Sustainable Riverine Timber and Land Protection Scoping Study

FINAL REPORT

Prepared for:

GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY

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EXECUTIVE SUMMARY

Background and objectives

This report scopes the issues relating to the expansion of a sustainable timber industry in the catchments of northern Victoria. The report has been prepared primarily for the floodplain areas in the Goulburn Broken Catchment, situated in northern Victoria and part of the Murray Darling Basin. The purpose of this study is to look at the feasibility and impacts of a significant expansion of mixed species eucalypt plantations on historically cleared land within the floodplain areas of the Goulburn Broken catchment. The study also aims to investigate the contribution of an expanded forestry industry to environmental outcomes, namely salinity, biodiversity and carbon sequestration, while providing strategic direction for government funding initiatives.

The industry

Harvestable public native forest (3%), private native forest (0.6%) and plantations (1.6%) occupy a small proportion of Victoria. In recent years there has been a significant reduction in the area of public forests from which firewood collection is permitted in north east Victoria due to the establishment of National Parks in Box-Ironbark forests, and the designation of Special Protection Zones and Special Management Zones in public forests and on other public land.

As well as the stewardship of the Department of Sustainability and Environment and VicForests, the forest industry in Victoria operates under the *Code of Forest Practices for Timber Production*, covering timber production and fire management on public land. The purpose of the Code is to ensure that commercial timber growing and timber harvesting operations are carried out on both public land and private land such that they:

- promote an internationally competitive forest industry;
- are compatible with the conservation for the wide range of environmental values associated with the forests; and
- promote the ecologically sustainable management of native forests proposed for continuous timber production; and
- enhances public confidence in the management of native forests and plantations for timber production.

Given the higher value logs generally take longer to grow, cash flow between harvests can be a barrier to investment. It is likely that multi-purpose plantations, which produce higher value products as well as firewood, will generally be more attractive to investors.

Critical factors for industry expansion

Factors critical to the expansion of the hardwood plantation industry on private land in the study area are:

1. landholder interest and uptake;
2. demand for hardwood plantation timber; and
3. public policy and resources for implementation.

Current estimates are that up to 30,000 tonnes per annum of timber is extracted from the Barmah State Forest alone, largely for firewood use in Melbourne and regional Victoria. The establishment of additional firewood plantations at a rate of 100

hectares per year for 15 years would provide about 15,000 tonnes of firewood per year from 2020. The likely benefits to attract landholder interest and uptake include diversification of income either through leases or joint ventures that offer annual cash-flows, forestry rights with annuities and tradable ownership. Hardwood plantations offer an alternative use of agricultural land, however, without additional incentives private allocation of land use tends to be to the highest value use as dictated by the market.

The Victorian Government's Plantations Incentives Strategy aims to promote sustainable industry development and to fund activities that benefit society and are unlikely to attract private sector investment due to 'market failure'. Under the strategy, the Victorian Government sees its role to:

- manage barriers to investment;
- generate environmental services from commercial plantations; and
- conduct research, development and extension to drive productivity improvements.

A competitive market for the provision of environmental services would mean that hardwood plantations may be commercially viable in areas where they otherwise could not compete with other land uses. For successful expansion of the industry, Plantations North East together with the Goulburn Broken Catchment Management Authority and the Victorian Department of Primary Industries would need to drive the process of encouraging participation and providing technical support. To encourage private investment in plantations the key economic barriers to overcome are:

1. subsidised public forestry;
2. differential in returns of different enterprises and forestry.
3. security of access – that is the right to harvest what is planted; and
4. shifting goalposts of government policy – issues around long-term investments.

Implications for industry and government

There are potential benefits in expanding plantations into drier parts of the continent to assist in amelioration of land degradation and water quality issues such as salinity, however tree survival and growth rates in these areas are lower than in traditional growing regions and are therefore less attractive to investors. To encourage plantation expansion in these regions, low returns could be offset by payments for environmental benefits associated with plantation development. If the trigger point for attracting investment in the region is a return of $140/hectare on an annual basis and the gross margin of forestry leases is currently approximately $75/hectare, a landholder would need to attract at least $65/hectare for environmental services.

Industry outlook

In the absence of significant unforseen change in consumer habits or government regulation, firewood demand is unlikely to be a limiting factor for the growth of the hardwood plantation industry. There is a general belief that plantations will be required to ensure an adequate supply of firewood in the future. However, without change to the current industry operation, supply for low value uses such as firewood is likely to continue to be dominated by public forests in Victoria and NSW. Further investment in private plantations for low value uses such as firewood is unlikely without incentives.

Key social considerations are the shift in employment from the public to the private sector. An expansion of the industry is likely to increase farm profitability and reduce

the need for farm consolidation. Farm forestry provides an opportunity to integrate forestry into an existing enterprise, diversify farm income, and potentially increase land values. Forestry may provide additional employment opportunities, depending on the existing land use.

Protection of soil, water and vegetation resources can be aided by removing the impacts of logging from native forests and can contribute to achievement of catchment targets. Strategic plantation design and management can provide additional habitat features in the landscape. Provision of an alternative to native forest timber extraction is a significant biodiversity gain. Each hectare of plantations is able to sequester up to 25 tonnes of carbon in its first 20 years. Also, strategically-located plantations can reduce recharge and help to mitigate the impacts of salinity within a catchment. If trees are strategically planted in lower catchment areas, they can provide net hydrological benefits in relation to recharge to groundwater with minimal impact on downstream water users.

Likely impacts of an expanded plantation industry

Farm level impacts:

- Farm forestry provides an opportunity to integrate forestry into an existing enterprise, diversify the farm income, and potentially increase land values.

Regional impacts:

- Forestry may provide additional employment opportunities, depending on the existing land use.

Plantations and biodiversity:

- Strategic plantation design and management can provide additional habitat features in the landscape.
- Provision of an alternative to native forest timber extraction is a significant biodiversity gain.

Plantations and carbon sequestration:

- Each hectare of plantations is able to sequester up to 25 tonnes of carbon in its first 20 years.

Plantations, salinity mitigation and groundwater management:

- Strategically-located plantations can reduce recharge and help to mitigate the impacts of salinity within a catchment.

Plantations and water use:

- If trees are strategically planted in lower catchment areas, they can provide net hydrological benefits in relation to recharge to groundwater with minimal impact on downstream water users.

Removal of logging from native forests on public land:

- Protection of soil, water and vegetation resources can be aided by removing the impacts of logging from native forests.
- Public native forests can be managed for their environmental values rather than as a timber resource.
- Contribution to achievement of catchment targets.

A way forward

Recommendations for a way forward discuss the need for a pricing policy for timber extraction in public native forest to reflect the real cost of production, including management, land value, infrastructure and maintenance. Also recommended is the creation of a market-based mechanism for environmental services, and establishes publicly-funded programs to support plantation development such as skills development, subsidies for set-up costs, and ongoing management advice and expertise.

The likely outcomes of the implementation are:

- creation of a competitive market – public versus private forestry;
- removal of more of the barriers to investment and encourage uptake; and
- new entrants to the private forestry industry.

Subject to additional modelling and data analysis, if this way forward was adopted, it would have the potential to enhance the region's economic growth and the environmental values without interrupting the supply of timber to the market or causing significant employment losses.

Future research requirements

To further inform any plantation expansion strategy, an in-depth study to investigate the following points is essential:

- available areas together that may be reverting to dryland farming;
- land on the floodplains where natural occasional floods may occur; and
- available land adjacent to areas that have been identified as needing to reduce water tables.

Additionally, in order to educate the community regarding sustainability and pricing issues, an education and awareness campaign with the following goals would be beneficial to:

- educate people on how to make informed decisions about sourcing and using firewood;
- foster community preference for eco-friendly wood;
- increase awareness of the impacts on biodiversity by private collectors; and
- provide information on good environmental practices for using firewood.

1 INTRODUCTION

1.1 Background

This report scopes the issues relating to the expansion of a sustainable timber industry in the catchments of northern Victoria. The report has been prepared primarily for the floodplain areas in the Goulburn Broken Catchment, situated in northern Victoria and part of the Murray Darling Basin.

The Goulburn Broken Catchment Management Authority (CMA) Region comprises the catchments of the Goulburn and Broken rivers and part of the Murray River valley, covering 2,431,655 ha or 10.5% of Victoria (Figure 1).

Figure 1 The Goulburn Broken CMA Region

Source: www.gbcma.vic.gov.au

The study incorporates the results of an extensive literature review as well the results of a detailed analysis of the hardwood timber plantation and farm forestry industry in Victoria, and the issues surrounding its expansion.

1.2 Project objectives

The purpose of this study is to look at the feasibility and impacts of a significant expansion of mixed species eucalypt plantations on historically cleared land within the floodplain areas of the Goulburn Broken catchment. The study also aims to investigate the contribution of an expanded forestry industry to environmental outcomes, namely salinity, biodiversity and carbon sequestration, while providing strategic direction for government funding initiatives.

This report is set out in the following sections:

- industry overview;
- critical factors for expansion;
- implications for industry and government;
- industry outlook;
- likely impacts of industry expansion;
- a way forward; and
- further research requirements.

2 INDUSTRY OVERVIEW

2.1 Public lands

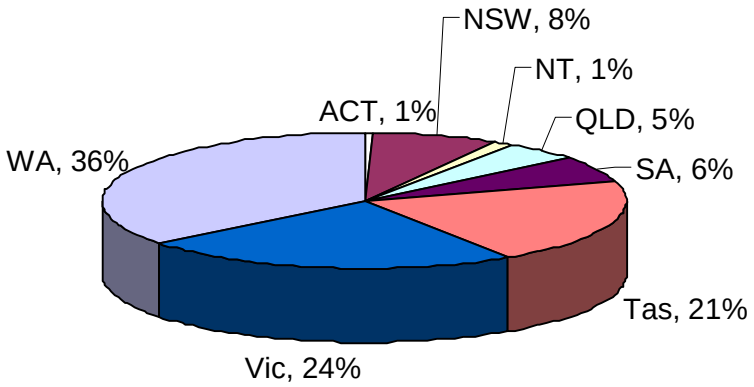
Timber has been harvested from red gum forests on public land in flood-prone areas since the mid-1800s. The industry has evolved from early reliance upon demand for mining timber, structural timber and fuel wood, to one primarily focussed on the supply of green sawn sleepers, house stumps, fencing, landscape and fuel timbers to the Victorian market (BIS Shrapnel Forestry Group 2001).

Harvestable public native forest, private native forest and plantations occupy a small proportion of Victoria, 3%, 0.6% and 1.6% respectively (Cameron Consulting 2005). In recent years there has been a significant reduction in the area of public forests from which firewood collection is permitted in north east Victoria, due to the establishment of National Parks in Box-Ironbark forests, and the designation of Special Protection Zones and Special Management Zones in public forests and on other public land. This reduction in native forest sawlog and pulpwood supply of over one million cubic metres per annum requires the establishment of about 55,000 hectares of new plantations in addition to the 25,000 hectares per year of new plantings called for under *Plantations 2020* (Cameron Consulting 2005).

2.2 Plantation forestry

Establishment of privately-owned commercial hardwood plantations in the Murray Valley region began in the 1990s with industry and government sponsored schemes to encourage landholder involvement (BRS 2005). The proportion of hardwood plantations compared with softwood plantations continues to increase and was now nearly 42% of all plantations in Australia in 2004, compared with 41% in 2003 and 15% in 1994 (see Figure 2), the first year reported by the National Plantation Inventory (BRS 2005).

Figure 2 Hardwood plantations December 2004



Source: BRS 2005.

Firewood is one of the least demanding wood products to produce in terms of form and quality specifications (NRE 2002). It is unlikely that a purpose-grown firewood plantation would yield a significant amount of higher-value wood products. Their values as a standing store of carbon, addressing land degradation, a fossil fuel replacement, or depending on species, as pulpwood are their most likely future alternative markets (NRE 2002).

It is likely that multi-purpose plantations, which produce higher value products as well as firewood, will generally be more attractive to investors (NRE 2002). Given the higher value logs generally take longer to grow, cash flow between harvests can be a barrier to investment (NRE 2002). For example, thinnings from a sawlog plantation could be sold as firewood to enhance the viability of the plantation, and potential benefits in the form of carbon and salinity credits could also enhance the attractiveness of investments.

Some rural communities have a negative outlook on plantations due to their concerns about population decline, feeling powerless, and change to agricultural production and the visual character of the landscape (Barlow and Cocklin 2003). Despite this, there has been a general increase in hardwood plantations for several reasons:

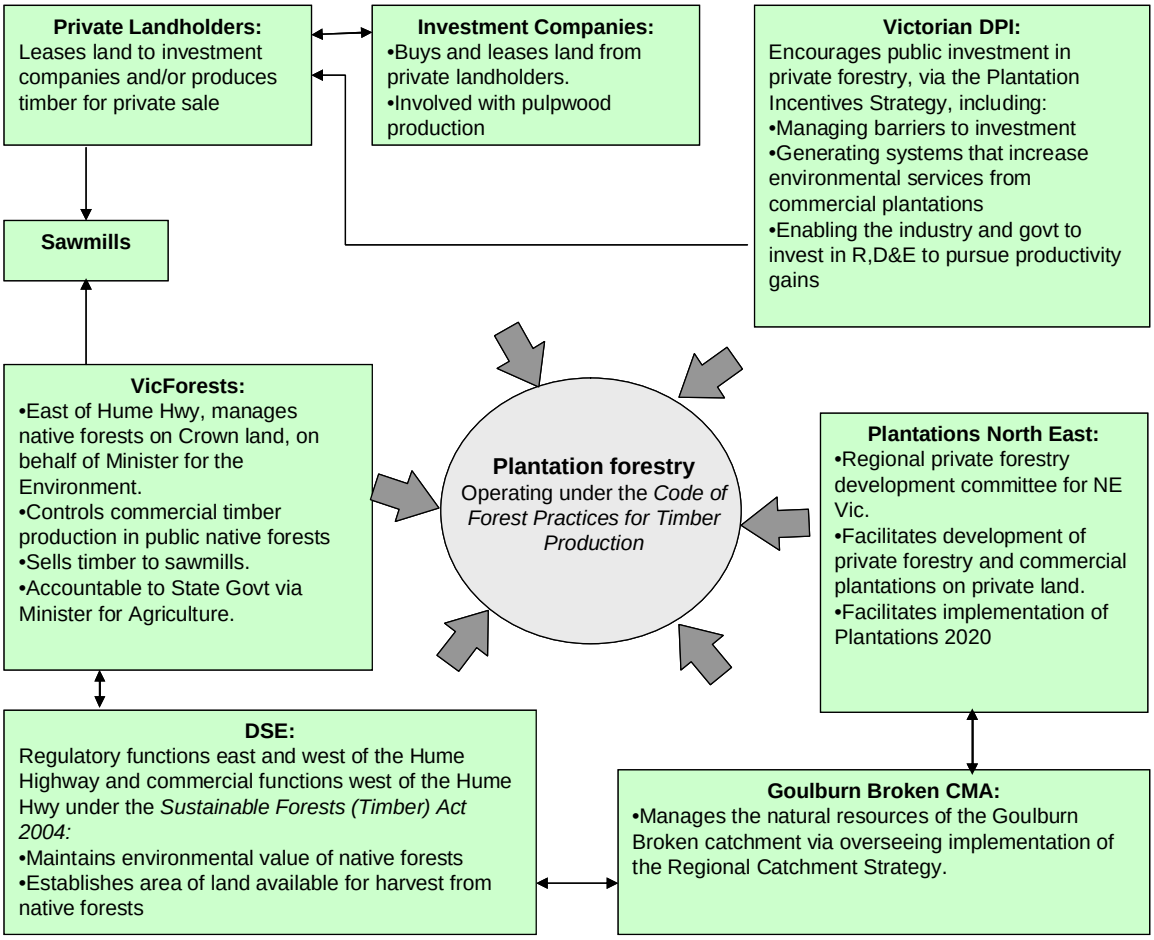
- market projections of increasing global consumptions of timber products;
- social pressures to reduce logging of native forests;
- plantations are widely considered an attractive new enterprise as forest products generally maintained or increased their real price over the long term;
- a general shift from operations that mix trees with agricultural activities towards large-scale plantations on agricultural land; and
- plantations have the potential to deliver significant environmental and economic benefits to rural Australia and can provide a much needed injection of capital into regional areas (Barlow and Cocklin 2003).

2.3 Stakeholders

Stakeholders and their various roles in the plantation timber industry in the study area are set out in Figure 3. Key stakeholders include:

- Plantations North East;
- VicForests;
- Department of Primary Industries;
- Department of Sustainability and the Environment;
- Goulburn Broken CMA;
- forestry investment companies;
- mills; and
- private landholders.

Figure 3 Stakeholders in the plantations timber industry



In Victoria, forest management activities east of the Hume Highway are carried out by VicForests for native forests on Crown Land, on behalf of the Minister for the Environment. VicForests is also responsible for selling the timber resource that is available for harvest to sawmills and is accountable to state parliament through the Minister for Agriculture.

Prior to the establishment of VicForests in 2004, the Department of Sustainability and Environment (DSE) had both regulatory and commercial functions in relation to Victorian forests across the state. DSE retains both regulatory and commercial functions in forests west of the Hume Highway in Victoria. Under new legislation – the *Sustainable Forests (Timber) Act 2004* – DSE maintains its responsibilities for maintaining the environmental values of its native forests and establishes the area of land available for harvest from native forests (The Allen Consulting Group 2006).

As well as the stewardship of DSE and VicForests, the forest industry in Victoria operates under the *Code of Forest Practices for Timber Production*, covering timber production and fire management on public land. The purpose of the Code is to ensure that commercial timber growing and timber harvesting operations are carried out on both public land and private land in such a way that they:

- promote an internationally competitive forest industry;
- are compatible with the conservation for the wide range of environmental values associated with the forest; and

- promote the ecologically sustainable management of native forests proposed for continuous timber production; and
- enhances public confidence in the management of native forests and plantations for timber production (DSE 2006).

3 CRITICAL FACTORS FOR INDUSTRY EXPANSION

Factors critical to the success of expansion of the hardwood plantation industry on private land in the study area have been identified through this process as:

1. landholder interest and uptake;
2. demand for hardwood plantation timber; and
3. public policy and resources for implementation.

3.1 Landholder interest and uptake

There is little information available regarding the level of interest among landholders regarding hardwood plantations as an alternative agricultural enterprise on previously cleared flood prone land in the Goulburn Broken Catchment. It is therefore difficult to gauge the likely success or otherwise of a transition from timber extraction on public land to private land forestry.

There is however, an indication that the public perception of plantations in the North East Region of Victoria is that it is an acceptable, alternative form of agriculture, and that $140/ha/annum lease was generally considered the trigger point for plantation development on private farms (Margules Pöyry Pty Ltd 1998). Where land is leased by a forestry corporation, returns are estimated to be approximately 5% of the land value (DPI 2006). Based on a range in property values between $1,500 and $8,000 per hectare, this equates to a return of $75 to $400 per hectare (DPI 2006).

Current estimates are that up to 30,000 tonnes per annum of timber is extracted from the Barmah State Forest alone, largely for firewood use in Melbourne and regional Victoria. The establishment of additional firewood plantations at a rate of 100 hectares per year for 15 years would provide about 15,000 tonnes of firewood per year from 2020 (North East CMA 2004a). In additional to larger scale hardwood plantations, farm forestry provides a source of timber at a small scale, and enables forestry to be integrated with cropping or livestock production.

The likely benefits to attract landholder interest and uptake include diversification of income either through leases or joint ventures that offer annual cash flows, forestry rights with annuities and tradable ownership. Hardwood plantations offer an alternative use of agricultural land, however, without additional incentives private allocation of land use tends to be to the highest value use as dictated by the market.

In addition to the financial incentives for private plantations, there is also likely to be a proportion of landholders who develop an interest for other non-financial purposes, such as aesthetics or a sense of community contribution. This is likely to include ‘lifestyle farmers’ who may not currently undertake high value enterprises, and could be attracted to plantations as an alternative.

Other potential barriers to investment emerge from the relatively long rotation, and the resulting uncertainty surrounding the security of access to the timber as a saleable commodity, and potential changes to government policy.

In summary, to encourage private investment in plantations the key economic barriers to overcome, are:

1. subsidised public forestry;
2. the differential between returns of different enterprises and forestry.

3. security of access – that is the right to harvest what is planted; and
4. shifting goalposts of government policy – issues around long-term investments.

3.2 Demand for plantation timber

According to a report by Borschmann and Poynter (2003), 75% of farm households and 33% of non-farm households in regional Victoria utilise firewood for heating. The demand for specific timber products changes over time due to substitution and supply issues. Trends relating to these high value uses are closely related to the housing sector and building cycles and substitution with softwood, engineered products and non-wood products such as steel and concrete products (DPI 2005).

Trends relating to firewood use also relate to substitution with alternative heating sources which may come about due to regulatory or price pressures. However, if the environmental concerns about firewood are allayed and sustainable supplies are available at affordable prices, the demand for plantation firewood in particular may increase (North East CMA 2004b). For a successful industry expansion on private land, demand for firewood and other uses of hardwood timber need to be maintained or increased.

3.3 Public policy and resources for implementation

Government investment in activities is often based on market failure, whereby the private sector is unable or unwilling to invest to the extent required by the community, and where public money can be justifiably spent for 'public good'. Following these lines, the Victorian Government's Plantations Incentives Strategy (DPI 2005) aims to promote sustainable industry development and to fund activities that benefit society and are unlikely to attract private sector investment, based on the concept of 'market failure'. Under the Strategy, the Victorian Government sees its role to:

- manage barriers to investment;
- generate environmental services from commercial plantations; and
- conduct research, development and extension to drive productivity improvements.

The Strategy (DPI 2005) seeks to address some of these key failings in the current plantation forestry industry to date, however with its major focus on encouraging investment in larger sawlog plantations, which may not capture issues relating to smaller plantations or farm forestry primarily for firewood collection.

There is a need to reform the pricing and allocation system used for the sale of public hardwoods, to ensure timber products from government and privately owned native forests and plantations can compete equally in the marketplace. Currently, private operators are largely priced out of the market, with pricing schemes for firewood extraction from public forests in no way accounting for the full "cost" of production.

A competitive market for the provision of environmental services would mean that hardwood plantations may be commercially viable in areas where they otherwise could not compete with other land uses. For successful expansion of the industry, Plantations North East together with the Goulburn Broken CMA and the Victorian DPI would need to drive the process of encouraging participation and providing technical support.

4 IMPLICATIONS FOR INDUSTRY AND GOVERNMENT

Community concerns about plantation expansion relate to the conversion of native forests to plantations, large-scale transformation of agricultural land to forestry and associated losses of traditional rural enterprises, use of chemicals, and impacts on social structures and community networks (Keenan and Kanowski 2002). Appropriate engagement and communication are essential to developing and maintaining community support in the region.

Government agencies, industry and extension groups promote different approaches to the establishment of trees for timber production across the landscape broadly in three ways, through:

1. industrial-scale plantations;
2. smaller scale commercial farm forestry integrated with agriculture; and
3. revegetation primarily for environmental benefits (Keenan and Kanowski 2002).

The key to achieving multiple benefits from an expanded timber industry is to integrate these three approaches more closely.

While long rotations established for traditional wood products alone and smaller scale commercial farm forestry struggle to achieve the necessary rates of return to secure investment from established funding sources, additional income derived from the broader benefit presents an opportunity to enhance the viability of these plantations (Keenan and Kanowski 2002, NRE 2002).

There are potential benefits in expanding plantations into drier parts of the continent to assist in mitigation of land degradation and water quality issues such as salinity, however tree survival and growth rates in these areas are lower than in traditional growing regions and are therefore less attractive to investors (Keenan and Kanowski 2002). To encourage plantation expansion in these regions, low returns could be offset by payments for environmental benefits associated with plantation development.

If, as is suggested by Margules Pöyry Pty Ltd (1998), the trigger point for attracting investment in the region is a return of $140/hectare on an annual basis and the gross margin of forestry leases is currently approximately $75/hectare, a landholder would need to attract at least $65/hectare for environmental services. Assuming 40,000 hectares is the maximum area of land available to be developed for the hardwood plantation forestry industry in the Shepparton and Seymour regions, a $2.6 million investment per year would be required to boost returns to the trigger point. However it should be noted that these figures are indicative and not based on current data, therefore they do not necessarily reflect the likely area to be developed, nor do they take into account the influence of changes in return per hectare.

With a favourable policy environment and collaboration across stakeholders, there are opportunities for plantations at all scales to leverage investment for their significant environmental benefits through partnerships with other industry and community interests.

5 INDUSTRY OUTLOOK

The River Red Gum timber industry in southern NSW and parts of northern Victoria produces substantial quantities of firewood, predominantly for the Melbourne market. After firewood, the major products are garden sleepers, garden mulch, fencing materials and railway sleepers (now only produced in NSW). All these products represent low value use of native hardwood timber. As the major end use, firewood is the focus of this study.

5.1 Firewood demand

Demand for firewood is affected by three primary factors:

1. the price of fire wood;
2. conventional/alternative energy prices; and
3. environmental concerns regarding combustion heating such as air quality and the impact of extraction on native forests (North East CMA 2004).

The Victorian Sustainable Energy Authority has provided a means of estimating the total economic contribution that the industry makes to north east Victoria, by comparing the costs for home heating options. The comparison demonstrates that where firewood can be obtained for $90/tonne or less it is the most competitively priced heating option over a five year period (Borschmann and Poynter 2003). This provides a useful benchmark if new pricing structures are introduced.

According to a report by Borschmann and Poynter (2003), 75% of farm households and 33% of non-farm households in regional Victoria utilise firewood for heating. It is also suggested that the pattern of demand for firewood in regional centres such as Ballarat and Bendigo has been altered by the use of alternative sources of heating such as natural gas.

Estimates of firewood consumption in regional Victoria provided by Borschmann and Poynter (2003) and the Victorian Firewood Strategy are provided in Table 1.

Table 1 Selected Victorian firewood consumption estimates by region

Region	*Estimated Total Firewood Consumption (Tonnes/year)*	
	Plantations North East	Victorian Firewood Strategy
Goulburn	57,000	53,000
Ovens-Murray	28,000	21,000
Central Highlands	43,000	25,000
Loddon	50,000	35,000
Total	178,000	133,000

Source: Borschmann and Poynter (2003)

Estimates are based on average consumption per household ranging between 1.6 tonnes per household and 4.6 tonnes per household, depending on the location and type of household (ie farm or non-farm), with non-farm households consuming less firewood on average.

In their report, Borschmann and Poynter (2003) conclude that:

> *"If a sustainable source of supply can be developed, the use of firewood for heating and electricity generation is an environmentally-superior option to non-renewable energy sources such as conventional coal-fired electricity. The expected increases in the price of electricity and gas, particularly if the Kyoto Protocol is ratified, should encourage demand for firewood provided a readily available source of supply can be maintained".*

ABARE predicted a growth in the demand for firewood of less than 1% in the 20 years up to 2019/20, compared with a growth of 2.3% in the demand for energy from electricity, gas and solar power nationally (Dickson *et al.* 2001). A study focussing on Victoria alone has estimated a steady demand for firewood in Victoria in the order of 725,000 to 1.5 millions tonnes per year, with further opportunities interstate and internationally (Economists@Large & Associates 2000).

In the absence of significant unforseen change in consumer habits or Government regulation, firewood demand is unlikely to be a limiting factor for the growth of the hardwood plantation industry.

5.2 Firewood supply

The actual area of plantation required to supply Victoria with firewood depends on how much of the current supply can be replaced by plantation firewood. This is because currently at least half the Victoria's total firewood consumption consists of firewood that is collected by consumers themselves, and may not be willing to pay market prices for plantation-grown firewood (NRE 2002).

A significant proportion of firewood consumed in Victoria is collected rather than purchased, with farm households purchasing around 15% of firewood and non-farm households purchasing around 40% of firewood. Based on these estimates, and using the demand figures provided in Table 1, estimates of the size of the commercial firewood market are provided in Table 2.

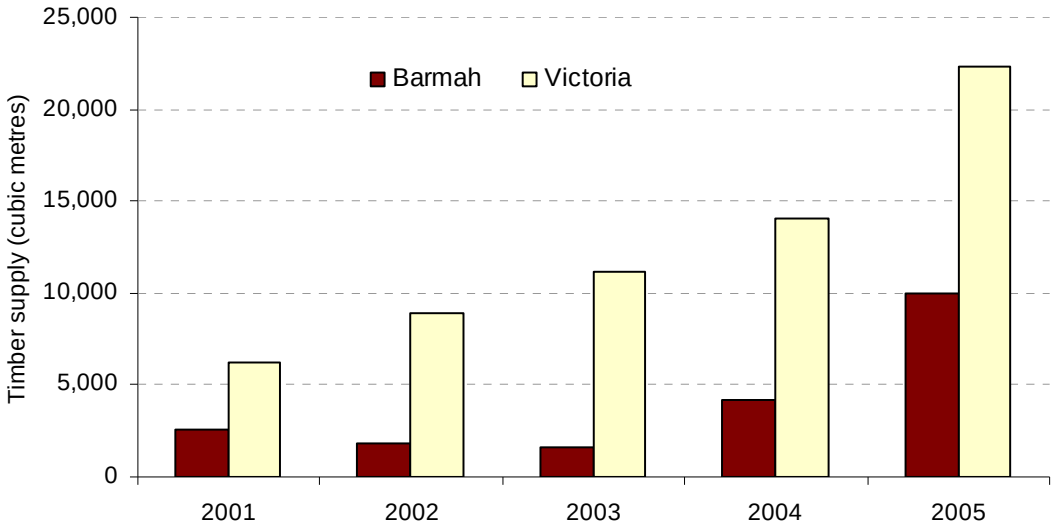
Table 2 Estimated size of selected Victorian commercial firewood market

Region	Market size (T/yr)
Goulburn	19,000
Ovens-Murray	9,500
Central Highlands	14,000
Loddon	17,000

Source: Borschmann and Poynter 2003.

Over the past 5 years, the quantity of hardwood native timber harvested from the Barmah Forest has averaged 4,015 m^3, or approximately 30,000 tonnes per annum. The supply of timber out of the forest varies significantly from year to year however, with 2003 being the lowest year of harvest with 1,500 m^3 and 2005 the highest at 10,000 m^3. Additionally, approximately 110,000 tonnes of red gum is brought into the Victorian market from NSW each year (Borschmann and Poynter 2003). These estimates are provided in Figure 4.

Figure 4 Firewood extraction from Barmah Forest and Victoria



Source: DSE 2006

If approximately 30,000 tonnes of firewood are removed from Barmah annually, then a plantation area of 200 hectares per annum for 15 years yields a figure of 30,000 hectares and an alternative source for the 30,000 tonnes from Barmah. This represents a major landuse change for the region.

There is a general belief that plantations will be required to ensure an adequate supply of firewood in the future (Borschmann and Poynter 2003). Alternative sources of firewood timber may be provided by thinning operations from silviculture in NSW and Victorian forestry operations, and from hardwood (mostly blue gum) plantations which have been increasing in size mainly to provide wood chips for export (Borschmann and Poynter 2003).

A firewood plantation could take 15 to 20 years to reach harvesting age, although options exist in mixed eucalypt plantations to harvest the faster growing species first, and hence yield a more consistent supply. It is unlikely, however, that forestry plantations will be developed specifically for the supply of firewood, given that prices for other hardwood products are higher than those for firewood production. It is more likely to be the case that firewood production will be a co-product from other hardwood forestry products (Borschmann and Poynter 2003).

Without change to the current industry operation, supply for low value uses such as firewood is likely to continue to be dominated by public forests in Victoria and NSW. Further investment in private plantations for low value uses such as firewood is unlikely without incentives.

5.3 Alternative timber sources

In order investigate the feasibility for new commercial timber plantation ventures for firewood, it is necessary to identify alternative sources which may compete. If the private forestry option is to be viable, consumers must be willing to pay for plantation-grown firewood, despite firewood being available at low cost from State forest, and is free when collected from private land. Alternative timber sources are likely to arise from both domestic and international sources.

The Victorian Firewood Strategy Discussion Paper (NRE 2002) states that the documented firewood harvested from State forests in Victoria accounts for approximately 9% of firewood used in Victoria. The remaining amount comes from:

- private land;
- wood waste; and
- illegal harvesting from public land.

Some collection of firewood for personal use is permitted from private property, while commercial collection requires a 'timber utilisation plan' issued by the local government. In order to plan for the future sustainability of the timber industry, it is important to quantify this component of Victoria's firewood industry.

Removing private firewood licensed activities from all crown land such as roadside reserves could reduce government exposure to potential litigation associated with duty of care such as Occupational Health and Safety (OH&S) issues surrounding the use of chainsaws on public land. Restricting firewood utilisation to commercial operators provides a greater opportunity to manage the forest resource for specific NRM (or other) outcomes.

Failure to address these issues could compromise the attractiveness of short to medium market analysis results which may add to the reluctance to invest in these timber ventures.

Additionally, international competitors such as Brazil, Chile and Asia have developed low-cost hardwood production systems that use innovative growing, harvesting and processing developments with Australian native hardwood species (DPI 2005). As Victoria's hardwood plantation timber resource is expected to increase also, increased competition from the global and domestic resource is likely (DPI 2005).

5.4 Competitiveness in the public and private domain

A review of forestry and the National Competition Policy (Marsden Jacob Associates 2001) critiqued compliance of Australian states with the Competition Principles Agreement. Major deficiencies in the arrangements for Australian forest industries were found. In particular, in all states timber from state-owned established native forests were found to compete with timber from plantations on an uneven playing field (Marsden Jacob Associates 2001).

The report outlined the key impacts of the lack of competitive neutrality between State-managed forestry in established forests and private forestry activities as:

- makes private investment in farm forestry and plantations less attractive;
- distorts the allocation of wood sources within the forest sector;
- encourages greater exploitation of public native forests in each State;
- undercuts competing uses of public native forests; and
- worsens the state of the environment and resource base (Marsden Jacob Associates 2001).

The study concluded that, consistent with rational and efficient pricing, the pricing objectives of governments and the State forestry agencies should be limited to:
ensuring revenue to maintain and regenerate Australia's forest stocks;

- providing a full return to the community from use of a public resource;

- allowing more efficient loggers and millers to secure more of the resource by bidding more, that is allowing competition;
- ensuring there are no subsidies favouring exploitation of native forests over the establishment and harvesting of plantations; and
- ensuring equity in pricing in the sense that equally situated businesses are treated equally (Marsden Jacob Associates 2001).

It should thereby follow that prices should recognise the full cost of production as well as the value of forests for other uses such as conservation, water production and tourism (Marsden Jacob Associates 2001).

The *Plantations 2020 Vision* acknowledges the need to entice additional investment in private forestry in order to meet timber plantation targets, and as a result taxation incentive mechanisms for private investors were introduced. However it is generally thought that this tax break has not resulted in a substantial reform of the skewed market towards inexpensive, low grade timber from public land.

In June 2005, a "Tender for the Purchase of River Red Gum Residual Log Grade 2 Timbers" was released by DSE for the Mid Murray Forest Management area, quoting a reserve price of $7.00 per tonne, on top of the licence fee of $0.35 per tonne. This pricing cannot fully recover costs incurred by plantation native timber. Timber harvesting and extraction from public forests receives a competitive advantage through pricing policies that are not market-based and do not incorporate full cost recovery.

5.5 Available land

Around 40,000 hectares of land out of a total area of approximately 167,000 hectares in the study area could potentially be developed for hardwood plantations in the Seymour and Shepparton regions yielding either pulpwood for export (Seymour) or pulpwood, posts and possibly small sawlogs (Shepparton) (Margules Pöyry Pty Ltd 1998). The establishment of additional firewood plantations at a rate of 100 hectares per year for 15 years would provide about 15,000 tonnes of firewood per year from 2020 (North East CMA 2004a). Another way to look at it is that 40,000 hectares of additional plantations requires a 25% land use change in the region. The rate and extent of land use change will be dependent on a range of factors that are also discussed in this report.

5.6 Competing land use

The North East Region experiences relatively high annual rainfall, predominantly between May and September. Shepparton averages 506mm annually, with higher altitude areas such as Mount Beauty recording 1,280mm. Cleared farm land with rainfall of at least 600mm per year (or with supplementary irrigation) is generally thought to be suitable for forestry production.

Dryland agricultural land use in the North East Region has traditionally been dominated by sheep and cattle grazing, and dryland cropping. However these enterprises are under increasing pressure as real returns decline (Margules Pöyry Pty Ltd 1998). As a result, there is a trend towards more capital intensive (often irrigated) production activities such as viticulture, fodder crops, horticulture, dairy and specialised livestock production such as horse studs. This trend towards irrigated production is reflected in relative land values. For example, in 2002 dairy and irrigated cropping and grazing land was valued at $3,500 and $2,500 per hectare

respectively, while dryland cropping and grazing land was valued at $1,000 per hectare (Earth Tech Engineering 2002).

Gross margins for various industries in the North East Region also highlight the relatively low per hectare returns from dryland enterprises such as wool production ($107/ha), while irrigated crops such as lucerne display higher returns. It is therefore likely that if utilisation forestry were to move from public to private land, the private land used would be that which has relatively low value, and that which is currently utilised for enterprises with relatively low gross margin returns.

Table 3 Gross margins by land use

Enterprise	GM ($/ha)
Irrigated Lucerne	357[a]
Winegrapes	5,426[b]
Wool sheep	107[c]
Prime Lambs	314[d]
Beef Cattle	309[d]
Forestry Corp lease- min	75[e]
Trigger level for plantation development in the NE region	140[f]
Forestry Corp lease- max	400[e]

Source: [a] Victorian DPI 2005a, [b] Victorian DPI 2005b, [c] Victorian DPI 2005c, [d] Victorian DPI 2005d, [e] Victorian DPI, [f] Margules Pöyry Pty Ltd 1998.
** Here, irrigated millet is used as an input to on-farm livestock production and therefore has a negative gross margin.*

To stall the trend towards high value, irrigated enterprises such as fodder crops or horticulture, significant investment in the timber industry would be required to ensure hardwood plantation timber was a viable alternative land use.

5.7 Financial considerations

The direct economic impact of the combined native and plantation forest industries on the Victorian economy is estimated to be over $3 billion (Cameron Consulting 2005). The majority of this value is derived from native hardwood and plantation softwood forests, with only 7% derived from plantation hardwood forests. Across the North East and Central Regions of Victoria, there is estimated to be a small amount of plantation hardwood production, at $5 million estimated for 2005 (Cameron Consulting 2005).

A significant cost associated with forestry activity is the initial capital cost, or establishment cost of the plantation. Based on estimated establishment costs provided by the Victorian DPI (2006), an average plantation establishment cost is estimated to be around $900 per hectare. The ongoing annual maintenance costs however are also a significant investment made over the period from planting to harvest.

Where property on a farm is leased by the forestry corporation, returns are estimated at approximately 5% of the land value. Based on a range in property values between $1,500 and $8,000 per hectare, this equates to a return of $75 to $400 per hectare (DPI 2006).

The relatively high establishment costs may be a limiting factor for landholders new to the industry, or already established in other enterprises. However the costs are unlikely to be a constraint on the expansion of existing forestry enterprises, where the

land is leased by a forestry corporation, or for the establishment of small-scale farm forestry.

5.8 Social considerations

A study to determine whether or not it is possible to obtain a reasonable financial return from firewood plantations (Economists@Large & Associates 2000) found that plantations at a farm scale would provide benefits outside of the merely financial, to both the individual farmers involved, and the wider community.

Victorian wood production and processing currently generates direct employment for 19,500 people and directly accounts for net value of production of $3,043 million per annum, including indirect effects (Cameron Consulting 2005). This estimate is based on production of approximately 6.8 million cubic metres per annum, although wood production has since surpassed this figure.

The firewood industry in north east Victoria provides employment through firewood merchants, chainsaw and trailer suppliers; heating sales and service, forest management and plantation establishment and management (North East CMA 2004a).

Conversion of small portions of Victorian farmland to plantations is likely to result in a significant boost in employment and economic development of regional Victoria (Cameron Consulting 2005).

URS Forestry (URS 2003) investigated the possible social outcomes of an expansion of farm forestry as a component of the broader plantation timber industry. The study predicted the following possible outcomes:

i) *A slow down in loss of farms*: the potential to increase farm profitability – reducing the need for farm consolidation;

ii) *A gain of younger generations and reduction in general population movement to urban areas*: the possibility that farm forestry could reduce the rate at which people move out of the area. Faced with increased employment opportunities both in agriculture and other sectors, many people, particularly the young may stay in the region, thereby enhancing the continuing viability of the regional communities;

iii) *Increased business management as a key skill of farmers*: this is a likely positive impact due to the substantial management and planning support that farm forestry attracts;

iv) *A reduction in fragmentation of farm management and ownership due to relationship and marriage breakdowns*: a possible outcome due to the farming enterprise becoming sustainable;

v) *A reduction in the median age of farmers*: a possible outcome due to interest in new land use options; and

vi) *The movement towards lifestyle or amenity farms less focussed on agricultural production, as an alternative to urban lifestyles*: It is likely that adoption of farm forestry on a wider scale will increase the tendency for farms being refocused as lifestyle or amenity farms, partly due to increased landscape amenity provided by farm forestry.

The plantation timber industry requires a range of skilled workers such as machine and transport operators, forestry professionals for extensions and advice, and

contractors for establishment and maintenance activities (DPI 2005). The Victorian Government's Plantations Incentives Strategy (DPI 2005) has recognised the need to attract, train and retain a skilled workforce in regional and rural areas of Victoria to assist with ongoing socio-economic development through the expansion of the hardwood timber industry.

Cameron Consulting (2005) investigated the direct socio-economic impacts for three wood sources – native hardwood, plantation hardwood and plantation softwood (see Table 4). The contribution from hardwood plantations is very small, but will increase as these young plantations reach harvest age. For the purpose of this assessment, Victoria is disaggregated into six regions, with the North East and Central regions being most relevant to the strategy for the study area.

Table 4 Employment and net value of wood sources per region

Region & wood source	Gippsland	North East	Central	South West	North West
Direct employment / 1000 ha					
Native hardwood	3.7	3.4	3.5	0.5	2.7
Plantation hardwood	10.5	7.2	3.1		4.9
Plantation softwood	19.6	19	18.9	18.1	5.4
Net value of output ($ / ha)					
Native hardwood	1038	408	839	120	288
Plantation hardwood	5952		185		362
Plantation softwood	5204	3490	4983	4232	704

Source: Adapted from Cameron Consulting 2005.

The most likely social impact of industry expansion would be changes to the type and location of employment. Some specialist skills may be able to be transferred from the public to the private sector, however there may also be some gaps in expertise that would need to be addressed.

5.9 Infrastructure

Given the number of mills sourcing logs from the North East Region, there is a relatively solid base from which to expand the timber industry. However, this expansion is likely to be driven by softwood plantation forests, unless gains are made in eucalypt processing technologies and the area of hardwood plantations increases significantly (Plantations North East 2006).

The North East Region is well served by an extensive transport network consisting of road, rail and port facilities. The Region is traversed by the Hume Highway which links Melbourne with Sydney. The Hume Freeway is a high speed (110 km/h) dual carriageway. There is no road toll, with contributions for development and maintenance included in vehicle registrations and fuel levies. Heavy vehicles up to 62.5 tonne gross (B-doubles) are currently licensed to operate on the Hume Freeway and most regional roads (Plantations North East 2006). There is also a network of local roads which are maintained by local government. Internal forest roads are maintained by forest owners.

The Region is served by two rail networks which run parallel to the Hume Highway. The standard gauge national rail links all the major cities in Australia. The main centres of Sydney, Melbourne and Geelong are accessible through this connection. The Region is also served by broad gauge rail (5'2") which extends throughout Victoria and across into NSW at Tocumwal and Echuca. The broad gauge link is

currently being used to transport logs from the Region to the Port of Geelong. A branch of the broad gauge line to Baranduda, near Wodonga, gives access to a suitable site where logs can be loaded (Plantations North East 2006).

Located 50 km south-west of Melbourne, Geelong is the closest port facility for the Region and is connected by good road and rail facilities. Logs are currently transported to the Port of Geelong via both road and rail links. Table 5 shows the relative distances to Geelong from the major centres.

Table 5 Distances from the Port to major centres in the Region

Town	Distance to Geelong (km)	
	Road	Rail
Albury/Wodonga	396	371
Wangaratta	325	304
Benalla	284	265
Euroa	240	221
Seymour	187	169
Shepparton	244	246
Tatura	230	242

Source: Plantations North East 2006.

There may also be an increased demand for upgrading of roads to carry timber at harvest – this is an issue for local governments concerned that they may be required to provide funding for this investment (Margules Pöyry Pty Ltd 1998).

Outside the issue of road infrastructure, there are other considerations which need to be made with regard to local government. Specifically, consideration will need to be given to the planning provisions made by Local Government for industrial scale plantation forestry. There is potential for land use conflict between forestry and other industries that would ultimately be dealt with at the Local Government level.

Transport and infrastructure are unlikely to be limiting factors for an expanded hardwood plantation industry.

5.10 Summary of key points

Firewood timber demand

- In the absence of significant unforseen change in consumer habits or regulation, firewood demand is unlikely to be a limiting factor for the growth of the hardwood plantation industry.

Firewood timber supply

- There is a general belief that plantations will be required to ensure an adequate supply of firewood in the future.

Competitiveness in the public and private domain:

- To ensure a more level playing field, prices of timber from public forests should be free of subsidies and recognise the full cost of production as well as the value of forests for other uses.

Likely available land in the study area:

- Approximately 40,000 hectares of land could be developed for hardwood plantations in the Seymour and Shepparton regions.

Competing land use:

- Native timber could be a competitive industry on dryland areas currently being utilised for industries with low gross margins such as grazing.

Economic considerations:

- If firewood can be purchased for $90 or less per tonne it is considered to be the most competitive heating option.
- Establishment costs have been estimated to be around $900 per hectare while returns have been estimated to be around 5% of the land value.

Social considerations:

- Main social considerations are the shift in employment from the public to the private sector.
- An expansion of the industry is likely to increase farm profitability and reduce the need for farm consolidation.

Infrastructure:

- The North-East Region is well serviced by roads, rail and ports. Transport and infrastructure are unlikely to be limiting factors for an expanded hardwood plantation industry.

6 LIKELY IMPACTS OF AN EXPANDED PLANTATION INDUSTRY

There are opportunities to utilise private plantations to modify existing agricultural operations in northern Victoria to bring about benefits relating to farm income and regional development, while simultaneously improving natural resource management and contributing to greenhouse outcomes (CSIRO *et al*. 2001). This section of the report provides a summary of the socio-economic and environmental factors associated with forestry activity, including native and plantation hardwood and softwood production, and the outcomes of these factors.

6.1 Farm level impacts

The impacts of expanded forestry at the farm scale in the North East Region include positive and negative impacts across the economic, social and environmental areas.

Farm forestry enterprises

Farm forestry activities can be incorporated into existing enterprises, and have the potential to deliver on-farm benefits such as:

- provision of shelter to crop and livestock which may result in increased productivity for these enterprises;
- prevention and/or reduction in land degradation through reduction of soil exposure to wind and water run-off;
- increased level of farm income and reduction in income variability (farm incomes may increase as much as 25%); and
- a sense of achievement associated with forestry and related environmental outcomes.

Based on these identified impacts, the integration of farm forestry into a farming system can play an important role in the economic, social and environmental outcomes on and off-farm. Importantly, farm forestry may offer a more stable source of income when compared to other farm activities, and can lead to an increase in overall farm system productivity.

Establishing a farm forestry plantation typically requires a large initial capital investment, which will often not be recovered for an extended period, given the time taken to produce mature forestry timber products. The impact on annual farm cash flows can also be affected. Under a leasing arrangement, the costs to the farmer and annual cash flows will be determined by the nature of the agreement established with a forestry corporation. Where land is leased by a forestry corporation, much of the set-up cost and risks will be borne by the forestry organisation.

Whole farm forestry

Farm owners may also decide to dedicate the total available area of their farm to forestry enterprises, which has more significant implications for the day-to-day and long-term management approach for the farm.

Farms that have been completely allocated to farm forestry may achieve positive outcomes including:

- a regular income stream for the term of the forestry lease – and an associated increase in financial certainty; and

- an increase in the ability to source off-farm work opportunities as day-to-day demand of farm labour is reduced.

The impacts on neighbouring properties may include:

- shading of neighbouring properties pasture and crops which may negatively affect productivity;
- benefits derived from the wind-break properties of the forest;
- increased pressure of grazing wildlife on the remaining agricultural areas;
- potential fire hazard posed by the plantation; and
- changes in hydrological cycles within the catchment.

Land values

Forestry is likely to have some impact on the value of rural lands where the industry is expanding. There are a number of factors that will determine the impact of forestry on land prices not only for land currently used for forestry, but also surrounding land.

It is reported by RIRDC (2001) that for Western Australia and Victoria in regions where forestry activity has been increasing, purchase and/or lease agreements on land for timber production by timber companies can increase land rents and purchase prices.

The impact of rising land prices on existing agricultural producers is generally regarded as negative as it makes it more difficult to expand production area over time. Over the past 50 years, the average farm size in Australia has continually increased to generate economies of scale to offset rising production costs. Restricting the ability of agricultural producers to do this through rising land values may affect medium to long term viability.

Conversely, where there is potential for forestry to lead a decline in the regional population, this is likely to be associated with a decline in the value of residential properties as people try to exit from the region.

6.2 Regional impacts of forestry

There are significant socio-economic changes that may be associated with an increase in forestry activity within a region. A large number of studies identify (often conflicting) evidence on the nature of these changes.

Timber plantations have been identified as a factor in generating regional employment and abating the trend of rural decline in some areas. It was estimated by Tonts *et al* (2001) that for every 10,000 hectares of forestry plantation established, 75 people are required to establish, manage, harvest and transport the timber. A study completed in the Oberon region of NSW (RIRDC 2001) found that the growth of the forestry industry was associated with an increasing population, improved employment levels, increased off-farm employment and improvements in services available in the community.

However, research also indicates that the benefits provided by forestry to a region are dependent on the way the industry has been set-up, and the ability of a region to capture not just forestry plantation growth but also employment and timber processing facilities within the region. The post harvest processing activities often account for a significant proportion of the employment and economic value generated by the industry.

When considering the impact of forestry at the regional level, the primary factors to take into account are:

- comparative employment levels between existing land uses such as agriculture and forestry;
- the establishment and location of processing activities – although these may be somewhat less important in the case of fire wood production; and
- the implications for service providers to farms and agricultural industries, such as shearers, fencing contractors and stock agents, as farmers are the primary market for these services.

The forestry sector remains a relatively small employer nationally, but for many regional communities it is a major source of income (CSIRO 2004). In Victoria, native forests account for about 40% of the socio-economic contribution and plantations for about 60%. The plantations impact is expected to increase as the recently expanded young eucalypt plantations reach harvest age (Cameron Consulting 2005). Substantial socio-economic impacts are generated in the harvest, haul and processing of logs into paper, wood panels, sawlogs and posts.

It is currently estimated that approximately 19,500 people are employed in the forestry industry in Victoria. Across the North East and Central Regions which are relevant to the area specified for this study, an estimated 1,750 people are employed in forestry production as set out in Table 6. These regions therefore account for approximately 9% of forestry employment in Victoria. Of the total employment in forestry in the region, only 5% is currently associated with plantation hardwood production.

Table 6 Employment and value of output from forestry in Victoria

	Gippsland	Nth East	Central	Sth West	Nth West	Metro	Victoria
Direct Employment (No.)							
Native hardwood	1,630	566	290	20	198	5,024	7,728
Plantation hardwood	294	9	78		12	513	906
Plantation softwood	1,199	1,142	608	1,061	3	6871	10,884
Net Value of Output ($M)							
Native Hardwood	462	67	69	5	21.4	527	1,151
Plantation hardwood	167		5		0.9	54	226
Plantation softwood	318	209	160	247	0.4	721	1,657

Source: Cameron Consulting 2005.

Table 7 shows that native hardwood plantations require lower employment per hectare than agriculture more generally, however it provides a greater per hectare value of output.

Table 7 Forestry and agricultural employment and output in Victoria

	Native hardwood	Agriculture
Employment (persons/1000ha)	9.6	10.4
Value of output ($/ha)	1,429	1,140

Source: Cameron Consulting 2005.

In summary, the impact of forestry at the regional level will depend on the relative employment generated in comparison with existing land uses that are being displaced. Further, the location of processing facilities will be a significant influencing

factor on employment generated in the region. The adjustment between industries also needs to be considered, as even in cases where forestry generates more employment than the existing industries, local labour forces will need to be trained to be able to effectively participate in the forestry industry, which is a further adjustment cost.

6.3 Plantations and biodiversity

In addition to socio-economic factors, plantation forestry impacts on the natural environment. Large-scale land use change in Australia has had a major impact on the health and functioning of the natural environment. Plantations have the capacity to restore landscape function and facilitate the recovery of more diverse ecological functions in landscapes that have been cleared for annual crops and pastures (CSIRO *et al.* 2001). While the primary goal of plantations and their management is to grow a timber crop for profit, there are also environmental benefits or services that are provided to the catchment. When the appropriate species and design is used, biodiversity goals, soil erosion and to some extent soil acidification can be addressed (CSIRO *et al.* 2001).

Lovn *et al.* (2005) found that eucalyptus plantations support more birds than cleared farmland, but fewer than native forest. They noted that certain approaches to plantations design and management can enhance the biodiversity value of plantations. Kavanagh *et al.* (2005) showed that forest bird abundance was higher in eucalypt plantations larger than 5 hectares than in smaller plantations. However, studies in commercial eucalypt plantations in Western Australia showed that some bird species favoured plantations edges while others showed no particular preference for edges (Hobbs *et al*. 2003). Therefore, more data is required to make unequivocal conclusions about effects of plantation size on bird populations. The research suggests that if improving habitat and biodiversity values is an objective of a plantation, then strategic design and management can provide additional habitat features.

With strategic plantation design, catchment impacts can be optimised and plantations can be used to enhance wildlife habitat and biodiversity conservation, however this will generally involve trade-offs with timber production (Keenan and Kanovski 2002).

6.4 Plantations and carbon sequestration

Carbon dioxide concentrations in the atmosphere have increased by 31% since 1750, primarily due to human activities (CSIRO *et al.* 2001). Vegetation plays an important role in reducing levels of greenhouse gases in the atmosphere, as they absorb carbon dioxide from the air. Forests which build up a store of carbon in the trees, shrubs and soil are considered greenhouse 'sinks'. The planting of trees on agricultural land is recognised under the terms of the Kyoto Protocol as an eligible activity to help mitigate emissions of greenhouse gases, primarily carbon dioxide.

The ability of plantations to absorb and sequester carbon dioxide varies widely depending upon a range of factors – the climate, soil depth and properties, position in the landscape, tree species, and management impacts (site preparation and establishment techniques, weed control, tree spacing and water and nutrient management). As a general estimate, one hectare of reasonably vigorous plantations might absorb during its first 20 years about 25 tonnes of carbon (although this figure would be unlikely to be achieved in the northern part of the Goulburn Broken). One million hectares of new plantations could therefore absorb about 5.8% of Australia's (1997) net greenhouse emissions (CSIRO et al. 2001).

A plantation is likely to sequester between one and ten tonnes of carbon per hectare per year over a 30-year period (CSIRO *et al.* 2001). There will be continuing greenhouse benefits during the expansion phase of the plantation, once the plantation estate stops expanding and all the areas have been harvested at least once with no other changes in management, then the total carbon stored in the estate will approach equilibrium as long as harvest and re-establishment rates are generally in balance.

6.5 Plantations, salinity mitigation and groundwater management

Salinity has increased in the Shepparton Irrigation Region through rising watertables and salt mobilisation, resulting in significant environmental, social and economic losses. Clearing of land and inefficient application of irrigation water has increased watertable levels, while 260,000 tonnes of salt is exported to the Murray River annually (GB CMA 2006).

An understanding and characterisation of groundwater flow systems can be applied to catchments and used to inform the extent of land use change and recharge reduction that is required to halt, and maybe reverse, the spread of salinity. One option is to plant perennial deep-rooted trees and shrubs into the landscape to reduce the amounts of water moving beyond the root zone (CSIRO *et al.* 2001). Commercial activities such as forestry can establish an income from deep-rooted perennial trees and shrubs and are central to managing the large-scale challenge that has been presented in dryland salinity.

For recharge reduction to be effective, revegetation will need to be strategically located and of sufficient scale to match the particular groundwater system that it is trying to control in the salinisation process (CSIRO *et al.* 2001). In the National Land and Water Resources Audit, it was demonstrated that the areas of revegetation required for reducing recharge for a given catchment and groundwater system varied from 10% to 90 %, but in most instances at least 40% revegetation was required (CSIRO *et al.* 2001).

Estimates of the lag times between adoption of recharge reduction practices and response in groundwater levels or salt delivery indicate that after recharge, salt responses at the discharge end of the system range from 10 years for local systems to 50-200 years for large regional groundwater systems (CSIRO *et al.* 2001).

6.6 Plantations and water use

Revegetation of cleared areas can reduce the amount of water entering rivers and streams. In particular environments, vegetation can intercept high quality freshwater runoff that would otherwise contribute to diluting salt loads in streams and rivers (CSIRO *et al.* 2001). Watertables and underground water resources will inevitably be affected by the recharge patterns under plantations, through enhanced interception of rainfall and increased transpiration.

Plantations established on cleared land take time to develop, and during the establishment period the water yield changes gradually as canopies and roots develop (RIRDC *et al* 2001). Specific catchment, climate and groundwater characteristics are important information that needs to be used in the assessment of the relative benefits. The amount by which revegetation can reduce river flow depends on the amount of rainfall and the proportion of the catchment under plantations. It is predicted to be smaller in low to mid rainfall catchments when compared to higher rainfall Catchments (CSIRO *et al.* 2001). Effects on stream flow can be reduced by concentrating plantings in elevated parts of catchments, planting

in lower rainfall zones and distributing planting in smaller blocks across a catchment (BRS 2006).

Using part of a catchment for agroforestry could affect the water balance for downstream landowners and water users, however agroforestry allows planting trees on sites where they can provide net hydrological benefits, such as controlling recharge to groundwater where dryland salinity is a problem (BRS 2004).

6.7 Removal of logging from native forests on public land

The Barmah Forest covers about 60,000 ha and comprises the most significant occurrence of River Red Gum forest in Australia, while Gunbower Forest and the contiguous Pericoota and Koondrook Forests in NSW comprise the next largest (DSE 2006).

The Mid-Murray Forest Management Plan, for example, captures over 58,000 hectares of state forest. Over 54% of this area is zoned for 'General Management', 27% for 'Special Management', and 18% reserved, with logging activities excluded (DSE 2006). In addition to the zoning restrictions, large habitat trees are to be retained across all zonings.

Where areas of public native forest are managed primarily for timber production, the result is an evenly aged forest with relatively few large trees, which are essential habitat for many fauna species. Removing logging from valuable pockets of remnants in the Goulburn Broken catchment would have the potential to yield significant environmental benefits by eliminating the risk of further damage to soil, water and vegetation resources, as well as contribute to the achievement of specific catchment targets.

For example, the Regional Catchment Strategy for the Shepparton Irrigation Region has specific biodiversity goals relating to the improvement of the quality of existing native vegetation, to increase the conservation status of threatened fauna, and to maintain and increase the provision of hollows and fallen timber for hollow-dependent fauna. Removal of logging from pockets of remnant native vegetation such as the Barmah Forest will contribute to these goals.

In the riverine woodlands the main issue of concern is that past and current timber-harvesting and silvicultural activities have significantly reduced the number of hollow-bearing trees below the natural threshold. Management of the areas of riverine woodlands on public land primarily for biodiversity values instead of for timber extraction would reduce disturbance and create a better habitat for hollow-dependent fauna.

6.8 Summary of key points

Farm level impacts:

- Farm forestry provides an opportunity to integrate forestry into an existing enterprise, diversify the farm income, and potentially increase land values.

Regional impacts:

- Forestry may provide additional employment opportunities, depending on the existing land use.

Plantations and biodiversity:

- Strategic plantation design and management can provide additional habitat features in the landscape.
- Provision of an alternative to native forest timber extraction is a significant biodiversity gain.

Plantations and carbon sequestration:

- Each hectare of plantations is able to sequester up to 25 tonnes of carbon in its first 20 years.

Plantations, salinity mitigation and groundwater management:

- Strategically-located plantations can reduce recharge and help to mitigate the impacts of salinity within a catchment.

Plantations and water use:

- If trees are strategically planted in lower catchment areas, they can provide net hydrological benefits in relation to recharge to groundwater with minimal impact on downstream water users.

Removal of logging from native forests on public land:

- Protection of soil, water and vegetation resources can be aided by removing the impacts of logging from native forests.
- Public native forests can be managed for their environmental values rather than as a timber resource.
- Contribution to achievement of catchment targets.

7 A WAY FORWARD

In order to demonstrate various impacts and risks of implementation, a theoretical scenario or way forward for the strategic development of the plantation hardwood industry is briefly outlined below.

7.1 Scenario

This scenario addresses some of the key issues and barriers to the expansion of the native hardwood plantation industry in the study area. The areas discussed are:

- pricing of timber extracted and sold from public native forests;
- the creation of an environmental services market; and
- the role of government incentives and development programs.

The way forward should be informed by an investigation into the pricing policies of timber extraction from public land. If sustainable timber extraction in the Barmah Forest was to continue, the pricing of the timber should reflect the real cost of production. Costs may include factors including management, land value, infrastructure and maintenance. This would need to be independently costed and a subsequent licensing and pricing system implemented.

Secondly, the expansion could be assisted through the creation of a market-based mechanism for recognising the provision of environmental services for plantations on private land. As a highly cleared catchment, strategically located private plantations of native hardwood species in the Goulburn Broken region are likely to provide numerous environmental services, including:

- salinity and groundwater management;
- mitigation of soil erosion;
- carbon sequestration;
- landscape linkages; and
- improved habitat for biodiversity.

Market mechanisms to promote private investment in forestry are encouraged in a number of relevant strategies such as the Murray Darling Basin Commission's Salinity Management Strategy, and the Victorian Salinity Management Framework, and could include options such as a competitive tender or auction systems, or a grants-based approach through the CMA. Opportunities may also arise in the future for participation in a national carbon trading scheme.

Government funding for an environmental services market addresses another market failure issue, in that the provision of these services is for the greater 'public good' in the absence of private gain.

The way forward also looks to overcome additional barriers to investment, such as a lack of industry expertise and support. This may include publicly funded programs for areas such as skills development, subsidies for set-up costs, and ongoing management advice and expertise.

Key actions:

- pricing policy developed for timber extracted from public land to reflect the full cost of production.

- development of market-based mechanisms for environmental services (and possible participation in a national carbon trading scheme) in line with needs identified through the Regional Catchment Strategy targets and other planning documents.
- establish publicly funded assistance / incentive programs where necessary.

The likely outcomes of the implementation of this way forward are:

- creation of a competitive market – public versus private forestry.
- removal of more of the barriers to investment and encourage uptake.
- new entrants to the private forestry industry.

7.2 Impacts and risks

This suggested way forward allows for an examination of the likely impacts and key risks of each change as set out in Table 8 and Table 9 below.

Table 8 Likely impacts of implementation of way forward

Issue or impact	Change
Management of public land for ecological values	á á
Uptake of private hardwood plantation forestry / land use change	á á
Maintenance of timber supply to market	ü
Relative cost to tax-payer	á
Cost of firewood to public	á á
Change in labour force (public to private)	á á
Provision of environmental services	á á
Impact on land values	á

á = some increase á á = substantial increase ü = likely to occur

Table 8 demonstrates the possible impacts of implementing the proposed way forward. This scenario is likely to promote a significant expansion of private hardwood plantations, while creating a shift from public forestry management to private plantations.

Implementing a competitive pricing system is likely to increase the cost of firewood to the public, which also brings associated risks, which are set out in Table 9.

Table 9 Key risks of implementation

Issue	Level of risk
Lack of landholder interest	Low
Competing land use values	Low
Cheaper interstate or international imports	High
Change in demand or substitution	High
Lack of skilled labour available	Low

Subject to additional modelling and data analysis, if this way forward was adopted, it would have the potential to enhance the region's economic growth and the environmental values without interrupting the supply of timber to the market or causing significant employment losses.

The associated risk of increasing the price of timber is competition from cheaper interstate or international imports. Another factor associated with the price increase is the risk of substitution of firewood for cheaper alternatives.

8 FUTURE RESEARCH REQUIREMENTS

There is a paucity of current data on the area of previously cleared agricultural land potentially available for new plantations in the Shepparton Irrigation Region and Goulburn Broken floodplain. To further inform any plantation expansion strategy, an in-depth study to investigate the following points is essential:

- available areas that may be reverting to dryland farming;
- land on the floodplains where natural occasional floods may occur; and
- available land adjacent to areas that have been identified as needing to reduce water tables.

Additionally, in order to educate the community regarding sustainability and pricing issues, an education and awareness campaign with the following goals would be beneficial to:

- educate people on how to make informed decisions about sourcing and using firewood;
- foster community preference for eco-friendly wood;
- increase awareness of the impacts on biodiversity by private collectors; and
- provide information on good environmental practices for using firewood.

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