

Executive Summary

Background

This booklet was commissioned by the Private Forestry Council Victoria primarily to provide current scientific understanding on the main economic, environmental and social issues facing the industry. The focus is on pine plantations, eucalypt plantations and agroforests, with the booklet intended to be of interest to a broad range of stakeholders. As background to the following conclusions (segregated into main themes for clarity), it is relevant to note that:

- There is a long history of plantation development in Victoria, initially focusing on conifers and more recently on hardwood species.
- Victoria now has more than 300,000 ha of plantations representing a very significant investment.
- Most of the plantations are industrial with farm forestry playing only a minor role.
- The investment in forestry has had significant and positive impacts on regional economies and social values in particular.

Greenhouse Implications

- There are concerns about the increasing concentrations of greenhouse gases, including carbon dioxide, in the atmosphere. Plantations have a positive effect as they accumulate and store carbon in their biomass. The amount and rate depends on the site, the species and the environmental conditions.
- The storage of carbon in plantations is very much greater than in the pastures which in recent times they have replaced. The plantations, on an annual basis, have a net accumulation of carbon.
- Wood from plantations is used in buildings and for other purposes and this stores carbon. Wood is an environmentally beneficial building material and a source of renewable energy.
- Private forestry is a positive component in any greenhouse gas amelioration strategy.



Soil Disturbance and Erosion

- Soils are often deliberately disturbed to establish plantations, however, this is primarily undertaken only once during the rotation and covers only a portion of the plantation area. The total area affected by cultivation for annual crops in Victoria each year is around 100 times that disturbed by forest establishment.
- Soil loss is mainly from plantation roads and this can be reduced by their correct design, maintenance and drainage.
- Soil loss from established forests is commonly 0.02 tonne/ha/yr compared with 0.05-0.37 tonne/ha/yr from pastures and 1.5 to more than 8 tonne/ha/yr for annual crops.

Plantation Soil Chemistry

- Plantations are successfully established on a wide range of soils types and the best returns are obtained by matching species and management to the soil type.
- Concerns have been expressed that plantations, especially of exotic species, lead to site deterioration through soil processes and nutrient removals in harvesting.
- In longer rotations, nutrient losses are low, especially when compared with nutrient removals in other agricultural harvesting. Shorter rotations, such as those of Blue Gum have higher nutrient losses, particularly for a nutrient such as calcium.
- Monitoring of the management regimes (using foliage analysis) allows any nutrient amelioration to be undertaken by appropriate fertilisation and management techniques using the principles of Site Specific Management.

Soil Acidity

- Pine plantations have minimal effects on soil acidity. There will be some changes depending on the pH at time of planting but there is no evidence of long term increases in acidity.
- Shorter rotations of eucalypts may lead to some declines in soil pH related to high uptake of calcium. As part of management, this needs to be monitored and any deleterious effects ameliorated.

Streamflow and Water Usage

- Conversion of native forest to grassland leads to a significant increase in runoff as measured in streamflow. This is because pastures generally have lower evapotranspiration levels than native forests. Below about 800 mm annual rainfall in forested catchments, streamflow is often intermittent or ephemeral under Victorian conditions.
- Pine plantations have different rates of evapotranspiration (ET) at different ages. Conversion of native forest to pine will lead to a period of increased runoff (more water) and this will decline with age so that by about mid-rotation, there is little difference in runoff between native forest and plantation.
- Conversion of pasture to pine or eucalypt plantations leads to a decrease in runoff mainly due to plantations having a higher leaf area and productivity which when combined with deep root systems lead to a higher water usage.

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- It is often claimed that streamflow reductions will be highest on high-rainfall sites, but we consider this is questionable given the mitigating effects on tree water use by high humidities and lower temperatures at upland sites. There is also the possibility of increased water use efficiencies at such sites along with ET being lower than predicted due to an unknown amount of recharge.
- Data on impacts of plantations are usually obtained from small catchments. When results are applied at the larger catchment scale where only a proportion of the area is under plantation and Codes of Practice are applied (including streamside retention), differences are less significant.

Water Quality

- Leaving aside salinity issues, there is convincing evidence that water quality values can be maintained within historical ranges provided that best practice management regimes as outlined in Codes of Practice and certification standards are strictly adopted. Indeed, reforestation of farmland (that formerly carried woodland or forest) is likely to lead to significant improvements in water quality. Strategically designed agroforests on individual farms will likewise lead to improved water quality.
- Chemical use in plantations or agroforestry (usually confined to relatively infrequent applications of herbicide and fertiliser) is unlikely to be a threat to water quality providing relevant prescriptions are applied.
- There is scant information on in-stream biota in Victorian river systems in terms of their tolerance to change in water quality (particularly chemical pollution). The precautionary principle should continue to be imposed until more information becomes available.



Salinity and Groundwater

- Of the three arbitrary components to water values considered in this review (that is, water quality; streamflow and water usage; and salinity and groundwater), it is arguable that the ‘jury is still out’ in terms of the role of tree plantations in reducing salinity and lowering watertables in the longer term. We draw the following conclusions in this regard, recognising that if plantations are acknowledged to be impacting on streamflow and recharge then they should also be affecting salt movement and salinisation processes and hence contributing to salinity control:
 - (a) For the Green Triangle region, definitive conclusions cannot yet be drawn, due in part to limited published data. The situation is compounded by the substantial spatial variation in water use by tree crops in the region.
 - (b) Watertable drawdown is usually seasonal, particularly for young plantings, due to variation in rainfall and water use by plantations and surrounding vegetation. Whilst ‘mature’ plantations may continuously access groundwater and hence contribute to control of shallow watertables and salinity in some locations, the relative low water use (for example, 300 mm/yr for 18- to 20-year-old unirrigated plantations in northern Victoria) serves as a warning against extravagant predictions of their effectiveness as a control measure.
 - (c) Whilst there will be some situations (particular catchments and climates) where plantations will contribute to effective salinity control, future reforestation programs involving pine and eucalypt are unlikely to significantly impact on river basin salinity trends on a regional level.
 - (d) The area of plantations needed for long-term impacts remains debatable.

Pests and Diseases

- As with any agricultural crop, forest plantations may be economically affected by pests and diseases. There is no evidence that plantation monocultures are at any greater risk of disease or pest attack than other primary industries.
- Management of pests and diseases involves an integrated strategy including quarantine, regular assessment, and treatment where necessary.
- The most significant insect affecting pines is Sirex Wood Wasp and its damage is limited through silvicultural management and biological control rather than the use of chemicals.

Fertilisers

- Fertilisers are used to stimulate plantation growth in both the long and short term. There are a wide range of site and plantation conditions under which they may be applied and applications are matched to the site to optimise response.
- Unlike many agricultural activities where fertilisers are applied on an annual basis, applications to plantations are few in number and relatively low in quantity. Treatments are typically only once or twice over a rotation.
- The low rate of application, careful placement and low periodicity of use, mean that potential environmental impacts from fertiliser applications are minimal.

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Herbicide Usage

- Herbicides are needed and used in plantation forestry to control weeds. Left uncontrolled, weeds will lead to reduced tree growth and even increased tree mortality.
- Herbicides are used at time of establishment, that is, essentially once or twice in a rotation, and areas of application are controlled by Codes of Practice. Rates of application are relatively low.
- Leaching and surface runoff are generally rare and hence water contamination is not expected to be an issue.

Pesticides

- Pesticides are used in plantations to a limited and targeted extent to control some problem organisms. Use is not regular nor is it extensive.
- Overall chemical usage is an important part of operations in forest plantations. However, the number of treatments required in a rotation, the extent of the areas treated and the quantities applied, are usually limited relative to many other agricultural enterprises.

Biodiversity Effects

- Where the biodiversity of plantations is compared with that of adjacent native forest, or in older plantations with the native forest it replaced, it is usually found to be significantly less. The extent of the reduction depends on the species, configuration and proportion of the area covered with plantation.
- More recent plantations have been established on low-biodiversity agricultural land, retaining residual woodland and streamside areas. In such situations, biodiversity is maintained and in many areas increased due to protection.
- Plantations have been established to assist with weed control and in all plantations, weed management is an essential component.
- There is a cost involved in managing and/or maintaining biodiversity.
- In some areas, exotic tree species may spread into adjacent native woodland but this can be reduced through removal programs or during routine fuel-reduction burning programs.

Markets for Forest Products

- Australian forest products are part of an international market. There was a national trade deficit (the value of imports is greater than the value of exports) of approximately \$1,850 million in 2002-2003.
- The expansion of the plantation industry in Victoria has led to development of a range of processing industries, with related regional economic benefits.
- Export of woodchips will continue to expand in economic importance.
- Increased competitiveness in the industry is crucial but there are a number of opportunities for Victoria's private forestry sector.

Economic Considerations

- Well-managed plantations on suitable sites, near existing or potential processing plants or export facilities can provide competitive returns on funds invested.

- Plantations have a number of defining characteristics including high initial costs of establishment, a long wait for returns from log sales and, for small areas of plantation, a lumpy income distribution.
- Private investors who are in a position to take advantage of existing taxation laws to enhance returns from investment in plantations have been primarily responsible for the rate of plantation expansion over the last five years being higher than that for any other five year period in Victoria.
- The planned integration of forestry and other agricultural activities can provide complementary benefits that increase the overall profitability of farming operations.

Socio-economic Impacts of Plantation Expansion

- Private plantations make a significant contribution to economic activity and employment in Victoria, particularly in regional areas. The magnitude of these benefits varies depending on whether the plantation estate has developed to a stage where harvesting and replanting has commenced and the nature of the industries processing the logs produced.
- Notwithstanding the generally negative perceptions of the impact of plantations on employment and population, recent studies in south-west Victoria have concluded that once the plantation estate expands and a cycle of harvest and replacement commences, labour demands for plantations are higher per 100 managed hectares than for beef, sheep or cropping.
- Labour demands are substantially increased by the development of log processing industries. In north-east Victoria, the total number of direct jobs in softwood log processing is three times greater than the number in plantation management and replanting, harvesting and log carting.
- Plantations have a long production cycle and annual log production does not fluctuate with seasonal conditions. Plantations can therefore provide regional areas with a degree of income stability when production in other agricultural activities is depressed by drought.

Damage to Rural Roads by Log Trucks

- The number of truck movements associated with plantations is higher than other agricultural activities and their impact on local roads is exacerbated by the traffic being concentrated over a relatively limited time period. Various levels of government, industry and the community have worked together in Victoria to achieve mutually acceptable solutions to this issue.

Incidence and Suppression of Fires in Plantations

- The CFA and companies owning plantations are addressing community concerns about the incidence and suppression of fires in plantations. The larger plantation owners have formed forest industry brigades which operate as part of the CFA network.