Coffs Harbour)	Hardwood	20,000-99,999
Albert Johnson Sawmill	Karuah	Hardwood	<19,999
Allied Timber Products	Raglan (Bathurst)	Softwood	>100,000
Aquafern	Warrell Creek (Tamworth)	Hardwood	20,000-99,999
Baradine Sawmilling	Baradine (Coonabarabran)	Hardwood	20,000-99,999
Bingara Cypress	Bingara (Moree)	Hardwood	<19,999

91 Bureau of Rural Sciences, 2007. *Australia's Plantation log supply 2005-2049*, Department of Agriculture, Fisheries and Forestry. It is important to note that forecast production can vary dramatically between years

92 Forests NSW, 2009. *Seeing Report: 2008-09*, Sydney.

Blayney Treated Pine	Blayney	Softwood	<19,999
Blue Ridge Hardwoods	Eden	Hardwood	20,000-99,999
Braidwood Sawmill	Braidwood	Softwood	<19,999
Darlington Point Sawmills	Darlington Point (Griffith)	Hardwood	20,000-99,999
E. and R.J. Hay	Eugowra (Canowindra)	Hardwood	<19,999
Fenning Timbers	Walcha	Hardwood	20,000-99,999
Ford Timbers	Woodenbong	Hardwood	20,000-99,999
Gulargambone Cypress	Gulargambone (Coonamble)	Hardwood	<19,999
Gwabegar Sawmill	Gwabegar (Narrabri)	Hardwood	<19,999
Hardwood Resources	Tumut	Hardwood	<19,999
Hayden Timbers	Wauchope	Hardwood	<19,999
Machins Sawmill	Wauchope	Hardwood	<19,999
Newell Creek Sawmilling	Newell Creek (Buladelah)	Hardwood	20,000-99,999
Newee Creek Sawmill	Newee Creek (Nambucca Heads)	Hardwood	<19,999
Riamukka Sawmill	Walcha	Softwood	<19,999
Romney Park Sawmill	Romney Park (Milton)	Hardwood	<19,999
S.A. Relf and Son	Buladelah	Hardwood	20,000-99,999
W.J. Treseder	Narromine	Hardwood	<19,999

The 24 sawmills identified in Table 16 are a relatively small proportion of the total number of sawmills in NSW (see Table 17). Of the 210 sawmills in NSW, 184 process hardwood logs. The majority of hardwood sawmills are quite small, only processing less than 3,000m^3/yr.

Table 17: Number of NSW sawmills by log intake: 2006-07[93]

Log intake (m^3/yr)	Hardwood	Softwood
Less than 3,000	123	4
3,000 to less than 15,000	39	6
15,000 to less than 45,000	19	7
45,000 to less than 75,000	2	4
75,000 to less than 100,000	1	1
More than 100,000	0	4
Total	184	26
Grand Total	210	

Selected hardwood and softwood sawmillers are identified in Table 18. Different companies specialise in different types of wood. Boral Timber is the State's largest hardwood sawmilling company and also deals with softwood. Other major softwood sawmillers include Hyne and Son in Tumbarumba and Weyerhaeuser in Tumut.[94] A contributing factor in the emergence and expansion of companies such as Boral and Weyerhaeuser in the NSW timber industry was the departure of CSR from timber production. Between 1995 and 2001, Carter Holt Harvey (CHH) and Boral bought the former CSR operations at Oberon, near Bathurst, at a value of over $200 million. In 2000, Weyerhauser

93 Burns, K., Sledge, P., Wicks, S., April 2009. *ABARE 2007 sawmill survey report*, Canberra.

94 National Association of Forest Industries, 2006. *Wood and Paper Products Industry Skills Shortage Audit,* National Association of Forest Industries, Canberra, 249pp.

(USA) took over CSR's former operations at Tumut.[95] In 2010**,** CHH, in turn, took over the Weyerhaeuser plant.

Table 18: Selected hardwood and softwood sawmillers in NSW: 2009[96]

Major hardwood sawmillers	Major softwood sawmillers
Company	Company
Australian Solar Timbers	Auswest
Big River Timbers	Boral
Blue Ridge Hardwoods	Carter Holt Harvey
Boral	Colenden
Coffs Harbour Hardwoods	Dale and Meyers
Davis and Herbert (Boral)	Hyne and Son
Grants Holdings	McVicars Timber
Gulpa Sawmill	Penrose Pine
Gunnedah Timbers	Tarmac
Hurfords	Willmott Forests
ITC Timber (Gunns)	
Koppers	
Notaras	
Thora	

Hardwood and softwood sawnwood supply has changed considerably in the past decade, but in opposite directions. Between 2003 and 2008, hardwood sawnwood production in NSW fell from 548,000m^3 to 433,600m^3. Conversely, softwood sawnwood production rose from 952,300m^3 to 1,298,500m^3.[97]

Forests NSW forest products are made into an assortment of timber products (see Table 19). Table 19 presents a summary of the products made from sawlogs produced by Forests NSW. Sawlog products from hardwood forests have changed considerably between 1995 and 2008. In 2007-08, the majority of hardwood logs were converted into floorboards (48%), whereas most hardwood logs ended up as house framing in 1995-96. The mix of softwood sawlog products has remained more constant: over 70% still ends up as house framing.[98]

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95 URS Forestry, August 2004. *Profile of the Value of the Timber Industry in the South West Slopes Region of New South Wales*. Report prepared for the Riverina Regional Development Board, URS, Melbourne.

96 Forests NSW, 2009. *Facts and Figures: 2008-09*, Sydney.

97 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

98 Forests NSW, *2009. Facts and Figures: 2008-09*, Sydney.

Table 19: Forests NSW product mix of timber harvested: 1995 to 2008[99]

Sawlog product mix from hardwood forests (native and plantation)			Sawlog product mix from softwood plantation		
Product	95-96 (%)	07-08 (%)	Product	95-96 (%)	07-08 (%)
Dry structural	21	7	House framing	71	73
Floorboards	22	48	Joinery/furniture	2	1
Joinery/furniture	1	6	Decking & panelling	1	6
Decking & panelling	4	6	Floorboards/bearers/joists	3	3
House framing	30	14	Fencing/landscape	7	6
Pallets	12	9	Other preservation	1	4
High strength structural	2	2	Unseasoned	14	7
Fencing/landscape	8	8			

Forests NSW has been selling carbon credits through the NSW Greenhouse Gas Abatement Scheme since February 2005 (see Table 20). By the end of 2008-09, 26,756 hectares of plantation forest was accredited for carbon trading. This scheme is likely to be replaced by any national carbon trading scheme should one be developed.

Table 20: Forests NSW National Greenhouse Abatement Certificates from compliant plantations: 2004 to 2009[100]

	2004-05	2006-07	2007-08	2008-09
Number of certificates created	166,005	538,471	694,935	660,382
Area of plantation accredited for carbon trading	n/r	23,515	26,864	26,756

Note: (1) Each certificate accredited represents one tonne of carbon dioxide removed from the atmosphere.

The first substantial paper plant in Sydney was the Sydney Paper Mills (SPM), built at Botany in 1901. Nineteen years later, SPM was taken over by Australian Paper Mills (APM) of Melbourne.[101] In 1957, Wiggins Teape of England opened a paper mill in the Shoalhaven. Thirteen years later, the Shoalhaven mill was taken over by Australian Pulp and Paper Mills (APPM).[102] In 1981 the Murdoch's and the Fairfax's built an Australian Newsprint Mill (ANM) at Albury, using softwood from Tumut and Tumbarumba in NSW, and from Bright and Myrtleford in Victoria.[103] In 1986 APM changed its name to Amcor.[104] Seven

99 Forests NSW, *2009. Facts and Figures: 2008-09*, Sydney.

100 Forests NSW, November 2009. *Forests NSW Annual Report 2008-09: Social, Environmental and Economic Performance*.

101 Sinclair, E.K., 1990. *The Spreading Tree: A History of APM and Amcor 1844-1989*, Allen and Unwin, Sydney, 278pp.

102 Shoalhaven Paper Mill, 2010. *Mill history*, accessed 25/11/2010.

103 Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp. See also: Bradshaw, M., 2001. Newsprint Mills in Australia: A Story of Shifting Optimum Location, *Australian Geographer*, 32(2): p.244.

104 Sinclair, E.K., 1990. *The Spreading Tree: A History of APM and Amcor 1844-1989*,

years later, Amcor took over APPM.[105] In 2000, Amcor sold off its office paper business, the latter taking the name of PaperlinX (manufacturers of the Reflex brand).[106]

By the beginning the twenty-first century, there were at least two large companies engaged in pulp and paper production in those areas of the State with the biggest softwood plantations. In 2000, Norske Skog of Norway acquired the paper mill at Albury (which the Murdoch's and the Fairfax's had earlier sold to Fletcher Challenge). Five years previously the mill's share of the domestic newsprint market had been around 70%.[107] Norske Skog's Albury plant proceeded to produce about 220,000 tonnes of newsprint a year and employ around 230 people.[108] Visy Industries opened a pulp mill in Tumut in 2002, with a capacity of around 240,000 tonnes of Kraft linerboard per year.[109] In 2009, Nippon Paper took over the PaperlinX plant at Shoalhaven.[110] In total there are six pulp and paper mills in New South Wales (see Table 21).

Table 21: Pulp and paper mills in NSW: 2009[111]

Pulp and Paper Firm	Location
ABC Tissue Products Proprietary Limited	Sydney
Amcor	Sydney
Nippon Paper	Shoalhaven Heads
Norske Skog	Albury
Visy	Sydney and Tumut

Allen and Unwin, Sydney, 278pp.

105 Shoalhaven Paper Mill, 2010. *Mill history*, accessed 25/11/2010.

106 Shoalhaven Paper Mill, 2010. *Mill history*, accessed 25/11/2010.

107 Bradshaw, M., 2001. Newsprint Mills in Australia: A Story of Shifting Optimum Location, *Australian Geographer*, 32(2): p.244.

108 URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

109 Australian Department of Agriculture, Fisheries and Forestry (DAFF) and Invest Australia, 2003. *Australian Forest Products Industry*, Canberra, 20pp.

110 PricewaterhouseCoopers, 2010. *Forest, Paper and Packaging Deals: 2009 Annual Review*.

111 Pulp and Paper Industry Strategy Group, March 2010. *Pulp and Paper Industry Strategy Group: Final Report*, Department of Innovation, Industry, Science and Research, Canberra.

The pulp and paper industry consists of much more than the pulp and paper mills. Using ABS data, IBISWorld estimated that in 2009 there were 442 enterprises operating in paper and paper-related product manufacturing and other value-adding activities in Australia. Since 2005-06, the number of enterprises and establishments has fallen by an annual average rate of approximately 2.9%/yr (see Table 22). This slow decline in the sector can be seen across a number of different statistics.

Table 22: Economic contribution of the broad Australian pulp and paper industry: 2005 to 2009[112]

Year ending June	2005	2009	5 years average annual growth
Industry value added ($m)	2,560	1,996	-4.90%
No. of establishments	611	527	-2.90%
No. of enterprises	511	442	-2.90%
Employment (FT equivalent)	21,494	18,732	-2.70%
Exports ($m)	1,176	1,006	-3.10%
Imports ($m)	3,549	3,486	-0.40%
Domestic demand ($m)	13,367	12,599	-1.20%

6.2.3 Forest & wood products industry in NSW: imports and exports

Australia is currently a net importer of traditional forest products.[113] In 2008-09, Australia had an export deficit of $2.1 billion in forest and wood products: Australia imported $4.4 billion in forest and wood product items (see Table 23). The majority of this expenditure was spent on paper products, which totalled $2.867 billion in 2008-09. The remainder was spent on sawnwood and other wood products, wood pulp, and miscellaneous forest products. NSW imported $104.5 million of sawnwood in 2008-09, most of which was Radiata pine. NSW also imported $64.5 million of veneers, plywood and board products in 2008-09.

112 Pulp and Paper Industry Strategy Group, March 2010. *Pulp and Paper Industry Strategy Group: Final Report*, Department of Innovation, Industry, Science and Research, Canberra.

113 Low, K., Mahendrarajah, S., March 2010. *Issues insights 10.1: Future directions for the Australian forest industry*, Australian Bureau of Agricultural and Resource Economics, Canberra.

Table 23: Australian forest and wood product imports: 2008-09[114]

Product imports	Australia		NSW	
	Volume ('000 m^3)	Value ($m)	Volume ('000 m^3)	Value ($m)
Sawnwood				
Douglas fir (roughsawn softwood sawnwood)	40.7	11.5	32.0	8.5
Douglas fir (dressed softwood sawnwood)	23.2	6.4	14.0	3.9
Radiata pine (roughsawn softwood sawnwood)	113.4	60.9	37.7	22.4
Radiata pine (dressed softwood sawnwood)	78.1	61.0	27.5	20.6
Western red cedar (roughsawn softwood sawnwood)	34.0	37.2	3.8	4.4
Other softwood (roughsawn softwood sawnwood)	67.5	24.2	6.2	2.2
Other softwood (dressed softwood sawnwood)	177.5	100.2	27.5	23.3
Roughsawn hardwood sawnwood	52.2	50.7	9.3	9.1
Dressed hardwood sawnwood	41.7	52.7	8.3	10.1
Total	628.3	404.8	166.3	104.5
Other wood products				
Veneers	21.4	28.3	4.6	10.1
Plywood	199.1	145.4	40.8	27.0
Board products (e.g. particleboard, hardboard)	191.1	97.5	34.3	27.4
Miscellaneous forest products	n/a	650.5	n/a	177.3
Total	411.6	921.7	79.7	241.8
Paper				
Newsprint	197.6 kt	173.4	n/a	n/a
Printing and writing	1,122.1 kt	1,467.8	n/a	n/a
Household and sanitary	82.0 kt	154.2	n/a	n/a
Packaging and industrial	254.0 kt	481.0	n/a	n/a
Total paper and paperboard	1,655.7 kt	2,276.4	n/a	n/a
Paper manufactures	n/a	590.2	n/a	n/a
Recovered paper	3.0	0.7	n/a	n/a
Total	1,658.7 kt	2,867.3	n/a	n/a
Wood pulp				
Wood pulp	344.7 kt	262.6	n/a	n/a
Grand total	n/a	4,456.4	n/a	346.3

114 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra. "Paper Manufactures" includes such items as boxes, letter trays, letter pads, notebooks and paper bags.

During the 1970s, 64% of all timber imports into NSW were sourced from the United States of America. The main species of timber imported at this time was Douglas fir.[115] However, the importation of Douglas fir and Western red cedar has been in decline over the past 20 years or so (see Table 24). The reasons are twofold. First, Australia is now basically self sufficient in framing timber, utilising mainly locally grown plantation Radiata pine. The second major shift in supply has been the rapid uptake of Engineered Wood Products, which are mainly used in floor joists, sourced mainly from Australia, New Zealand and Scandinavia.[116]

Table 24: Imports of Douglas fir and Western red cedar: 1990 to 2009[117]

Year	Douglas fir (m^3)	Western red cedar (m^3)
1990	599,000	83,250
1995	310,300	69,076
2000	169,700	69,526
2005	84,300	46,125
2009	63,900	34,000

In 2008-09, Australia exported forest and wood products valued at $2.3 billion (see Table 25). Most of this value was made up by wood chips ($996.8 million) and paper products ($946.3 million). NSW exported $108.4 million worth of wood chips in 2008-09, $99.2 million of which was hardwood wood chips. $28.5 million worth of sawnwood was exported by NSW, $76 million less than was imported (see Table 23). The majority of exported Australian hardwood and softwood sawnwood was roughsawn, rather than the value-added dressed sawnwood. For example, in 2008-09 282,700m^3 of Australian roughsawn softwood sawnwood was exported in comparison to 18,200m^3 of Australian dressed softwood sawnwood.

115 Bureau of Agricultural Economics, 1977. *The Australian Softwood Products Industry: Plantation Requirements to 1980*, Bureau of Agricultural Economics, Canberra, p.33. In Australia, Douglas fir is also known as "Oregon".

116 Forest and Wood Products Australia, 2008. *Australian Market Requirements for Western Red Cedar and Douglas-fir*, Melbourne.

117 Forest and Wood Products Australia, 2008. *Australian Market Requirements for Western Red Cedar and Douglas-fir*, Melbourne; and Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

Table 25: Australian forest and wood product exports: 2008-09[118]

Product exports	Australia		NSW	
	Volume ('000 m^3)	Value ($m)	Volume ('000 m^3)	Value ($m)
Sawnwood and roundwood				
Softwood sawnwood	301.0	78.5	98.8	24.9
Hardwood sawnwood	53.6	46.3	4.9	3.6
Roundwood	986.4	101.0	456.1	41.3
Total	1,341	225.8	559.8	69.8
Wood pulp and wood chips				
Wood pulp	22.0 kt	17.7	n/a	n/a
Hardwood wood chips	4,290.7 kt	807.4	597.4 kt	99.2
Softwood wood chips	964.1 kt	189.4	50.3 kt	9.2
Total	5,276.8 kt	1,014.5	647.7 kt	108.4
Other wood products				
Veneer	85.7	36.5	n/a	n/a
Plywood	52.6	4.1	n/a	n/a
Board products	207.1	60.6	n/a	n/a
Miscellaneous forest products	n/a	51.0	n/a	6.9
Total	345.4	152.2	n/a	6.9
Paper				
Newsprint	2.2 kt	2.0	n/a	n/a
Printing and writing	111.9 kt	128.1	n/a	n/a
Household and sanitary	37.9 kt	110.9	n/a	n/a
Packaging and industrial	617.0 kt	364.4	n/a	n/a
Total paper and paperboard	769.0 kt	605.4	n/a	n/a
Paper manufactures	n/a	106.1	n/a	n/a
Recovered paper	1,215.9 kt	234.8	n/a	n/a
Total	1,984.9 kt	946.3	n/a	n/a
Grand total	n/a	2,339.8	n/a	185.1

Australia has a particular trade imbalance in the area of furniture. In comparison with furniture imports worth $1.397 billion, Australia only exported $23.2 million in 2008-09 (see Table 26). China was Australia's biggest supplier of furniture, with imports from China totalling $777 million. The importation figures for NSW are comparable with those for the rest of Australia, with NSW importing $501.7 million worth of furniture more than it exported.

118 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

Table 26: Imports and exports of secondary wood products: 2008-09[119]

Wood product	Australia Value ($m)	NSW Value ($m)
Imports		
Wood furniture	1,396.7	507.6
Prefabricated buildings	92.9	6.5
Printed articles	1,144.3	667.5
Total	2,633.9	1,181.6
Exports		
Wood furniture	23.2	5.9
Prefabricated buildings	47.7	7.6
Printed articles	296.0	135.5
Total	366.9	149.0

6.2.4 Forest & wood products industry in NSW: domestic and overseas markets

Australia's annual log harvest volume fell by 10.7% in 2008-09, the largest percentage decline recorded in ABARE's harvest data. This was largely a result of the global financial crisis, including the decline in Australian housing activity and the downturn in international woodchip trade. As a result, domestic demand was weak. For example, total dwelling commencements fell by 17% to 132,000 units between 2007-08 and 2008-09. Sawnwood and wood-based panel consumption and production consequently declined in all categories except veneer production in 2008-09. Consumption of sawnwood fell by approximately 14% and wood-based panel consumption by 11%.[120]

The pulp industry in Australia is small: local paper producers consume most domestic output. Imports of pulp account for approximately one quarter of domestic pulp consumption. Between 1997 and 2007, Australia's pulp production rose from 914,000 metric tonnes to 1.2 million metric tonnes.[121] Large volumes of hardwood pulpwood are expected to come online in the next 5 to 10 years. However, it remains to be seen whether or not pulpmills or other value-adding processing facilities can be viably developed in Australia. This is because pulp is more exposed to international markets than other forest products, as its prices are notoriously volatile.[122]

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119 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

120 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

121 Honnold, V., 2009. Developments in the Sourcing of Raw Materials for the Production of Paper, *Journal of International Commerce and Economics*, vol.2, p.206.

122 URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

International demand for forest and wood products has been driven to a large extent by growth in building construction. Australian forest product exports reached $2.3 billion in 2008-09, down 5.2% relative to the previous year. The decline was driven mainly by a significant drop in the value of woodchips, packaging and industrial paper. According to ABARE, uncertainty surrounds future demand from Australia's major trading partners (see Table 27). International market factors that may affect Australian exports include:

- Asia: the strongest growth in exports of forest products is currently from Asian markets, much of which is driven by Chinese demand
- United States: although Australia does not have significant trade in timber products with the United States, the size of the United States market means that changes in United States demand can have an indirect effect on Australian markets
- Europe: signs of recovery can be detected in Europe at present, but the pace of the recovery is expected to be relatively slow compared with other economies
- Rest of the world: production of timber products has been adversely affected by contractions in developed economies.[123]

Australia's two most significant export markets are Japan ($860.5 million) and China ($390.4 million) (Table 27). Japan is Australia's main market for woodchips. However, as a result of the GFC, total Japanese hardwood chip imports fell by 26% in 2009. Despite this decrease, Australia is expected to remain an important source of woodchip supply for Japan. Chinese demand for woodchips has steadily increased since 2000.[124] Chinese hardwood wood chip imports more than doubled in 2009, Australian exports increasing fivefold in the September and December 2009 quarters in comparison with the same period in 2008.[125] According to ABARE, the Chinese market for Australian forest and wood products is more promising than Japan as, compared with Japanese demand, China imports a diverse range of forest products (see Table 27).[126] After Japan and China, New Zealand and South Korea are the largest importers of Australian forest and wood products, followed by Malaysia, Taiwan and Hong Kong (see Table 27).

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123 Low, K., Mahendrarajah, S., March 2010. *Issues insights 10.1: Future directions for the Australian forest industry*, Australian Bureau of Agricultural and Resource Economics, Canberra.

124 Pechey, L., 10-13 October 2010. *The outlook for softwood sawntimber and hardwood chips*, Australian Forest Growers Conference 2010, Mount Gambier, South Australia.

125 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

126 Low, K., Mahendrarajah, S., March 2010. *Issues insights 10.1: Future directions for the Australian forest industry*, Australian Bureau of Agricultural and Resource Economics, Canberra.

Table 27: Australian forest and wood product exports to select Asia-Pacific destinations: 2008-09[127]

Product	China ($m)	Taiwan ($m)	Hong Kong ($m)	Japan ($m)	Malaysia ($m)	New Zealand ($m)	South Korea ($m)
Wood products							
Roundwood	54.3	2.3	2.5	0.2	1.6	3.4	31.0
Softwood roughsawn sawnwood	18.9	18.9	0.2	2.0	3.7	0.6	4.4
Softwood dressed sawnwood	0.5	0.1	0.0	1.9	0.3	2.0	0.0
Hardwood roughsawn sawnwood	20.4	0.0	0.3	0.9	1.8	2.4	1.0
Hardwood dressed sawnwood	2.6	0.1	0.1	0.6	0.4	0.4	0.0
Miscellaneous forest products	1.9	1.1	0.7	0.8	1.5	15.9	0.5
Veneers	0.6	0.0	0.3	0.2	32.5	1.7	0.0
Medium density fibreboard	24.5	2.5	1.0	5.2	1.3	1.3	12.4
Pulp	0.5	0.4	0.0	0.0	0.0	0.0	2.3
Woodchips	74.5	34.8	0.0	843.1	0.0	0.3	41.7
Total	198.7	60.3	5.2	854.8	43.1	28.4	93.4
Paper products							
Printing and writing	1.0	0.3	14.9	0.0	3.3	37.0	2.2
Household and sanitary	0.1	0.0	0.5	0.2	0.8	86.5	0.0
Packaging and industrial	34.3	16.4	23.6	1.7	24.9	111.7	2.4
Paper manufactures	1.3	0.0	2.4	0.6	1.6	54.8	0.6
Wastepaper	154.4	0.0	4.8	0.0	4.7	0.0	2.2
Total	191.1	16.7	46.2	2.5	35.3	290.0	7.4
Grand total	390.4	77.3	51.3	860.5	78.5	323.8	103.2

Note: The Grand total value of exports to these countries includes export products not included in this Table.

127 Australian Bureau of Agricultural and Resource Economics (ABARE), May 2010. *Australian Forest and Wood Products Statistics: September and December Quarters 2009*, ABARE, Canberra.

6.2.5 Forest & wood products industry in NSW: employment

In 2006, there were 38,140 people employed in the forest and wood products industry in NSW (see Table 28). 2,511 businesses were operating in the industry at this time.[128] 31% of the total national forest and wood products industry workforce was employed in NSW.[129] Most of those employed in the sector work for wood structural fitting and component manufacturing and paper product manufacturing companies.

Table 28: People employed in the NSW forest and wood products industry: 2006 Census[130]

Sector	Employment	% of total
Agriculture, Forestry and Fishing Support Services	27	0.1
Agriculture, Forestry and Fishing	434	1.1
Converted Paper Product Manufacturing	7	0.02
Corrugated Paperboard and Paperboard Container Manufacturing	1,803	4.7
Forestry Support Services	831	2.2
Forestry and Logging	40	0.1
Forestry	1,061	2.8
Log Sawmilling and Timber Dressing	968	2.5
Log Sawmilling	2,037	5.3
Logging	590	1.5
Other Converted Paper Product Manufacturing	255	0.7
Other Furniture Manufacturing	4,692	12.3
Other Wood Product Manufacturing	1,676	4.4
Paper Bag and Sack Manufacturing	171	0.4
Paper Product Wholesaling	4,317	11.3
Paper Stationery Manufacturing	1,760	4.6
Prefabricated Wood Building Manufacturing	75	0.2
Pulp, Paper and Converted Paper product Manufacturing	647	1.7
Pulp, Paper and Paperboard Manufacturing	1,114	2.9
Reconstituted Wood Product Manufacturing	661	1.7
Sanitary Paper Product Manufacturing	1,175	3.1
Timber Resawing and Dressing	428	1.1
Timber Wholesaling	1,446	3.8
Timber and Hardware Goods Wholesaling	55	0.1
Veneer and Plywood Manufacturing	297	0.8
Wood Chipping	103	0.3
Wood Product Manufacturing	141	0.4
Wooden Furniture and Upholstered Seat Manufacturing	3,381	8.9
Wooden Structural Fitting and Component Manufacturing	7,948	20.8
Total	38,140	100

128 ForestWorks, February 2010. *Industry Skills Scan*.

129 ForestWorks, no date. *NSW forest, wood, paper and timber product industry snapshot*, submitted to the NSW Government.

130 Australian Bureau of Statistics, *Census: 2006*, ABS Catalogue 2068.0 (Australian Bureau of Statistics, Canberra, 2007) - Industry of Employment (New South Wales).

6.3 Plantation forestry in NSW: current issues

Over the past 15 years, plantation forestry expansion has largely been driven by private investment. The collapse of several large MIS companies in 2009-10 has been accompanied by an overall decline in plantation investment. This section opens with a brief account of Managed Investment Schemes in NSW, before summarising recent proposals for alternative investment approaches. It finishes by identifying a series of issues timber plantation companies now face, as identified by the industry.

6.3.1 Plantation forestry in NSW: Managed Investment Schemes

Two years after gaining office, the Howard Government passed the *Managed Investments Act 1998*, to facilitate the introduction of the Managed Investment Scheme (MIS) as a basis for growing timber.[131] A key feature of the managed investments legislation was tax deductibility. In 2003, Sol Rabinowicz, Executive Director of Timbercorp, explained the operational structure of a timber MIS:

> A managed timber investment [MTI] is a pooled arrangement in which a group of investors acquire an interest in land and together establish and manage a plantation on that land. The investors are usually brought together as part of a plantation project initiated and promoted by a specialist plantation manager … two basic financial structures are commonly adopted by MTI managers. The first requires the investor to pay an up-front sum of money for the establishment of the plantation, with no ongoing costs. The manager maintains the trees and, on maturity, takes a share of the wood proceeds in lieu of annual rent and/or maintenance costs. The second structure requires the investor to pay an upfront amount for plantation establishment and then ongoing fees for annual rent and maintenance.[132]

In 2005, Rabinowicz outlined the boost given to plantation investment by the managed investment arrangements, stating:

> More than 70% of all the new timber plantations, established since the Plantations 2020 Vision was launched in 1997, have been financed and planted by the managed investment plantation sector. In the market at present, there are eleven large and medium MIS

131 Parliamentary Joint Committee on Corporations and Financial Services, September 2009. *Inquiry into aspects of agribusiness managed investment schemes*, Commonwealth Government.

132 Rabinowicz, S., March 2003. Managed timber investments, paper presented at the *ABARE Outlook Conference*, March 2003, Canberra.

> plantation companies (seven of them listed on the stock exchange), and another seven smaller companies that are smaller-scale … the companies manage woodlots for well over 40,000 private growers … the $750 million invested by growers in 2004-05 will be used by managers to establish over 100,000 hectares of new plantations in 2005-06.[133]

In April and May of 2009, the two largest timber MIS companies – Timbercorp and Great Southern Plantations – were placed into administration (see Figure 2). Two further MIS companies with plantations in NSW went into receivership in 2010: Forest Enterprises Australia in April; and Willmott Forests in July.[134] It is important to distinguish between the companies that manage a MIS, and the MIS.[135] The collapse of MIS companies has been attributed to a number of factors.[136] These include the companies' management structures, debt levels and, in the case of Timbercorp and Great Southern Plantations, earlier decisions to diversify away from forestry and into other agricultural enterprises.[137] Although investment in timber MIS is tax deductible, land acquisition for the purpose of establishing plantations is not tax deductible. MIS companies acquired large areas of land, often financing the acquisitions on their balance sheets with substantial bank debt. As a result of the 'Global Financial Crisis', a situation arose where the "combined effect of a volatile share market, reduced demand for MIS products and an inability to roll over debt facilities" resulted in MIS company collapse.[138]

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133 Rabinowicz, S., October 2005. Treefarm Investment Managers Australia (A Special Interest Branch of Australian Forest Growers), presentation to the *TIMA Parliamentary Breakfast*, Senate Alcove, Parliament House, Canberra, 11 October 2005.

134 In May 2010, Rewards Group (which had no timber plantations in NSW), entered administration. NewForests, September 2010. *Rationalizing Timberland Managed Investment Schemes: The Changing Landscape of Australia's Forestry Investment Sector*, Market Outlook: September 2010.

135 National Association of Forest Industries, July 2009. *Submission by National Association of Forest Industries (NAFI) and Australian Plantation Products and Paper Industry Council (A3P) to the Parliamentary Joint Committee on Corporations and Financial Services Inquiry into Agribusiness Managed Investment Schemes*.

136 Parliamentary Joint Committee on Corporations and Financial Services, September 2009. *Inquiry into aspects of agribusiness managed investment schemes*, Commonwealth Government.

137 The Institute of Foresters Australia, June 2009. *Submission to the Parliamentary Joint Committee on Corporations and Financial Services Inquiry into Agribusiness Managed Investment Schemes*.

138 NewForests, September 2010. *Rationalizing Timberland Managed Investment Schemes: The Changing Landscape of Australia's Forestry Investment Sector*, Market Outlook: September 2010: p1.

A key debate amongst industry and government stakeholders is the continued suitability of the MIS approach to investing in plantation forestry. As a result, several stakeholders have proposed investigating alternative forestry investment models.[139] A recent report has identified four types of policy instruments by which governments could induce increased timber plantation investment, especially in long-term timber plantations: tax-based incentive mechanisms; government investment or support of forest enterprises; government extension/R&D programs; and indirect government policies such as market regulations and an emissions trading scheme.[140]

6.3.2 Plantation forestry in NSW: industry issues

Australian Forest Growers argue that a loss of investor confidence in the MIS forestry sector and a looming sawlog supply shortage have brought plantation forestry to a crossroads.[141] Other industry stakeholders have also drawn attention to these factors along with identifying a broader set of issues facing the plantation forestry (see Table 29). These issues cover a range of topics, many of which are affected by legislative and regulatory arrangements. Other than those associated with the collapse of MIS companies, economic challenges include: the general failure of farm forestry to become a significant contributor to the supply of softwood and hardwood timber; and inadequate investment into expanding softwood plantations, long rotation hardwood plantations for sawlogs, and value-adding industries. Underdeveloped markets for forest products also hamper industry viability and expansion.

Further challenges faced by the industry include skills and labour shortages and potential and actual changes in government policy and support. One of the most pressing concerns for the industry is the unresolved issue of water rights and regulation with regard to timber plantation consumption, as plantation owners currently do not pay a price for water consumed by their plantation.[142] According to the industry, recent government policy has also resulted in a decline in State government-funded forestry R&D and extension services at a time when

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139 See for example: Australian Forest Growers, 5 October 2010. *Media release – Time is ripe for a new forestry investment model*. Alternative forestry investment models were a key issue of debate at the Australian Forest Growers Biennial Conference in October 2010.

140 Australian Bureau of Agricultural and Resource Economics, May 2010. *Models for a sustainable forest plantation industry: a review of policy alternatives*, ABARE research report 10.05, Canberra. See also: Thompson, D., 10-13 October 2010. *Plantation investment models and forestry policy*, Australian Forest Growers Conference 2010, Mount Gambier, South Australia.

141 Australian Forest Growers, 12 October 2010. *Media release: Plantation investment at the crossroads?*

142 L'Estrange, G., 9 September 2010. *Australia's place in the changing global forest products market*. Gunns Plantation Ltd CEO Speech to ForestWorks Conference, Melbourne, Victoria.

national and global demand for forest products is on the rise. As a result, the industry generally advocates an update of, and recommitment to, policies such as the 1992 National Forest Policy Statement and the Regional Forest Agreements in light of present realities.

Table 29: Issues facing plantation forestry in NSW as identified by industry participants[143]

Topic	Issues
Economic	• $2.1 billion trade deficit in forest products • Building codes and energy rating schemes should not unfairly restrict the use of wood products • Competition from alternative building materials • Falling housing approvals and housing starts in Australia accompanied by rising interest rates • Lack of investment in long rotation hardwood plantations for sawlogs – looming shortage in sawn timber supply • Lack of investment in value-adding industries • Lack of markets for lower quality wood and thinning products • Languishing US housing starts resulting in reduced international demand for wood products • Managed Investment Schemes: negative distortions of resource allocation; inadequate information available to potential investors; inflated rural land prices; collapse has significantly reduced plantation establishment rates • Potential for increased costs due to plantation water consumption • Rate of softwood plantation establishment is insufficient • Use of tree species that are highly susceptible to insect attack and which produce poor wood quality e.g. *eucalyptus dunnii*
Labour and skills	• Skills and labour shortages • Training existing workforce
Policy	• 1992 National Forest Policy Statement needs updating to reflect current realities – need recommitment to Regional Forest Agreements • Sovereign risk due to policy changes
Private native forestry issues	• Inadequate incentives for investment in private native forestry – farm forestry remains an insignificant industry contributor • Present incentive system in NSW generates an exploitative regime of 'high-grading' that will produce a substantial decline in commercial timber yields
R&D and extension services	• Limited and declining investment in forest research and innovation • Loss of forestry extension and technical support services • Loss of funding for Private Forestry Development Committees
Transport	• Lack of transport infrastructure funding – need long-term funding stream • Lack of advanced planning for transport, electricity and port infrastructure

143 See Appendix A for a list of all sources.

7.0 PLANTATION FORESTRY IN NSW: RESEARCH AND DEVELOPMENT

This section focuses on plantation forestry research into tree species, economic viability and environmental issues. A brief account of government investment in forestry research precedes the summary of research into tree species. An overview of research into the economic viability of plantation and farm forestry is presented before ending with a short summation of the environmental issues facing plantation forestry.

7.1 Government investment in plantation forestry research

Several Commonwealth and NSW government bodies invest in forestry research, including:

- Australian Bureau of Agricultural and Resource Economics (Commonwealth)
- Bureau of Rural Sciences (Commonwealth)
- Co-operative Research Centre for Forestry (Joint Government/industry research group)
- CSIRO (Commonwealth)
- Forest & Wood Products Australia (Commonwealth)
- Forests NSW (NSW)
- Rural Industries Research & Development Corporation (Commonwealth)

Three bodies have set forth forestry research directions of particular relevance and importance for plantation forestry: the Forestry & Forest Products Committee for the Primary Industries Ministerial Council; Forest & Wood Products Australia; and Forests NSW (see Table 30). The breadth of research topics recommended by the Forestry & Forest Products Committee and covered by Forest & Wood Products Australia in comparison with Forests NSW research reflects changes in research investment in the forest sector. According to the Forestry & Forest Products Committee, "there has been a decline in overall research investment in the forest sector in the last 10 years, with some increased investment by the Federal Government and significantly lower investment by State agencies".[144] This is despite evaluations of past investments in forestry R&D that have found benefit to cost ratios of around seven to one.[145] A survey of the industry in 2004 found that Commonwealth, State, industry and university expenditure in 2002 dollars declined from $96

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144 Forestry and Forest Products Committee, June 2008. *Forest Research Strategic Directions 2008-2011*, prepared by the Research Priorities and Coordination Committee: p3.

145 Forestry and Forest Products Committee, June 2008. *Forest Research Strategic Directions 2008-2011*, prepared by the Research Priorities and Coordination Committee.

million in 1980/81 to $70 million in 2001/02.[146] More recently, the Montréal Process Implementation Group for Australia found that total reported annual forest-related R&D expenditure declined by 8% from $216 million in 2001/02 to $199 million in 2004/05.[147]

Table 30: Research directions of key forestry bodies[148]

Forestry body	Research directions
Forestry & Forest Products Committee (Commonwealth-State body)	5 R&D themes, each with several specific topics of inquiry: (1) Mitigation of, and adaptation to climate change in Australia: e.g. carbon accounting; carbon trading; and biomass energy production systems. (2) Water quality and yield: e.g. water-balance accounts; and plantation design and management systems. (3) Forests for multiple objectives: e.g. biodiversity conservation; and integrated forestry and agricultural production systems. (4) Health and biosecurity of Australia's forests: e.g. preparation and mitigation strategies; and improved surveillance methods. (5) Product development and use: e.g. timber quality and value-adding; and harvesting and processing techniques and technologies.
Forest & Wood Products Australia (Industry-funded and -run body established under Commonwealth legislation)	13 investment priorities: (1) Information, analysis and interpretation of domestic and export markets (2) Timber construction in residential buildings (3) Timber construction in commercial and industrial buildings (4) Appearance of timber products and markets (5) Wood products in sustainable buildings (6) Development of secondary products and markets for these products (7) Solid wood, engineered wood and pulp and paper products (8) Maximising product yields and values from current resources (9) Improving wood quality and yield, and tools for forest management (10) Genetic improvement and delivery for increased wood yield and quality (11) Water use efficiency, water access and balanced policy outcomes (12) Forest biosecurity and preparedness (13) Mitigation of and adaptation to climate change
Forests NSW	Three main program areas: (1) New forests: environmental services of forests in the areas of climate change mitigation and land rehabilitation (2) Forest biosecurity and resource assessment: management options to digitally map, quantify and minimise the impact of damaging forest and plantation processes (3) Forest biodiversity and ecology: maximising and measuring the ecological sustainability of biodiversity in planted and native forests

146 URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

147 Montréal Process Implementation Group for Australia, 2008. *Australia's State of the Forests Report: Five-yearly report 2008*, prepared by the Montréal Process Implementation Group for Australia on behalf of the Australian, state and territory governments.

148 Sources: Forestry and Forest Products Committee, June 2008. *Forest Research Strategic Directions 2008-2011*, prepared by the Research Priorities and Coordination Committee; Forest & Wood Products Australia, 2010. *Forest & Wood Products Australia Annual Report 09/10*; and Department of Primary Industries, November 2009. *NSW Department of Primary Industries Science and Research and Forests NSW: Research and Development Annual Report 2008-09*.

A breakdown of funding by sector and source provides a more nuanced account of changes in forestry R&D investment (see Table 31). Investment into forestry and environmental management R&D fell between 2001 and 2005. In contrast, over the same period investment in timber product manufacturing R&D increased from $85 million to $111.9 million. In 2005, 96.5% of R&D expenditure into timber product manufacturing was from private sources.

Table 31: Forestry R&D investment by sector and source: 2001 to 2005[149]

Socioeconomic objective	2001-02	2002-03	2004-05		
			Public	Private[1]	Total
Forestry (primary wood production)	74.9	54.4	38.5	1.7	40.2
Manufacturing (wood, wood product and paper)	85.0	85.9	3.9	108.0	111.9
Environmental management (forest and wooded lands)	56.2	60.5	44.1	2.7	46.8
Total	216.1	200.8	86.5	112.4	198.9

Notes: (1) Initial figures derived from ABS data (expenditure by higher education institutions not included)

The newly elected Rudd Government, in its May 2008 Budget, announced the introduction of a program entitled Preparing Australia's Forest Industries for the Future. The package provided $20 million a year over three years, with the following sums of money for designated measures:

- $9 million for a Forest Industries Development Fund – to encourage investment in value-adding activities and to boost the competiveness of Australia's forest industry. Grants from the fund were limited to no more than $500,000.
- $8 million for research into the impact of climate change on forest systems and industries (including $5 million towards the Forest Industries Climate Change Research Fund).
- $1 million for the ForestWorks program – to address skills shortages in the industry and intended to support the establishment of the Forest and Forest Products Industry Skills Council.
- $1 million for measures to support collaboration with industry and Asia-Pacific governments to restrict the sale of illegally-logged timber.[150]

149 Adapted from: Montréal Process Implementation Group for Australia, 2008. *Australia's State of the Forests Report: Five-yearly report 2008*, prepared by the Montréal Process Implementation Group for Australia on behalf of the Australian, state and territory governments. For further detail on forestry research by program and topic, see: Lott, R., Gooding, G., July 2008. Eucalypt plantations for solid-wood products in southern Australia: a review of research investment and needs, in (eds) Brown, A.G., Beadle, C.L., July 2008. *Plantation eucalypts for high-value timber: enhancing investment through research and development*, RIRDC Publication No. 08/113.

150 Productivity Commission, 2009. *Trade and Assistance Review 2007-08*, Productivity Commission, Melbourne.

Between 2008 and 2010, a number of concerns in NSW received grants under the Preparing Australia's Forest Industry for the Future Program (see Table 32).

Table 32: NSW recipients of grants under the Preparing Australia's Forest Industry for the Future Program: 2009-10[151]

Recipient	Amount	Purpose
Allied Timber Products (Bathurst)	$459,000	Expansion of Integrated Processing Plant
Big River Group (Wagga)	$500,000	Upgrading of Plywood Plant
Collenden (Lowanna)	$330,000	Value Adding Upgrade
Kempsey Timbers	$412,500	New 3D Scanning System for Strip Flooring Line
Kempsey Timbers	$288,000	New Timber Processing Facility for Flooring Products
Kempsey Timbers	$198,000	New End-Matching System for Strip Flooring Line
PACPine (Burraga)	$33,000	Steam Piston Generator
South East Fibre Exports	$73,114	Sawmill Biomass Fuel Study
University of New England	$218,998	Conversion of Eucalypt Forestry Waste into Biofuels
University of Western Sydney	$440,000	Provision of Missing Information for Decision Support Systems to Manage Forests under Rising Carbon Dioxide and Global Warming
Total	$2,952,612	

Forests NSW R&D investment has declined in the ten years between 1998-99 and 2008-09 (see Table 33). The largest decline occurred between 2007-08 and 2008-09, when $3 million was cut from the R&D budget to bring total expenditure down to $4.6 million.

Table 33: Forests NSW R&D investment: 1998 to 2009[152]

Year	R&D investment
1998-99	$7.2 million
2005-06	$6.9 million
2006-07	$7.0 million
2007-08	$7.6 million
2008-09	$4.6 million

Currently, Forests NSW is conducting several R&D projects of relevance to the subject of this paper (see Table 34). Although there is some research on species trials, most of the research concerns either the climate change aspects of forestry (e.g. carbon sequestration), forest health or forest biodiversity.

151 Department of Agriculture, Fisheries and Forestry, 2010. *Forest Industries Development Fund*, accessed 25/11/2010.

152 Forests NSW, November 2009. *Forests NSW Annual Report 2008-09: Social, Environmental and Economic Performance*.

Table 34: Select current Forests NSW R&D projects[153]

Name	Objectives/findings
Land management to increase soil carbon sequestration in NSW	• Investigate the extent of carbon sequestration potential from improved land use and management practices • Previous studies had suggested there could be significant loss of soil carbon when pasture sites were reforested, particularly with pine. Results from this study found that soil carbon is marginally higher in a mature pine plantation site than in the adjacent pasture
The greenhouse footprint of wood products	• Deliver an energy budget for wood products used for building in NSW and determine the greenhouse impact of waste disposal options, thereby informing the development of carbon trading schemes, energy rating systems and waste disposal strategies
Pilot of a catchment management authority participating in the NSW Greenhouse Gas Abatement Scheme	• Investigated the development of tools and systems to enable a catchment management authority to apply for accreditation to manage a carbon pool based on its revegetation programs and existing plantings in its catchment • Concluded that, although a preliminary business case suggests net incomes for authorities and landholders would be financially attractive, uncertainty surrounding a prospective national carbon trading scheme means there is little incentive to pursue the option
Commercial and environmental tree use in medium rainfall areas	• Assess the growth, performance and suitable silvicultural regimes for a range of tree species in the lower rainfall areas of NSW (500-700mm) • The project has conducted: thinning and pruning trials on different species; establishment technique trails; belt width trials; and spacing trials.
Biosolid benefits for plantation pine	• Biosolids proved an effective fertiliser for pine, both environmentally and silviculturally • Analysis of the carbon sequestration potential of plantations treated with biosolids continues to be assessed

7.2 Plantation forestry research: species trials in the eastern States

Forestry R&D investment has not only decreased in recent years, it has also changed focus. The most significant change between 1981 and 2002 was the increased focus on native species for plantations: from 2.5% of R&D investment to 31.4% (see Table 35). When adjusted for inflation, research into native species rose by an average of 52% per year over the period; this is in contrast to significant falls in research expenditure on native forests and exotic species for plantations.[154] This change is manifest in the species trials and genetic improvement research of the past ten or so years, the focus having shifted to native species such as eucalypts.

153 Department of Primary Industries, November 2009. *NSW Department of Primary Industries Science and Research and Forests NSW: Research and Development Annual Report 2008-09*.

154 Bureau of Rural Sciences, 2008. *The changing face of Australia's forests: a summary of major changes in Australia's forests since 1992*, Department of Agriculture, Fisheries and Forestry, Canberra, 20pp.

Table 35: Forestry research expenditure on plantation species and native forests as a percentage: 1981 to 2002[155]

Forestry topic	1981-82	2001-02
Exotic species' plantations	42.8%	35%
Native species' plantations	2.5%	31.4%
Native forests	41.8%	25.2%

Research into exotic species in NSW, Victoria and Queensland has focused on pine and, to a lesser extent, cypress species. Queensland also conducts research into exotic tropical species, suitable only for plantations in the far north of Queensland. There is little research available on the use of Douglas fir, Californian redwood or Western red cedar as a plantation timber in Australia. Publications of relevance are as follows:

- *First review of Research Working Plan R3: Trials of exotic species in species trials and pilot plantings (1971):* Several trials of Douglas fir were established between 1957 and 1968: the Tumut district in 1957; the Bathurst district in 1961 and 1962; the Metropolitan district in 1965; the Eden sub-district in 1968; and the Barrington Tops area (no date given). In the Tumut trials, Douglas fir rated just behind Ponderosa pine. In the Bathurst trial, Douglas fir lagged well behind the neighbouring Radiata pine stand, despite being "one of the fastest growing post-war plots of Douglas fir". Aside from a brief comment recommending another pilot planting of Douglas fir near Tumut, despite recent "establishment of Douglas fir (at the site) over the last several years (being) beset with problems and several partial failures", the report makes no recommendations as to whether or not to pursue further trials of Douglas fir or as to its suitability for plantation forestry in NSW.
- *History of forestry in NSW: 1788 and 1988 (1989)*[156]: only one mention of any of the three species was found, being restricted to a sentence on the establishment of 1267 hectares of Douglas fir on the southern Tablelands between 1924 and 1972.
- *Otway Forest Management Plan (1992)*: Douglas fir was being replanted in the Otway Forest Management area in Victoria up until 1987. Douglas fir is listed, together with Californian redwood, as a species of economic importance. Later in the same chapter, both species are listed as softwood demonstration reserves: Californian redwoods were established in 1929 on three hectares; and Douglas firs were established from 1932 onwards on 108 hectares.
- *Douglas-fir planted forests (1999)*: cites a 1978 paper on the establishment of approximately 1,500 ha of Douglas fir in Australia.

155 Bureau of Rural Sciences, 2008. *The changing face of Australia's forests: a summary of major changes in Australia's forests since 1992*, Department of Agriculture, Fisheries and Forestry, Canberra, 20pp.

156 See Appendix B for a full list of the references canvassed.

- *Farm forestry species for the Adelaide Hills and Fleurieu Peninsula (2005)*: Californian redwoods listed as of very limited local potential
- *Australian New Crops* website: has identified research papers written between 1926 and 2007 on 68,000 different species of plants. No research was identified for any of the three species on their use in Australia since 1980. Prior to 1980, only one reference was found, and it concerned the growth of Californian redwood in the Otway region of Victoria.
- *Agroforestry.net.au:* A plantation of Californian redwood is being grown on a farm in southern Victoria. The website, published by the farm owner, makes the following note: "The long rotation lengths associated with growing Redwoods tend to frighten off the institutional and corporate investors."
- Relevant publications within which it may be expected to see discussion of the merits of growing the three species in Australia, but that contained no mention of any of the species in this regard, are as follows: *A bibliography of plantation hardwood and farm forestry silviculture research trials in Australia (2001); Achievements in forest tree genetic improvement in Australia and New Zealand 5: Genetic improvement of Douglas-fir in New Zealand (2007);* and *Australian market requirements for western red cedar and Douglas-fir (2008).*

It therefore appears that, where trials of these species have been conducted in the past in Australia, the results have been such that growing these species is unviable for climatic or economic reasons.[157]

Two key areas of research are discussed below, namely: genetic improvements to species currently grown in plantations; and species trials for plantation and farm forestry. Although a large amount of research has been conducted, no clear industry statement on the key species for plantations could be found.[158] The following account briefly summarises, by species, a large number of reports published by leading research organisations on ongoing and completed research.

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157 A paper on the Weyerhaeuser company notes that, whilst Douglas fir has "strength and quality characteristics unmatched by other species", it requires 50 to 80 years to reach commercial viability. In contrast, pine species such as Radiata and Loblolly are ready for harvest after 35 years (Milstein, M.B., 1997. *Weyerhaeuser company: the next 100 years*, World Resources Institute, 22pp.)

158 The following reference identified this problem with regard to hardwood sawlog plantations in 2008: Lott, R., Gooding, G., July 2008. Eucalypt plantations for solid-wood products in southern Australia: a review of research investment and needs, in (eds) Brown, A.G., Beadle, C.L., July 2008. *Plantation eucalypts for high-value timber: enhancing investment through research and development*, RIRDC Publication No. 08/113.

7.2.1 Plantation forestry research: genetic improvement

Genetic improvement research focuses on different properties according to the purpose for which the trees are grown. Genetic improvement on hardwood trees grown for sawlogs focuses on the following traits: sawn timber recovery; wood structural, dimensional and aesthetic properties; gluing and machinability; and durability. In the case of pulpwood plantations, traits of interest are those properties linked to chip and pulp yield. Genetic improvements can be achieved by two methods: breeding for certain traits; and creating hybrid species.

Appendix C summarises the research on the genetic improvement of tree species by selective breeding in Victoria, NSW and Queensland. A literature review identified twenty species that have been or are currently being trialled, almost all of which show promise as a source of timber products. Selective breeding trials have taken place from low to high rainfall zones and generally identify the types of products for which a particular species may be suitable.

Genetic improvement programs are conducted by government and industry bodies. Forests NSW is currently conducting a Tree Improvement Program at the Grafton Forest Technology Centre. Three species are under improvement: Blackbutt; Spotted gum; and Dunn's white gum.[159] The Co-operative Research Centre (CRC) for Forestry is also a significant source of research into genetic improvement of native hardwoods. A relevant project currently underway at the CRC is focused on high value wood resources, and involves research into breeding and improved silviculture methods.[160] Industry bodies also conduct or sponsor genetic improvement research. For example, Heartwood Plantations in Victoria has participated in genetic gain trials for Sugar gum and Spotted gum.[161]

Hybrid eucalypts have been very successful internationally. Australian hybrid research programs are experimenting with a number of eucalypt species (see Table 36). There are two main reasons for using hybrids instead of pure species: hybrid vigour is desirable (i.e. the hybrid is superior in some trait to both parents); and qualities that are intermediate between those of the chosen pure species are required.[162] For example, Tasmanian blue gum/River red gum

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159 Forests NSW, 2005. *Tree improvement program – Grafton Forest Technology Centre*, accessed 01/12/2010. CSIRO has also recently announced a research project into over 1000 genes in Australia's major plantation eucalypts in the hope of finding those genes responsible for superior wood traits: CSIRO Plant Industry, Summer 2010. CSIRO intensifies search for wood trait markers, *CSIRO Plant Industry newsletter*, Issue 32.

160 CRC for Forestry, 2010. *High value wood resources*, accessed 01/12/2010.

161 Heartwood Plantations, 2010. *Research & Development: projects*, accessed 01/12/2010.

162 Bush, D., 2008. Genetic improvement for high-value eucalypt timber, in (eds) Brown, A.G., Beadle, C.L., July 2008. *Plantation eucalypts for high-value timber: enhancing investment through research and development*, RIRDC Publication No. 08/113.

hybrids show promise producing trees suitable for pulp production on saline lands.[163] Table 36 summarises potential hybrid combinations for temperate and sub-tropical climatic zones. Other species being used in hybrid trials not identified in Table 36 include: Timor mountain gum (*E. urophylla*); Maiden's gum (*E. maidenii*); and Forest red gum (*E. tereticornis*).

Table 36: Genetic improvement programs: breeding hybrids[164]

Parent 1 (with rooting ability)	Parent 2	Desired property of hybrid
Temperate		
River red gum	Tasmanian blue gum Flooded gum Sydney blue gum Shining gum	Good growth rates and tolerance of slightly drier and/or waterlogged/saline sites
Swamp yate	Tasmanian blue gum Flooded gum	Good stem form and growth rate combined with drought and salinity tolerance
Sub-tropics		
Cadagi tree	Lemon-scented gum Large-leaved spotted gum Spotted gum	Resistance to *Quambalaria*[1], increased cold tolerance, increased drought tolerance
River red gum	Flooded gum	Increased drought tolerance
Flooded gum	Grey gums	Increased site plasticity
Flooded gum River red gum	Red mahogany Red stringybark	Adaptation to sites intermediate between those parents are suited to dual-purpose high-value timber and pulp
Grey gum	Red mahogany Dunn's white gum	Site adaptability, wood colour, dual purpose high-value timber and pulp

Note: (1) Quambalaria shoot blight is a major disease affecting Spotted gum in tropical and sub-tropical Australia. It is caused by several species of the fungus *Quambalaria*.[165]

7.2.2 Plantation forestry research: species trials

A large number of species have been, or are still subject to species trials across Victoria, Queensland and NSW. Some of these species are more suited for large-scale plantation forestry, while others have potential for farm forestry. Appendix D identifies 39 species that are being trialled for plantation forestry. Many of these species are currently grown in plantations. Where trials are ongoing for these species they are focused on trialling the species in new

163 McComb, J., May 2007. *Salt-tolerant hybrid eucalypts: a report for the RIRDC/L&WA/FWPRDC Joint Venture Agroforestry Program*, RIRDC Publication No 07/068, Canberra.

164 Bush, D., 2008. Genetic improvement for high-value eucalypt timber, in (eds) Brown, A.G., Beadle, C.L., July 2008. *Plantation eucalypts for high-value timber: enhancing investment through research and development*, RIRDC Publication No. 08/113; Lee, D.J., 2007. Achievements in forest tree genetic improvement in Australian and New Zealand 2: Development of *Corymbia* species and hybrids for plantations in eastern Australia, *Australian Forestry*, 70(1):11-16.

165 Pegg, G.S., Carnegie, A.J., Wingfield, M.J., Drenth, A., 2009. *Quambalaria* species: increasing threat to eucalypt plantations in Australia, *Southern Forests: a Journal of Forest Science*, 71(2): 111-114.

climatic, biophysical and/or socio-economic conditions. Most of the trials have concentrated on the impact of climate on the growth of a species. One study considered the economic viability of long-rotation hardwood plantations in south eastern Queensland involving several hardwood species. This study concluded that plantation forestry could be socio-economically viable on sites considered to be marginal for hardwoods, although this depended on the availability of low cost land. It also found plantation viability increased when ecosystem service values, such as carbon sequestration and salinity amelioration, were incorporated in the analysis.[166]

A much larger variety of tree species have been tested for their suitability for farm forestry than those trialled for plantation forestry (see Appendix E). A literature review identified 76 species that have been or are currently being trialled for farm forestry. Many of these species are suitable for a variety of timber and other forest products. The potential exists for these species to fill niche timber markets. However, available market information varies by species.

A recent study has comprehensively analysed market opportunities for farm forestry in Australia.[167] This is summarised in section 7.3.2, as it also reviews markets for non-timber farm forestry products such as bioenergy, biofuel and carbon sequestration.

7.3 Plantation forestry: economic viability

Several studies have assessed the economic viability of plantations and farm forestry in Australia and NSW. This section identifies and summarises several of the most relevant studies on this topic.

7.3.1 Plantations: economic viability

The most comprehensive analysis of plantation viability in NSW was conducted in 2001. This study had three foci by which it analysed plantation viability across all of NSW: plantation capability; plantation suitability; and the economic competitiveness of plantations in traditional and non-traditional plantation areas. The study was modelled with reference to three hardwood species (Blackbutt, Shining gum and Spotted gum) and a generic softwood management regime. Table 37 divides NSW by area according to plantation productivity. Approximately 16.7 million hectares of land were considered capable of achieving commercial growth rates of a mean annual increment (MAI) of more than 12 cubic metres per hectare a year. These were largely in the higher rainfall coastal and tableland regions.

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166 Venn, T.J., 2005. Financial and economic performance of long-rotation hardwood plantation investments in Queensland, Australia, *Forest Policy and Economics*, 7():437-454.

167 URS Forestry, July 2008. *Market opportunities for farm forestry in Australia*, RIRDC Publication No 08/105, Canberra.

Table 37: Plantation capability in NSW: area of capable land by productivity class for softwood and hardwood[168]

Class	MAI (m^3/ha/yr)	Softwood (million ha)	Hardwood (million ha)	Maximum (million ha)
1	>20	3.6	2.5	3.8
2	16-20	7.4	5.1	7.6
3	12-16	5.4	6.3	5.3
4	8-12	5.2	7.7	5.1
5	3-8	10.7	10.9	10.7
6	<3	47.7	47.7	47.7

Note: Figures for combined area do not equal the hardwood and softwood totals because the same land may receive a different productivity classification for either hardwoods or softwoods. Estimates of capable land exclude alpine areas and other areas not capable of supporting tree growth.

Of the 50.3 million hectares of cleared private land in 2001 not under intensive or urban use, 6.3 million hectares were considered capable of commercial growth rates and suitable for plantation development (see Table 38). A further 3.3 million hectares were classified as being marginally productive (8-12 m^3/ha/yr)[169].

Table 38: Plantation suitability in NSW: area of cleared private land by productivity class for softwood and hardwood[170]

Class	MAI (m^3/ha/yr)	Softwood (million ha)	Hardwood (million ha)	Maximum (million ha)
1	>20	0.9	0.6	0.9
2	16-20	2.4	1.7	2.5
3	12-16	3.0	2.3	2.9
4	8-12	3.3	4.9	3.3
5	3-8	8.6	8.7	8.6
6	<3	31.9	31.9	31.9

The economic competitiveness of plantations was compared with estimated farm business profits (EFBPs) and estimated values of agricultural land (EVALs). When prospective plantation returns were compared with EFBPs, the reference case demonstrated potential for about 425,000 hectares of plantation development (see Table 39). The derived gross value of production for this

168 ABARE and BRS, August 2001. *An assessment of the potential for plantation development in New South Wales: ABARE and BRS report to the New South Wales Plantations Taskforce Steering Committee on Plantation Capability and Suitability*, Canberra.

169 ABARE and BRS, August 2001. *An assessment of the potential for plantation development in New South Wales: ABARE and BRS report to the New South Wales Plantations Taskforce Steering Committee on Plantation Capability and Suitability*, Canberra.

170 ABARE and BRS, August 2001. *An assessment of the potential for plantation development in New South Wales: ABARE and BRS report to the New South Wales Plantations Taskforce Steering Committee on Plantation Capability and Suitability*, Canberra.

entire plantation estate was estimated at a current annual value of more than $1.5 billion. However, the economic competitiveness of plantations compared to the EVAL benchmark was significantly less. The potential for additional plantation development using the EVAL benchmark was approximately 160,000 hectares. Two thirds of this area would be softwood regimes in the northern tablelands and far south coast. The production of woodchips and softwood sawntimber accounted for the majority of plantation timber, while the gross value of production consisted primarily of softwood and hardwood sawntimber.[171]

Table 39: Economic competitiveness of plantations in NSW[172]

	Reference case	Change from reference case		
		$5/t CO_2e (% increase)	$15/t CO_2e (% increase)	$30/t CO_2e (% increase)
Estimated Farm Business Profits benchmark				
Plantation area ('000 ha)	425.1	+27.2	+75.6	+133.7
Production ('000 m^3)	9545.1	+24.8	+62.7	+100.0
Gross value of production ($m)	1506.2	+24.6	+67.1	+111.7
Employment	13.5	+24.0	+65.9	+114.8
CO_2e sequestration (Mt)	93.7	+28.1	+73.8	+133.7
Estimated Values of Agricultural Land benchmark				
Plantation area ('000 ha)	160.5	+170.9	+264.3	+479.7
Production ('000 m^3)	3529.5	+158.5	+227.0	+396.9
Gross value of production ($m)	524.6	+166.8	+252.7	+444.3
Employment	4.9	+166.8	+252.0	+452.8
CO_2e sequestration (Mt)	35.4	+161.2	+257.7	+479.2

The analysis of plantation economic competitiveness included three cases in which a carbon price was included. These cases assumed plantation owners could sell plantation sequestered carbon credits each year. They also assumed that a market for emission permits existed from the first year of plantation development, and emission permits were obtainable by plantation owners in each year of the plantation. Inclusion of carbon credits in the model substantially increased the economic competitiveness of plantations in NSW.[173]

Analysis of economic competitiveness in non-traditional plantation areas (areas having less than 12 MAI) was also conducted. The simulation found that, based

171 ABARE and BRS, August 2001. *An assessment of the potential for plantation development in New South Wales: ABARE and BRS report to the New South Wales Plantations Taskforce Steering Committee on Plantation Capability and Suitability*, Canberra.

172 ABARE and BRS, August 2001. *An assessment of the potential for plantation development in New South Wales: ABARE and BRS report to the New South Wales Plantations Taskforce Steering Committee on Plantation Capability and Suitability*, Canberra.

173 Later studies have also confirmed this finding, see for example: Venn, T.J., 2005. Financial and economic performance of long-rotation hardwood plantation investments in Queensland, Australia, *Forest Policy and Economics*, 7():437-454.

on returns from the sale of carbon credits only, less than 700,000 hectares of land in non-traditional plantation areas could be economically competitive for plantations (using the lowest establishment cost assumptions and based on a $30/tonne carbon price for carbon credits). The report proposed that less productive areas in western regions may have commercial production potential if alternative species, improved genetic material, advanced establishment techniques were employed and markets for environmental services introduced.[174] Many of the more recent species trials for both plantation and farm forestry species have tested species potential within low-rainfall areas.

7.3.2 Farm forestry: economic viability

A scarcity of suitable data is an important qualification cited in most studies on farm forestry viability.[175] In NSW, 8.4% of all plantations were located on farms in 2005-06.[176] The economic, social and environmental values provided by farm forestry were assessed at a national level in 2008 (see Table 40). The gross value of production of Australian farm forestry was estimated at $362 million per annum. On top of this, total environmental values may be worth approximately $25 million per annum. However, it is important to recognise that many of these values are concentrated in specific regions across Australia, such as the northern rivers region of NSW.

Table 40: Economic, social and environmental values of Australian farm forestry: 2008[177]

Economic values	Social values	Environmental values
Gross Value of Production is $362 million p.a.	Lifestyle and amenity values of forested land	Improvements in biodiversity worth up to $3.51 million p.a.
Between 1,778 and 2,144 jobs are generated	Amenity values may increase rural property prices	Salinity control may be worth up to $1.99 million p.a.
The processing and services sector contributes $271 million of farm forestry Gross Value of Production	Farm forestry diversifies farm income	Carbon sequestration services could reach $14.7 million p.a.
		Improvements in soil condition worth up to $1.59 million p.a.

174 ABARE and BRS, August 2001. *An assessment of the potential for plantation development in New South Wales: ABARE and BRS report to the New South Wales Plantations Taskforce Steering Committee on Plantation Capability and Suitability*, Canberra.

175 Hassall, A., October 2008. *Quantifying the value of farm forestry: a national level analysis*, RIRDC Publication No 08/147, 56pp.

176 Nuberg, I., Reid, R., George, B., 2009. Agroforestry as integrated natural resource management, in (eds) Nuberg, I., George, B., Reid, R., *Agroforestry for natural resource management*, CSIRO publishing, Canberra, pp:1-20.

177 Hassall, A., October 2008. *Quantifying the value of farm forestry: a national level analysis*, RIRDC Publication No 08/147, Canberra, 56pp.

Two key research programs have recently investigated a broad range of timber and non-timber products and tree species. Table 41 provides an indicative picture of potentially viable timber products and non-timber products for farm forestry. Non-timber products from farm forestry fall under two categories: tangible products (e.g. woody biomass); and environmental services. The potential growth in markets for environmental services is highly dependent upon government policy. Relevant NSW policy includes the NSW Greenhouse Gas Abatement Scheme. Proposed Commonwealth policies include the Carbon Farming Initiative and an emissions trading scheme.

Table 41: Potential and current farm forestry products in NSW[178]

Program	Products	Species
Commercial Environmental Forestry (CSIRO & SCION)	• Environmental services – carbon sequestration and biodiversity	• Blue gum • Blue mallee • Oil mallee • Radiata pine • Spotted gum • Sugar gum • York gum
Joint Venture Agroforestry Program (RIRDC, Land & Water Australia, FWPRDC and the MDBC)	• Activated carbon • Alcohols – ethanol and methanol • Appearance grade timber • Bioenergy • Biofuel • Carbon sequestration • Composite wood products • Dry formed fibreboard • Electricity from woody biomass • Engineered strand lumber • *Eucalyptus* oil • Fibre cement • Fodder • Gums and biopolymers • Hardwood sawn timber • Industrial carbon • Laminated Veneer Lumber (LVL) • Plywood • Posts and poles • Pulp & paper • Pyrolytic bio-oil • Sandalwood • Softwood sawn timber • Tannins • Veneer • Woodchip exports • Wood-plastic composites	• Apple box • Australian sandalwood • Black wattle • Blackwood • Blue mallee • Broad-leaved peppermint • Creswick Apple-box • Desert poplar • Golden spray • Indian sandalwood • Long-leaved box • Red gum • Red mahogany • Red morrell • Ridge-fruited mallee • River red gum • Rough-barked manna gum • South Australian mallee box • Southern blue gum • Southern mahogany • Sugar gum • Swamp gum • Swamp wattle • Swamp yate • Water gum • Western white gum • Willow Wattle • Yellow gum

178 References: ENSIS, June 2006. *Commercial environmental forestry: integrating trees into landscapes for multiple benefits*, Summary Technical Report, ENSIS: The joint forces of CSIRO & SCION, 22pp; and URS Forestry, July 2008. *Market opportunities for farm forestry in Australia*, RIRDC Publication No 08/105, Canberra, 84pp.

A recent study of market opportunities for farm forestry in Australia ranked market opportunities by Australian regions (see Table 42). The report makes an important point when it comes to interpreting the table:

> the rankings for market opportunities are for individual products, not production systems e.g. plantations aimed at producing softwood sawlogs also produce posts and pulpwood but market opportunities for the different products produced from one plantation can vary. A number of regions in Australia have markets for plantation sawlogs but find it difficult to secure markets for all available pulpwood. Therefore while market opportunities may be reported for softwood sawn timber in a region, returns to farm forestry plantation investment in that region may not be attractive if market opportunities for pulpwood are limited.[179]

The Murray Valley has the largest number of "high" market opportunities for farm forestry. This is because a significant plantation processing capacity exists in the region, including world scale sawmills, pulp and paper manufacturing and MDF and particleboard manufacturing. The region with the "lowest" market opportunities according to the table is the northern and central tablelands. Plantation processing facilities in the region include a world-scale softwood sawmill, an MDF mill, and several small sawmills.

Table 42: NSW regional ranking of farm forestry market opportunities for existing larger scale products[180]

Region	Softwood timber	Hardwood timber	Veneer, ply & LVL[1]	Log exports	Posts & poles	Composite wood products	Woodchip exports	Pulp & paper
North Coast NSW	L	H	M	L	M	L	M	L
Northern/Central Tablelands	M/H	M	L	L	M	L	L	L
Murray Valley	H	L	M	L	H	H	L	H
Southern Tablelands	M	L	M	L	M	L	L	M/H
South East NSW	M	M/H	L	M	M	L	M	L

Note: LVL = laminated veneer lumber

179 URS Forestry, July 2008. *Market opportunities for farm forestry in Australia*, RIRDC Publication No 08/105, Canberra, page x.

180 Adapted from: URS Forestry, July 2008. *Market opportunities for farm forestry in Australia*, RIRDC Publication No 08/105, Canberra.

Investing in farm forestry requires a good understanding of the investment time frames, risks and returns involved. Farm forestry must be evaluated as a separate crop as well as an integrated component of the farm. Farm forestry viability is also dependent on the surrounding local and regional forest industry. As argued by a recent study into farm forestry viability:

> profitable farm forestry occurs where the participant is operating within a sphere of influence of an established forestry industry that is already growing and harvesting the same species. In these situations the markets are available and the industry knowledge available to reduce risk.[181]

This study made five recommendations regarding farm forestry viability:

(1) Based on financial analysis it is difficult to justify the promotion of investment in long timeframe sawlog regimes at the farm level, unless ways can be found to generate income earlier in the rotation to offset costs or demonstrate integrated whole farm benefits.
(2) A lack of historical prices and measured growth rates for farm woodlots meant that meaningful analysis of historical prices to develop industry specific measures for risk adjusted return to compensate for risk taken in farm forestry was not possible. The industry needs these measures to enable proper financial scrutiny of potential investment returns
(3) The long term nature of the investment means that entrants need to understand the financial analysis tools such as Net Present Value so they are better equipped to make investment decisions and understand the risks. Farmer understanding of financial models and risk is poor, including by farm forestry stakeholders, and needs to be improved at the extension and grower level
(4) Accessible market links and support industries for thinning, prunings and environmental services need to be developed to allow the recovery of costs earlier in the rotation. This is particularly important for sawlog regimes, which on current analysis are inherently risky and provide poor economic reward.
(5) Existing expertise in extension needs to be developed to allow farm forestry participants to learn from localised experience on issues such as marketing, species selection, stand density and silviculture, and therefore to avoid mistakes.

181 Fritsch, S., Hudson, B., October 2008. *Whole farm financial and environmental returns under farm forestry*, RIRDC Publication No 08/146, Canberra, pvii.

7.4 Plantation forestry: environmental sustainability

Box 7: Plantation forestry: environmental issues
- Biodiversity
- Bushfire management
- Carbon sequestration
- Fertiliser use
- Pesticide use
- Plantation water consumption
- Weed management

A significant proportion of plantation forestry legislation, policy and research is concerned with the sustainable management of plantation forestry. Management of these forests involves engaging with a number of different environmental issues (see Box 7). Environmental issues associated with plantation and farm forestry vary geographically and according to the species of trees involved. This section briefly reviews several of these environmental issues.

The Australian Pesticides and Veterinary Medicines Authority is the Australian administrative body responsible for assessing and registering the chemicals used in plantation forestry as pesticides and herbicides. All the chemicals used in the industry are used in agriculture except for sulfometuron methyl. According to a recent industry review of chemical use in the industry, of the 10 million hectares treated by aerial application in Australia each year, less than 0.5% is applied to plantation forests. Application rates per hectare are also estimated to be significantly lower than agricultural industries. For example, an estimated $10.92/ha/yr of chemicals is applied to the typical Tasmanian blue gum plantation. In comparison, $933.34/ha/yr of chemicals is applied on an onion farm and $1,911.08/ha/yr is applied on a banana plantation. Estimates for the total spent on chemicals by the plantation industry in 2005 range from $16.2 to $20.9 million.[182]

Large-scale plantation forestry has been identified in the National Water Initiative as having the potential to intercept significant volumes of water. This is because trees use more water than pasture. Over the plantation cycle, runoff reductions are minor for the first five years before peaking between 10-20 years after planting. At this point in the cycle, plantations can reduce runoff by between 100 to 150 mm/year. Average water use across the plantation cycle has been estimated to be approximately 70% of peak use.[183]

In 2008, the CSIRO published a report into water availability in the Murray-Darling Basin that included estimates for the potential impact of new

182 Jenkin, B.M., September 2006. *The use of chemical pesticides by the Australian plantation forest industry*, Forest and Wood Products Research and Development Corporation, Project Number PN06.4016, Victoria, 183pp.

183 Interpretation of these figures must take into account limitations of current data and analysis. Minimal rainfall data is available, and its usefulness for modeling is limited due to large spatial and temporal variation. Hydrological data is similarly limited. Further confounding factors include the limitations inherent in current computer modeling and changing plantation management practices. See: Parsons, M., Frakes, I., Gerrand, A., August 2007. *Plantations and water use*, Bureau of Rural Sciences, Canberra, 12pp.

plantations.[184] Forecasts by the Bureau of Rural Sciences indicated that commercial plantation forestry could expand by 52,000 hectares by 2030. In the NSW parts of the Murray-Darling Basin, an estimated 17,000 hectares will be planted in the Murrumbidgee catchment and 33,000 hectares in the Murray catchment.[185] The impact of plantation forestry on water availability in 2030 was calculated according to three future climate scenarios (see Table 43). As Table 43 demonstrates, future plantation forests will have a minimal impact on water availability at the regional level. Plantation water use in relation to total inflows was less than 0.2% in the Murrumbidgee and Murray, and 2.88% in the Eastern Mount Lofty Ranges (South Australia). However, the expansion of plantation forestry is "likely to be concentrated in small areas and in these areas the local impact on runoff could be significant."[186]

Table 43: Estimated impact of plantation forestry on water availability in three Murray-Darling Basin catchments in 2030: three climatic scenarios[187]

	Eastern Mount Lofty Ranges	Murrumbidgee	Murray
Total area of new plantations by 2030 (ha)	2,000	17,000	33,000
Future development, median 2030 climate			
Total water use (GL/yr)	2.8	5.7	19.0
% of total inflows used by plantations	2.88	0.13	0.18
Future development, wet extreme 2030 climate			
Total water use (GL/yr)	3.2	6.6	22.4
% of total inflows used by plantations	2.79	0.12	0.16
Future development, dry extreme 2030 climate			
Total water use (GL/yr)	1.9	5.3	15.0
% of total inflows used by plantations	3.28	0.15	0.21

184 CSIRO, 2008. *Water availability in the Murray-Darling Basin. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project*. CSIRO, Australia, 67pp.

185 The CSIRO report notes that "there is considerable uncertainty in the estimation of growth in commercial forestry plantations … the projections of this project are based on historical trends and current policy controls and there is considerable uncertainty both as to how landholders will respond to the development policies and how governments may set policies in the future", CSIRO, 2008. *Water availability in the Murray-Darling Basin. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project*. CSIRO, Australia, p27.

186 CSIRO, 2008. *Water availability in the Murray-Darling Basin. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project*. CSIRO, Australia, p10.

187 Adapted from: CSIRO, 2008. *Water availability in the Murray-Darling Basin. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project*. CSIRO, Australia, 67pp.

Policy and academic debate regarding the impact of plantation forestry on water availability has raised the issue of licensing plantation forestry water use.[188] Currently, plantations in NSW are not required to possess a water access licence under the *Water Management Act 2000* (NSW) for any water used. The only State to have introduced such a policy is South Australia.[189] The National Association of Forest Industries has called for equitable treatment with other dryland agricultural crops in any future changes to water policy frameworks regarding plantation forestry.[190] Plantation location in the landscape and plantation design can also play an important role in the impact of plantation forestry on water availability.[191]

The research literature on carbon sequestration[192] and biodiversity outcomes[193] from plantation forestry is rapidly expanding. Different types of plantation forestry yield different carbon sequestration and biodiversity outcomes. However, research findings on carbon sequestration rates by plantation type vary depending on the model used. For example, according to the National Carbon Accounting Toolbox prototype, monoculture Hoop Pine plantations (low biodiversity outcomes) sequester higher carbon stocks per hectare than mixed

188 See for example: L'Estrange, G., 9 September 2010. *Australia's place in the changing global forest products market*. Gunns Plantation Ltd CEO Speech to ForestWorks Conference, Melbourne, Victoria.

189 South Australia recently released a State policy framework for plantation water use. The policy framework provides for three management options to be used by agencies and regional Natural Resource Management boards in managing the water resource impacts of plantation forests: (1) a water licence under the *Natural Resources Management Act 2004* (SA) (2) a water-affecting activity permit under the *Natural Resources Management Act 2004* (SA) (3) and Codes of Practice and industry agreements. (Government of South Australia, June 2009. *Managing the water resource impacts of plantation forests: A Statewide policy framework*. South Australia, 38pp.)

190 National Association of Forest Industries, 2009. *Playing a greater role in Australia's future: A strategy for the development of Australia's sustainable forest industries*, 43pp.

191 Parsons, M., Frakes, I., Gerrand, A., August 2007. *Plantations and water use*, Bureau of Rural Sciences, Canberra, 12pp.

192 See for example: Walsh, P.P., Barton, C.V.M., Haywood, A., 2008. Growth and carbon sequestration rates at age ten years of some eucalypt species in the low- to medium-rainfall areas of New South Wales, Australia. *Australian Forestry*, 71(1): 70-77; and Kapambwe, M., Ximenes, F., Vinden, P., Keenan, R., May 2009. *Dynamics of carbon stocks in timber in Australian residential housing*. Forest & Wood Products Australia, Market Access & Development Project Number PN07.1058, Melbourne, 108pp.

193 See for example: Race, D., Freudenberger, D., March 2003. *Farm forestry for green and gold: Australian experiences of linking biodiversity to commercial forestry*. ANU School of Resources, Environment & Society, CRC for Sustainable Production Forestry and CSIRO Division of Sustainable Ecosystems, 63pp; and Loyn, R.H., McNabb, E.G., Macak, P., Noble, P., November 2008. *Eucalypt plantation habitats for fauna in rural landscapes: enhancing their value with appropriate designs*, RIRDC Publication No 08/193, 33pp.

species environmental plantings (high biodiversity outcomes). The study which produced these findings used a different methodology to find that carbon stocks by plantation type were, from lowest to highest: monoculture Hoop Pine plantations (low biodiversity outcomes); mixed species cabinet timber plantations (medium biodiversity outcomes); and environmental restoration plantings (high biodiversity outcomes).[194]

An important factor driving research into carbon sequestration in plantation forestry is the emergence and growth of carbon trading markets. Carbon credits in plantation forestry are not restricted to carbon captured within a plantation, but may also be traded in the future according to the carbon captured in plantation forestry products, such as sawn timber, plywood, particleboard and paper.[195] As identified in Table 34, net incomes derived from carbon trading for catchment management authorities and landholders are financially attractive. However, developing markets for carbon credits from plantation forestry still face several significant hurdles, including: ensuring verifiable and rigorous methodologies are available for carbon accounting;[196] and the development of an appropriate and stable policy framework.[197]

194 Kanowski, J., Catterall, C.P., August 2010. Carbon stocks in above-ground biomass of monoculture plantations, mixed species plantations and environmental restoration plantings in north-east Australia, *Ecological Management & Restoration*, 11(2):119-126.

195 Richards, G.P., Borough, C., Evans, D., Reddin, A., Ximenes, F., Gardner, D., 2007. Developing a carbon stocks and flows model for Australian wood products, *Australian Forestry*, 70(2): 108-119.

196 ENSIS, June 2006. *Commercial environmental forestry: integrated trees into landscapes for multiple benefits*, Summary Technical Report, ENSIS: The joint forces of CSIRO & SCION, 22pp.

197 Grieve, A., Wood, S., Cowie, A., August 2008. *Carbon trading and Catchment Management Authorities: Realising the revenue potential of environmental plantings under the New South Wales carbon market*, RIRDC Publication No 08/136, Canberra, 23pp.

8.0 EDUCATION AND TRAINING FOR THE FORESTRY SECTOR

In 2010, a review of forestry education and training needs was commissioned by Forest & Wood Products Australia.[198] This review assessed gaps and needs in the forest and wood products industry across the education and training sector. The review was commissioned because, due to the shortage of skilled workers in Australia, the industry is currently employing workers from countries such as South Africa and New Zealand. This section addresses the three categories of forestry education identified by the review: community awareness and engagement; knowledge based education (primary, secondary and tertiary); and vocational education and training (VET).

8.1 Education in the forestry sector: an overview

In NSW, there is a current skills shortage in the forest and wood product industries. Skills and efficiency are key factors in maintaining the competitiveness of these industries. However, recent trends in Australian forestry education have been marked by a decline. Forestry undergraduate pass degree completions in Australia have declined by more than 50% between 1994 and 2007. The number of students graduating in Australia is about 30 annually and diminishing, a trend also visible in countries such as Canada, the United States, the United Kingdom and New Zealand.[199] Graduate numbers are estimated to meet only half the level of demand. The regional nature of the industry has compounded the problem, making education and training expensive and difficult to consolidate in one location.[200] A further complication is the diversity of companies and products within the industry that the education sector needs to resource. This diversity can be categorised within three sectors:

- Tree growing and development of sustainable resources;
- Harvesting and processing; and
- Market development.[201]

The recent review of forestry education and training needs comprehensively summarised what is currently on offer nationally and within each State and

198 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

199 This trend is mirrored in the agricultural sector, see: Searle, S., Bryant, C., 2009. Why students choose to study for a forestry degree and implications for the forestry profession, *Australian Forestry*, 72(2):71-79.

200 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

201 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

Territory. Table 44 identifies the education and training programs available in NSW (some of which are identified as being available Australia-wide). These will be discussed further in the following sections.

Table 44: Current NSW community engagement, knowledge based and competency-based education and training programs[202]

Type of education	Education and training programs	Funding status
Community	ForestWorks (Nationwide)	Currently funded
	Wood – Naturally Better (Nationwide – Forest & Wood Products Australia)	Currently funded
	Treedudes (Nationwide – Plantations 2020)	Funding concluding in 2010
	Australian Forests (Nationwide – National Association of Forest Industries and National Forestry Education & Awareness Network)	No current funding
	Master Tree Growers (Nationwide)	No current funding
	Private Forestry Development Committees (Nationwide)	No current funding
	Timbertrek (Nationwide – National Association of Forest Industries)	No current funding
	LandLearn NSW (Forests NSW is one component)	Currently funded
Primary School	LandLearn NSW (Forests NSW is one component)	Currently funded
Secondary School	LandLearn NSW (Forests NSW is one component)	Currently funded
VET – tree growing	Certificate II, III, IV and Diploma of Forest Growing and Management	Currently funded
VET – harvesting	Certificate II and III in Harvesting & Haulage	Currently funded
VET – processing	Certificate II and III in Sawmilling & Processing	Currently funded
	Certificate III in Woodmachining	Currently funded
	Certificate III in Sawdoctoring	Currently funded
	Certificate II and III in Wood Panels Products	Currently funded
	Certificate II and III in Timber Manufactured Products	Currently funded
	Certificate IV in Timber Processing	Currently funded
VET – marketing	Certificate II and III in Timber Merchandising	Currently funded
	Technical Resources Program (Forest & Wood Products Australia)	Currently funded
University – tree growing	Bachelor of Forest Science & Management (Southern Cross)	Currently funded
	Masters of Forestry	Funding concluding in 2010
University – harvesting	Bachelor of Forest Science & Management (Southern Cross)	Currently funded
University – processing	NSW Timber Development Association – assistance to tertiary institutions	Funding concluding in 2010
University – marketing	None	Funding concluding in 2010

202 Adapted from: de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd, p20.

8.2 Community education

According to the study on forestry education and training, most industry participants believed that the forest "industry has lost its social licence to operate over the last 30 years." Correspondingly, most respondents also felt that a poor image of the industry existed in the community.[203] Half of the community education programs identified by the study were either about to run out of funding in 2010, or had already run out (see Table 44). After reviewing community education programs conducted by other primary industries such as mining, the study recommended the development of an Australian Forest Industry website to "provide a focal point for existing and new information to improve community awareness, promote career profiles for industry recruits and illustrate education and training opportunities."[204]

8.3 Primary and secondary education

The Forests NSW schools program is one component of the overarching Industry & Investment NSW schools program LandLearn NSW (see Table 44). The program is aligned with the NSW syllabus requirements and reflects Forests NSW corporate priorities. Program content includes: an overview of forest management and forest ecology; relevance to syllabus documents; and self-guided and guided activities for kindergarten to year 12 students. Greater engagement with teachers in order to improve their awareness of the forest and wood products industry was recommended in order to raise student awareness of forestry as a trade option.[205]

8.4 University education

Two problems with forestry in the university education sector have been identified. First, the number of forestry graduates has been in decline since 1994. As a consequence, the quality of new recruits may decrease. Second, there are no university level courses in timber processing and/or construction or forest products marketing. In 2004, six Australian universities offered undergraduate forestry degrees (see Table 45). In 2010, only three universities offer an undergraduate degree (including Southern Cross University in Lismore and the Australian National University in Canberra); one university is hoping to recommence its undergraduate degree (Edith Cowan University); and one

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203 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd, p26.

204 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd, p32.

205 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

university now only offers a Masters degree in forestry (University of Melbourne). The review of forestry education and training recommended developing closer connections between universities and the industry in order to focus on what is needed and how it can be cost-efficiently provided.[206]

Table 45: Australian universities offering forestry degrees in 2010[207]

University	Course offerings
Southern Cross University (Lismore, NSW)	3 year Bachelor of Forest Science & Management and 1 year Masters of Forestry
University of Queensland (Brisbane)	Unlikely to continue offering forestry degrees in 2011
Australian National University (Canberra, ACT)	3 year Bachelor of Science (Forestry) and 1 year Masters of Forestry
University of Melbourne (Melbourne)	2 year Master of Forest Ecosystem Science
University of Tasmania (Hobart)	Bachelor of Forest Science & Ecology, Master of Forestry, proposed Graduate Certificate in Timber (Processing & Building) for 2011
Edith Cowan University (Perth, WA)	Hoping to offer a Bachelor of Environmental Studies (Sustainable Forestry) in 2011

8.5 Vocational Education and Training

ForestWorks, the national forestry Industry Skills Council, identifies seven forest industry sectors for which the Vocational Education and Training (VET) sector provides training:

(1) Forest growing and management;
(2) Harvesting and haulage;
(3) Sawmilling and processing;
(4) Timber products manufacturing – including roof truss, wall frames, door and window manufacture;
(5) Timber merchandising;
(6) Wood panel and board production; and
(7) Pulp and paper manufacturing.[208]

ForestWorks conducted a comprehensive analysis of each sector in February 2010, identifying: the critical skills and occupations required in each sector; current skill and occupation gaps; opportunities to address skill issues; and challenges faced in overcoming skills issues. Box 8 provides some examples of

206 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

207 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

208 ForestWorks, February 2010. *Industry Skills Scan*.

the current skill shortages in each sector.[209] According to ForestWorks, industry emphasis on avoiding skills shortages in 2010 was focused on six areas Australia-wide: plantation harvesting; haulage; implementation and management of third party certification schemes and systems; sustainable forest management operations; biomass energy generation; and manufacturing estimators and detailers.

Box 8: Examples of current skill shortages in forest industry sectors

FOREST GROWING AND MANAGEMENT:
- Experienced plantation establishment managers
- Workers trained in tree planting and cultivation

HARVESTING AND HAULAGE
- Mechanical harvesting
- Small business management for contractors

SAWMILLING AND PROCESSING
- New timber drying techniques
- Timber treatment operators

TIMBER PRODUCTS MANUFACTURING
- Estimating and detailing at a technical level
- IT skills in frame, truss and floor systems design

TIMBER MERCHANDISING
- Mobile equipment operators
- Logistics and transport officers

WOOD PANEL AND BOARD PRODUCTION
- Timber properties knowledge
- Sector-specific new technology skills

PULP AND PAPER MANUFACTURING
- Knowledge of pulp and paper technology
- Line management & team leader skills

The VET sector is funded by the Commonwealth and State Governments. It is delivered via State Training Authorities via a network of Registered Training Organisations (RTOs), of which TAFE is a large part.[210] A broad range of VET courses are offered in NSW (see Table 44). In 2009, a total of 487 people were enrolled in VET forestry courses in NSW, down from a recent peak of 761 in 2007 (see Table 46). In contrast, apprentice numbers have risen in 2010 to 452 from a recent low of 217 in 2009. The majority of VET students are enrolled in forestry management, harvesting and processing courses rather than timber, pulp or paper product courses (see Table 46). However, the fastest growing course types in terms of enrolment between 2007 and 2008 were "timber merchandising" and "pulp and paper manufacturing." According to 2009-10 figures from the National Centre for Vocational Education Research, 94.8% of VET graduates were either employed or in further study after completing their training. The average salary of the 84.1% in full-time employment was $49,600 per annum.[211]

209 Box 8 source: ForestWorks, February 2010. *Industry Skills Scan*.

210 de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

211 National Centre for Vocational Education Research, 2010. *Resources*, accessed 8/12/2010. Note that the website indicated that the particular webpage from which this information was acquired was a beta version and therefore still undergoing testing.

Table 46: Forestry VET students and apprentices in NSW and Australia by industry sector: 2005 to 2010[212]

	2005	2006	2007	2008	2009	2010
VET students: total enrolments						
NSW	746	596	761	721	487	n/a
Australia	5,830	4,884	4,077	5,056	5,076	n/a
Apprentices and trainees in training as at 30 June						
NSW	n/a	364	270	230	217	452
Australia	n/a	1,563	1,177	1,128	896	980
Total enrolments by industry sector						
Forest Growing and Management	n/a	n/a	1,923	2,256	n/a	n/a
Harvesting and Haulage	n/a	n/a	1,084	1,428	n/a	n/a
Sawmilling and Processing	n/a	n/a	1,006	1,003	n/a	n/a
Timber Products Manufacturing	n/a	n/a	286	332	n/a	n/a
Timber Merchandising	n/a	n/a	89	168	n/a	n/a
Wood Panel Products	n/a	n/a	181	265	n/a	n/a
Pulp and Paper Manufacturing	n/a	n/a	312	461	n/a	n/a

ForestWorks has developed two national Training Packages under contract to the Commonwealth Government:

- FPI05 – Forest and Forest Products Training Package
- FPP01 – Pulp and Paper Manufacturing Industry Training Package.

These packages include a range of industry specific units along with units imported from other industries. Together, they cover all seven forestry industry sectors.[213]

In NSW, private native forestry (PNF) specific training is provided by several bodies. The TAFE NSW Forest Industry Training Centre and NSW Department of Environment, Climate Change and Water together provide two PNF specific courses: the Accredited Course in Sustainable Private Native Forestry; and the Private Native Forestry Operations Planner Course. $4 million has been provided by the NSW Government to subsidise these courses. These courses are promoted through Private Native Forestry Awareness Days for landholders run by Industry & Investment NSW.[214]

212 National Centre for Vocational Education Research, 2010. *Resources*, accessed 8/12/2010. Note that the website indicated that the particular webpage from which this information was acquired was a beta version and therefore still undergoing testing.

213 ForestWorks, February 2010. *Industry Skills Scan*.

214 Department of Environment, Climate Change and Water, 2010. *Private native forestry*, accessed 09/12/2010.

According to industry stakeholders, the provision of forestry VET courses faces several difficulties (see Box 9).[215] These include high equipment costs, low participant numbers and the highly dispersed nature of the industry. ForestWorks proposes two goals to address these difficulties: the cost to benefit ratio for enterprises to engage with the VET sector needs to change; and the cost to benefit ratio for RTOs to deliver training to the industry needs to change. Any changes to improve VET will also need to be responsive to emerging workforce priorities such as: increased demand for environmental certification; the development of environmentally friendly products such as engineered wood products; and growth in demand for biofuels.[216]

Box 9: Difficulties facing the provision of forestry VET courses

- High equipment costs
- Courses funded on enrolment basis, thereby undermining viability of Registered Training Organisations should enrolments drop
- State funding makes delivery of a uniform national curriculum difficult
- More than 70% of training and skills development in the industry is conducted "on the job"
- Skill delivery at risk of market failure due to low demand on RTOs leading to lack of investment by RTOs, leading to lack of delivery capacity and options and a lack of industry demand
- Regional dispersion of forest industry

215 Sources: ForestWorks, February 2010. *Industry Skills Scan*; and de Fégely, R., May 2010. *Review of Australian Forestry and Wood Products Education and Training Needs*, Prepared for Forest & Wood Products Australia by Rob de Fégely, Myoora Investments Pty Ltd.

216 ForestWorks, February 2010. *Industry Skills Scan*.

9.0 CONCLUSION

This paper explored plantation forestry in NSW with particular regard to the following topics: NSW and Commonwealth legislative, policy and administrative frameworks; industry facts and figures; research into plantation species and products; and education and training for the forestry sector. Several factors have been instrumental in shaping plantation forestry. First, market requirements for evidence of sustainable forest management are becoming increasingly important. Second, the political sensitivity of native forest harvesting on public land has resulted in a significant decrease in the area of public land available for harvesting. Third, and concurrently, there has been a shift towards increased private investment in forestry on both private and public land. Fourth, the integration of small-scale plantations into farming, known as 'farm forestry', presents an opportunity to improve the environmental sustainability of farming, to contribute to the wider forest industry and increase farm resilience. Finally, marketable environmental benefits, such as carbon sequestration and biodiversity credits, provide not only a means of increasing the economic viability of the industry, but also present an opportunity for the industry to improve its waning public image.

Commonwealth and NSW legislative, policy and administrative reforms have been, and continue to be, instrumental in shaping plantation forestry. The current regulatory regime is a complicated arrangement intended to regulate the sustainability of the industry and encourage further private investment in plantation forestry. Recent NSW reforms include a 2010 legislative amendment to the *Plantations and Reafforestation Act 1999* that expanded the powers of compliance officers as part of a stricter environmental regulatory regime now in force, and clarified plantation ownership provisions. Commonwealth tax legislation reforms have sought to increase private investment by clarifying the tax deductibility of investing in Managed Investment Scheme plantation forestry, introducing a secondary market for trading in Managed Investment Schemes, and protecting investors from having to pay capital gains tax should a Managed Investment Scheme become insolvent.

The future of plantation forestry in NSW is closely tied to research and development in the industry and the availability of skilled labour. Bodies such as ForestWorks and Forest & Wood Products Australia are working on addressing the skills and labour shortage currently faced by the industry. The education and training sector will have to be responsive to current and future industry developments such as biofuels, bioenergy, carbon sequestration and forest product certification. Other areas of plantation forestry research include trialling new tree species and improving the economic viability of plantation and farm forestry. Together with government regulatory arrangements, R&D and education and training are factors that will be instrumental in maintaining and improving the environmental, social and economic sustainability of NSW plantation forestry.

APPENDIX A

References for Table 29: Issues facing plantation forestry in NSW as identified by industry participants

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Australian Forest Growers, 12 October 2010. *Media release: Plantation investment at the crossroads?*

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Plantations 2020, 19 April 2010. *Media release – Wood, not carbon the driver of plantation expansion*.

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URS Australia, December 2007. *Australia's forest industry in the year 2020*, Prepared for the Department of Agriculture, Fisheries and Forestry, Canberra.

APPENDIX B

Research literature on the use of Douglas fir, Californian redwood and Western red cedar for plantation forestry in Australia:

Australian New Crops Website, June 2008. *Australian New Crops Website, supported by the Rural Industries Research and Development Corporation*, accessed 30/11/2010.

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Forest and Wood Products Australia, 2008. *Australian Market Requirements for Western Red Cedar and Douglas-fir*, Melbourne.

Grant, T.C., 1989. *History of Forestry in New South Wales: 1788 to 1988*. Erskineville, NSW, 320pp.

Hermann, R.K., Lavender, D.P., 1999. Douglas-fir planted forests, *New Forests*, 17(1):53-70.

Lott, R., October 2001. *A bibliography of plantation hardwood and farm forestry silviculture research trials in Australia*, A report for the RIRDC/Land & Water Australia/FWPRDC Joint Venture Agroforestry Program, RIRDC Publication 01/101, Canberra, 314pp.

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Rural Solutions SA, 2005. *Farm forestry species for the Adelaide Hills and Fleurieu Peninsula*, Farm Forestry Note 8/05, Government of South Australia, Adelaide, 13pp.

Shelbourne, C.J.A., Low, C.B., Gea, L.D., Knowles, R.L., 2007. Achievements in forest tree genetic improvement in Australia and New Zealand 5: Genetic improvement of Douglas-fir in New Zealand, *Australian Forestry*, 70(1):28-32.

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APPENDIX C

Table: Plantation forestry in NSW: genetic improvement programs

Species	Climate/location	Commercial use/viability
	Native hardwoods	
Alpine ash (*Eucalyptus delegatensis*)	• High-to-medium rainfall in southern Australia •	• Suitable for joinery, veneer and cabinetry
Blackbutt (*Eucalyptus pilularis*)	• High-to-medium rainfall – sub-tropics & tropics	• Hard and strong • Moderately durable
Brown barrel (*Eucalyptus fastigata*)	• High-to-medium rainfall in southern Australia	• Can be prone to collapse
Cadagi tree (*Corymbia torelliana*)	• High-to-medium rainfall – sub-tropics & tropics	• n/a
Dunn's white gum (*Eucalyptus dunnii*)	• High-to-medium rainfall – sub-tropics & tropics	• Insect attack is a serious problem • High-quality wood chips
Flooded gum (*Eucalyptus grandis*)	• High-to-medium rainfall – sub-tropics & tropics	• Rapid growth • Good form • Light construction
Forest red gum (*Eucalyptus tereticornis*)	• High-to-medium rainfall – sub-tropics & tropics	• Strong, heavy and moderately durable
Grey box (*Eucalyptus moluccana*)	• High-to-medium rainfall – sub-tropics & tropics	• Highly durable timber • Heavy construction
Grey gums (*Eucalyptus punctata*) (*Eucalyptus longirostrata*)	• Medium-to-low rainfall	• Highly durable timber
Gympie messmate (*Eucalyptus cloeziana*)	• High-to-medium rainfall – sub-tropics & tropics	• Very dense, strong and very durable
Lemon-scented gum (*Corymbia citriodora*)	• High-to-medium rainfall – sub-tropics & tropics	• Hard • Good durability • Construction and furniture
Large-leaved spotted gum (*Corymbia henryi*)	• High-to-medium rainfall – sub-tropics & tropics	• n/a
Messmate stringybark (*Eucalyptus obliqua*)	• High-to-medium rainfall in southern Australia	• Growth generally slower than alternatives
Mountain ash (*Eucalyptus regnans*)	• High-to-medium rainfall in southern Australia	• Suitable for joinery, veneer and cabinetry
Red ironbark (*Eucalyptus tricarpa*) (*Eucalyptus sideroxylon*)	• Medium-to-low rainfall	• Strong, dense and durable • Heavy construction and furniture • Growth rate quite low
Red mahogany (*Eucalyptus pellita*)	• Tropics	• n/a
River red gum (*Eucalyptus camaldulensis*)	• Medium-to-low rainfall • High-to-medium rainfall – sub-tropics & tropics	• Strong, heavy and moderately durable • Pure species tends to be poor
Shining gum (*Eucalyptus nitens*)	• High-to-medium rainfall in southern Australia •	• Good pulp yield • More tolerant of cold than E. globulus
Spotted gums (*Corymbia maculata*)	• Medium-to-low rainfall • High-to-medium rainfall – sub-tropics & tropics • Low rainfall trials	• Hard • Good durability • Construction and furniture

Sugar gum (*Eucalyptus cladocalyx*)	• Medium-to-low rainfall • Low rainfall trials	• Construction and furniture • Good durability
Swamp yate (*Eucalyptus occidentalis*)	• Medium-to-low rainfall • Low rainfall trials	• Heavy construction • Form tends to be poor
Sydney blue gum (*Eucalyptus saligna*)	• Medium-to-low rainfall	• n/a
Tasmanian blue gum (*Eucalyptus globulus*)	• High-to-medium rainfall in southern Australia •	• High growth rate • Excellent pulp yield • Sawn timber showing promise
Western white gum (*Eucalyptus argophloia*)	• Medium-to-low rainfall	• Class 1 durability
Native softwoods		
Hoop pine (*Araucaria cunninghamii*)	• High-to-medium rainfall – sub-tropics & tropics	• n/a
Exotic species		
Calabrian pine (*Pinus brutia*)	• Medium-to-low rainfall	• n/a
Maritime pine (*Pinus pinaster*)	• Medium-to-low rainfall	• n/a
Radiata pine (*Pinus radiata*)	• Medium-to-low rainfall • Low rainfall trial	• n/a

Note: information on where the trials took place or commercial use and/or viability was not available for all species.

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APPENDIX D

Table: Plantation forestry in NSW: species trials

Species	Climate/location	Commercial use/viability
	Native hardwoods	
Australian red cedar (*Toona ciliate*)	• Northern NSW	• Successful trial
Blackbutt (*Eucalyptus pilularis*)	• Queensland • Tropical • Northern NSW	• Viable under certain conditions – low-cost land and/or ecosystem service payments (Qld) • Successful NSW trial • Suitable for vineyard posts
Brown barrel (*Eucalyptus fastigata*)	• Northern tablelands	• Successful trial
Dunn's white gum (*Eucalyptus dunnii*)	• Dorrigo plateau • Northern NSW	• Successful Dorrigo trial • Suitable for pulpwood
Flooded gum (*Eucalyptus grandis*)	• Northern NSW	• Susceptible to borers (NSW) • Suitable for vineyard posts
Forest red gum (*Eucalyptus tereticornis*)	• Hunter	• Successful Hunter trial
Gidgee (*Acacia cambagei*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Grey gum (*Eucalyptus punctata*) (*Eucalyptus longirostrata*)	• Hunter • Northern NSW	• Successful NSW trials
Gully gum (*Eucalyptus smithii*)	• n/a	• Suitable for pulpwood
Gympie messmate (*Eucalyptus cloeziana*)	• Queensland • Northern NSW	• Successful trial
Lemon-scented gum (*Corymbia citriodora*)	• Central Queensland • Northern NSW	• Successful trial
Large-leaved spotted gum (*Corymbia henryi*)	• South-east Queensland	• Successful trial
Messmate stringybark (*Eucalyptus obliqua*)	• Northern tablelands	• Successful trial
Mugga (red ironbark) (*Eucalyptus sideroxylon*)	• Hunter • North West slopes & plains • Low-rainfall trials (NSW)	• Successful Hunter trial

Narrow-leaved ironbark (*Eucalyptus crebra*)	• Hunter	• Successful Hunter trial
Red mahogany (*Eucalyptus pellita*)	• Dorrigo plateau • Tropical	• Successful trial
River red gum (*Eucalyptus camaldulensis*)	• Hunter • Birchip (Victoria) • North West slopes & plains • Low-rainfall trials (NSW)	• Successful NSW trials • Successful Victorian trial
Shining gum (*Eucalyptus nitens*)	• Dorrigo plateau • Northern tablelands	• Suitable for pulpwood
Spotted gums (*Corymbia maculata*)	• Queensland • Hunter • North West slopes & plains • Low-rainfall trials (NSW)	• Successful trials • Suitable for pulpwood • Suitable for vineyard posts
Sugar gum (*Eucalyptus cladocalyx*)	• Low rainfall trial	• Suitable for vineyard posts • Potential pulpwood
Swamp yate (*Eucalyptus occidentalis*)	• Birchip, Victoria	• Successful Victorian trial • Suitable for pulpwood
Sydney blue gum (*Eucalyptus saligna*)	• Hunter • Dorrigo plateau • Northern NSW	• Successful Hunter & Dorrigo trials • Susceptible to borers (Northern NSW)
Tasmanian blue gum (*Eucalyptus globulus*)	• North West slopes & plains • Northern tablelands	• Successful trial
Western white gum (*Eucalyptus argophloia*)	• Queensland • North West slopes & plains	• Successful trial
Yellow stringybark (*Eucalyptus muelleriana*)	• South and central Gippsland (Victoria)	• Successful trials
Hardwood hybrids		
Flooded gum x River red gum	• Northern NSW	• Successful trial
Timor mountain gum x Flooded gum	• Northern NSW	• Susceptible to borers
Native softwoods		
Hoop pine (*Araucaria cunninghamii*)	• Coastal regions and nearby ranges • Tropical/sub-tropical	• Cabinet timber & panelling • Sawlogs • Suitable for vineyard posts • Potential for medium-density fibreboard
Exotic species		
Aleppo pine (*Pinus halepensis*)	• Low-rainfall zone (NSW) • Low-rainfall zone (Qld)	• Trial underway
Calabrian pine (*Pinus brutia*)	• Low-rainfall zone (NSW) • Low-rainfall zone (Qld)	• Trial underway
Canary Island pine (*Pinus canariensis*)	• Low-rainfall zone (NSW) • Low-rainfall zone (Qld)	• Trial underway
Caribbean pine (*Pinus caribaea*)	• Tropical/sub-tropical	• n/a
Chihuahua pine (*Pinus leiophylla*)	• Low-rainfall zone (Qld)	• Trial underway
Gregg's pine (*Pinus greggii*)	• Low-rainfall zone (NSW)	• Trial underway
Maritime pine (*Pinus pinaster*)	• Low-rainfall zone (NSW) • Low-rainfall zone (Qld)	• Trial underway

Mexican white pine (*Pinus ayacahuite*)	• Low-rainfall zone (Qld)	• Trial underway
Radiata pine (*Pinus radiata*)	• Low-rainfall zone (NSW)	• Trial underway
Radiata x Knobcone hybrid (*P. radiata x P. attenuata*)	• Low-rainfall zone (NSW)	• Trial underway
Slash pine (*Pinus elliottii*)	• n/a	• Suitable for vineyard posts

Note: information on where the trials took place or commercial use and/or viability was not available for all species.

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APPENDIX E

Table: Farm forestry in NSW: species trials

Species	Climate/location	Commercial use/viability
	Native hardwoods	
Beefwood (*Grevillea striata*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Belah hybrid (*Casuarina cristata X cunninghamiana*)	• Tableland areas	• Cabinet timber & panelling
Bimble box (*Eucalyptus populnea*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Black she oak (*Allocasuraina littoralis*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling
Black wattle (*Acacia decurrens*) (*Acacia mearnsii*)	• Coastal regions and nearby ranges • Tableland areas	• Cabinet timber & panelling • Potential pulpwood
Blackwood (*Acacia melanoxylon*)	• Coastal regions and nearby ranges • Tableland areas • Dorrigo plateau	• Cabinet timber & panelling • Sawlogs
Blakely's red gum (*Eucalyptus blakelyi*)	• North West slopes & plains • Low-rainfall trial	• Potential for medium-density fibreboard
Blaxlands stringybark (*Eucalyptus blaxlandii*)	• Tableland areas	• Sawlogs
Blue-leaved mallee (*Eucalyptus polybractea*)	• Low-rainfall trial	• Potential pulpwood
Blue-leaved stringybark (*Eucalyptus agglomerata*)	• Hunter	• Successful Hunter trial

Bracelet honey myrtle (*Melaleuca armillaris*)	• Low-rainfall trial	• Potential for medium-density fibreboard
Broad leaved hickory wattle (*Acacia falciformis*)	• Coastal regions and nearby ranges • Tableland areas	• Cabinet timber & panelling
Brown salwood (*Acacia aulacocarpa*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling
Brown stringybark (*Eucalyptus baxteri*)	• Low-rainfall trial	• Potential for medium-density fibreboard
Butterfly bush (*Petalostylis labicheoides*)	• Low-rainfall trial	• Potential for medium-density fibreboard
Camden white gum (*Eucalyptus benthamii*)	• Temperate	• n/a
Candlebark (*Eucalyptus rubida*)	• Low-rainfall trial	• Potential for medium-density fibreboard
Creswick apple box (*Eucalyptus aromaphloia*)	• Low-rainfall trial	• Potential pulpwood
Desert oak (*Acacia coriacea*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Eumong (*Acacia stenophylla*)	• Victoria	• Suitable for furniture, flooring and fencing
Forest she oak (*Allocasuarina torlulosa*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling
Golden spray (*Viminaria juncea*)	• n/a	• Potential pulpwood
Inland grey box (*Eucalyptus microcarpa*)	• Hunter trial • North West slopes & plains	• Successful Hunter trial
Ironwood (*Acacia excels*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Lancewood (*Acacia shirleyi*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Lightwood (*Acacia implexa*)	• Victoria	• Suitable for furniture and flooring
Long-leaved box (*Eucalyptus goniocalyx*)	• Low-rainfall trial	• Potential pulpwood
Moreton bay chestnut (*Castanospermum australe*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling • Veneer
Mountain gum (*Eucalyptus dalrympleana*)	• Tableland areas	• Cabinet timber & panelling • Sawlogs
Mulga (*Acacia aneura*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Northern black wattle (*Acacia auriculiformis*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling
Northern silver wattle (*Acacia leucoclada*)	• Low-rainfall trial	• Potential pulpwood • Potential for medium-density fibreboard
Pilliga Grey Box (*Eucalyptus pilligaensis*)	• North West slopes & plains	• n/a
Prickly acacia (*Acacia nilotica*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Queensland yellowjacket (*Corymbia similis*)	• Medium-to-low rainfall in Queensland	• Niche timber markets

Red ash (*Aliphitonia excelsa*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling
Red lancewood (*Archidendropsis basaltica*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Red morrell (*Eucalyptus oleosa*)	• Low-rainfall trial	• Potential pulpwood
Red stringybark (*Eucalyptus marcrorhyncha*)	• Tableland areas	• Sawlogs • Fencing material
Ribbon gum (*Eucalyptus viminalis*)	• Tableland areas • Northern tablelands	• Sawlogs
Ridge-fruited mallee (*Eucalyptus incrassata*)	• Low-rainfall trial	• Potential pulpwood
River oak (*Casuarina cunninghamiana*)	• Coastal regions and nearby ranges • Tableland areas • North West slopes & plains	• Cabinet timber & panelling • Veneer • Construction
River peppermint (*Eucalyptus elata*)	• Tableland areas	• Sawlogs
Rough-barked manna gum (*Eucalyptus viminalis subsp. cygnetensis*)	• Low-rainfall trial	• Potential pulpwood • Potential for medium-density fibreboard
Sandalbox (*Eremophila mitchellii*)	• Medium-to-low rainfall in Queensland	• Niche timber markets
Silky oak (*Grevillea robusta*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling • Veneer
Silver-leafed ironbark (*Eucalyptus melanophloia*)	• North West slopes & plains	• n/a
Silver wattle (*Acacia dealbata*)	• Tableland areas	• Cabinet timber & panelling
Silvertop stringybark (*Eucalyptus leavopinea*)	• Coastal regions and nearby ranges • Dorrigo plateau	• Sawlogs
South Australian mallee box (*Eucalyptus porosa*)	• Low-rainfall trial	• Potential pulpwood
Southern blue gum (*Eucalyptus globulus subsp. bicostata*)	• Low-rainfall trial	• Potential pulpwood
Southern mahogany (*Eucalyptus botryoides*)	• Coastal regions and nearby ranges	• Sawlogs
Sugarwood (*Myoporum platycarpum*)	• Low-rainfall trial	• Potential pulpwood
Swamp gum (*Eucalyptus ovata*)	• Low-rainfall trial	• Potential pulpwood • Potential for medium-density fibreboard
Swamp oak (*Casuarina glauca*)	• Coastal regions and nearby ranges • Tableland areas	• Cabinet timber & panelling
Swamp wattle (*Acacia retinodes*)	• Low-rainfall trial	• Potential pulpwood • Potential for medium-density fibreboard

Tallowwood (*Eucalyptus microcorys*)	• Hunter • Dorrigo plateau	• Successful Hunter trial
Water gum (*Eucalyptus petiolaris*)	• Low-rainfall trial	• Potential pulpwood
White ash (*Eucalyptus fraxinoides*)	• Temperate	• n/a
White box (*Eucalyptus albens*)	• Tableland areas • North West slopes & plains	• Sawlogs • Fencing material
White gum (*Eucalyptus nobilis*)	• Dorrigo plateau • Northern tablelands	• Successful trials
White-topped box (*Eucalyptus quadrangulata*)	• Northern tablelands	• Successful trial
Willow wattle (*Acacia salicina*)	• Low-rainfall trial • Victoria	• Potential pulpwood • Suitable for furniture, flooring and fencing
Yellow box (*Eucalyptus melliodora*)	• North West slopes & plains	• Successful trial
Yellow gum (*Eucalyptus leucoxylon*)	• Birchip, Victoria	• Successful Victorian trial
Exotic trees		
Black walnut (*Juglans nigra*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling
Carolina poplar (*Populus deltoides*)	• Coastal regions and nearby ranges	• Sawlogs • Veneer
Corsican pine (*Pinus nigra*)	• Tableland areas	• Sawlogs
Douglas fir (*Pseudotsuga menziesii*)	• Tableland areas	• Cabinet timber & panelling • Sawlogs
European ash (*Fraxinus excelsior*)	• Tableland areas	• Cabinet timber & panelling
Leyland cypress (*Cupressus leylandii*)	• Victoria	• Cabinet timber & panelling
Mexican cypress (Cupressus lusitanica)	• Victoria	• Cabinet timber & panelling
Monterey cypress (*Cupressus macrocarpa*)	• Tableland areas • Victoria	• Cabinet timber & panelling • Sawlogs
Paulownia (*Paulownia spp*.)	• Coastal regions and nearby ranges	• Cabinet timber & panelling • Sawlogs • Veneer
Ponderosa pine (*Pinus ponderosa*)	• Tableland areas	• Sawlogs
Silver birch (*Betula verrucosa*)	• Coastal regions and nearby ranges	• Cabinet timber & panelling

Note: information on where the trials took place or commercial use and/or viability was not available for all species.

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