Development of large-scale non-industrial private forestry – integrating funding, site priority, management and marketing

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ABSTRACT

For farmers to invest money, land and time in commencing farm forestry on a large scale, they need to have confidence. They need to see there is an active market, and good commercial returns for the timber product. Also they need to know that there is a long-term government commitment to the industry.

However at this early stage there may in fact be no effective market for private timber, as there is no production from farm woodlots. Hence much of the initial investment must usually come from government, business, philanthropic organisations, or other sources able to commit to the long time frame. Investors also need to have confidence in a number of factors. These include evidence of good selection and management of sites, adequate growth rates, and the critical annual area or volume planted. All these will contribute to a perception by the investor of reduced risk.

Government, as well as being a key investor, has a vital role in driving this from behind the scenes, through clear policy, intelligent legislation and favourable tax treatment. In addition to all the above, there has to be an effective system of management at all points. In many counties this is provided by commercially-oriented grower associations.

The Australian state of Victoria is at the beginning of this process with non-industrial private forestry (NIPF). In many areas we are suffering the environmental consequences of the over clearing of forest since first settlement, and the unsustainable harvesting of the remaining forest. This paper discusses models for the securing of funding, investment in carbon, bioenergy and environmental services in order to replant hundreds of thousands of hectares, and the commercial activity in marketing and value-adding by grower associations to assist in making this an economically viable process overall.

INTRODUCTION

In Australia until the 1930s, when large pine plantations of radiata pine began to be established by some state governments, the timber supply came almost entirely from native forest. By the 1930s the higher quality native softwoods had been exploited almost to extinction, with remaining stands or specimens of the most sought-after species finally protected in national and state parks. The better quality hardwoods on land with potential for agriculture had also been largely cleared by this time. In addition, millions of hectares of forest that had little or no commercial value, often in areas of marginal agricultural value, were also cleared. In many cases this clearing has resulted in emerging problems with salinity, erosion and declining water quality, as well as being linked with disappearance or isolation of many species of native fauna and flora.

Over the last 12 years the supply of hardwood sawlogs has been reduced progressively in most states, following recognition that the log harvest rates can not be maintained without serious affect longterm. Softwoods planted since the 1930s on purchased farmland and on cleared forest areas now make up perhaps two-thirds of Australia's milled lumber requirement. An increasing amount of timber is imported to fill a growing timber requirement shortfall, much of it from rainforest sources in Indonesia, Malaysia and New Guinea.

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The potential for expanding industrial monoculture plantations is increasingly hindered by the displeasure of increasingly politicised rural dwellers, concerns about impacts on groundwater, and the rising price of land. Development of industrial-scale plantations is rapidly becoming as politically problematic as harvesting of native forest already is. Almost all the industrial hardwood plantations planted in Victoria are of the short rotation species suited to paper making, such as *E. nitens* and *E. globulus*. Both of these have good potential for producing sawlogs, but the investment returns from industrial sawlog plantations are currently unattractive, due to the combination of perceived risk, international prices, and availability till now of a cheap native forest log supply.

Fortunately, few of these concerns apply to the option of dispersed non-industrial private forestry (NIPF) woodlots, integrated into conventional farm layouts, and raising farm productivity. The economics of establishing the sawlog trees can be quite different. For the farmer, the shelter benefits from NIPF for stock, crops and pasture are enough to sometimes offset planting cost within a few years. In addition these farm woodlots can be sited and configured to target areas of most concern for natural resource management issues. They have often been shown to raise farm value significantly. Importantly, they add to or link together habitat. They are usually managed in a more intensive way to yield a higher value faster grown log, and they can to sited to maximise multiple benefits.

In Victoria a number of groups are working on the many issues of how to fund the necessary large scale of planting, how to manage the establishment and management, and how best to locate plantings to have optimum environmental effects, as well as achieving the necessary volume and constancy of quality sawlog production.

ALTERNATIVE SYSTEMS OF ESTABLISHING AND MANAGING LARGE ESTATES OF NIPF

Two fundamentally different systems are possible for the stimulus and management of large NIPF areas. One is the situation where the government maintains control of the funding, applies some stimulus to landowners to plant, and the ongoing provision of extension services is responsive to the higher bureaucracy, rather than growers' needs and market signals. This approach resulted in the planting of about 10,000 hectares of Radiata pine plantations in Victoria in the 1980s in the higher rainfall areas. The government investment and management approach is well suited for establishing industrial-scale plantations, as with the approx. 600,000 ha of Radiata pine resource in the three states of south-eastern Australia.

Successful examples of smallholdings totalling a large estate of sustainably-managed NIPF are almost invariably of the other type, which is managed by associations of the forest owners, with advisory and marketing services performed by officers employed by the association. Examples of these are usually found where there is an existing large resource, rather than where one is going to have to be established from scratch. Ireland and Australia have this national task in common, that an extensive forestry industry based on NIPF needs to be established as a matter of urgency, but without an ongoing harvest financing the establishment, and without a entrenched culture of sustainable forestry management.

The present situation in Victoria has a very low base level of hardwood sawlog NIPF – perhaps 5000 ha of plantings since 2002, and 4000 ha of mature but badly managed wide farm plantations. However, interest is rapidly growing in NIPF as the solution to boosting the supply of hardwood sawlog, to arresting the most pressing environmental problems, to reversing decline in rural economies, and to increasing carbon sequestration. Suitable species are available of genera of *Acacia, Eucalyptus* and *Casurina* for almost any site, soil and rainfall. The approximate volumes of hardwood sawlog required are to fill the forecast shortfalls, and the time until they are urgently required, are known. The land is available. The relative scale of planting and the costs are known.

What is remains to be developed are:

1. processes for raising and administering investment funding for large aggregations of sites.

2. alternative models for how the dispersed woodlots are sited, established, managed, and harvested most effectively and economically.
3. the way that environmental benefits are costed, valued and assessed – including carbon sequestration, water quality, and habitat and native vegetation enhancement.
4. methods for thinning, harvesting, processing biomass, and marketing timber product

CATCHMENT MANAGEMENT AUTHORITIES, AND PRIVATE FORESTRY DEVELOPMENT COMMITTEES.

Work is beginning on the approach for aggregation of sites, and for the development of a generic prospectus format for investors. A suitable region to commence the introduction of this scale of NIPF will be on the scale of a river catchment. Across Australia each catchment is administered by a Catchment Management Authority (CMA), which has the mission of managing the catchment by best principles for improving water quality and preserving the integrity of the natural environment. The CMAs were set up in the 1997 to rationalise the targeting of federal government funding to the environmental issues in catchments across Australia, and are guided by a board of local people with suitable experience and skills. With time funding processes have altered, but the CMAs retain a key role in managing regional environmental issues. For example they are the conduit for about $300 million allocated for work on salinity in Victoria through the current National Action Plan (NAP) for Salinity and Water Quality.

Each CMA is independent of but runs in close collaboration with state and federal government departments, and relevant non-government organisations (NGOs). Each CMA will also be in touch with its local Private Forestry Development Committee (PFDC). The PFDCs have had a similar genesis in that they are a conduit for federal money for the stimulus of private forestry development in Australia. Now funded 50/50 by the federal and relevant state governments, each PFDC works for the appropriate plantation development of its area. So one may work entirely with industrial plantation companies, while another in a perhaps drier area further from ports will deal almost entirely with NIPF issues.

Each CMA has its own specialist staff, some of whom are already involved with managing tree planting for environmental and habitat enhancement purposes. These deal with organised groups of landowners across the CMA area, but normally are most active in areas of greatest environmental concern.

Various CMAs have looked at the problem of reversing environmental deterioration across cleared land, and declining water quality. The Goulburn-Broken CMA in north-east Victoria in 2001 commissioned an extensive study on the needs, the costs and the possible solutions for correcting landscape change. This CMA covers about 2.5 million hectares overall, and has 1.4 million ha that is neither forested or irrigated. It is estimated that to reverse the developing salinity problems 150-300,000 ha of this area needs to be reafforested, costing possibly $300-500million.

The concept was that this could only be done using a partnership between the public and private sectors. Provided the public sector was prepared to meet the responsibility of funding planting on the most degraded and commercially unproductive areas, at an estimated cost of $25-100 million, at least $250 million would be needed from the private sector to plant the commercially productive woodlots and plantations.

At the time of the report's publication in 2002, the issues of how to value environmental benefits of salinity, water quality, habitat and native vegetation preservation were not well developed. There was no model for this process of public/private investment of this scale of funds. There was no real workable process for selecting the sites, contracting with landowners, of managing and harvesting the dispersed woodlots. As importantly there was no model for aggregating the planted sites to give a parcel saleable to a large investor, or of aggregating the carbon sequestered or any of the other environmental benefits. However, things have moved fast. Now, four years on, many of these hurdles are considerably smaller or have gone, the need is still as great, and the political mind is becoming more focussed on facilitating the process.

This sudden awareness of the need for and scope for production of hardwood sawlogs applies to most other relatively high rainfall parts of the state. In the east of the state one of the four Victorian PFDCs, Gippsland Private Forestry Inc., commissioned a report in 2005 into the impediments to and opportunities for new plantation establishment in Gippsland. This report identified that to replace the sawlog shortfalls from reduced harvesting in native forest would require establishment of about 55,000-80,000 ha of hardwood sawlog plantations. The report is also clear that the land for establishment of industrial scale plantations will be hard to locate, due to subdivision, and increasing political pressure by resident.

Another CMA in south-western Victoria, the Corangamite CMA (CCMA), began planning for NIPF to be part of its environmental strategy in 2005. It is a mix of cleared farmland and forested coastal ranges. It has a population of approximately 330,000, spread over 13,340 km^2, and with 175km of coastline. Traditionally an area with a long-established and flourishing forestry processing industry, it has seen sharp reductions in available timber, with consequent closure of mills and loss of hundreds of jobs. The forested ranges will be finally closed to logging from 2008.

The CCMA is shaped like a rectangle, with a short and long side being coast line. It contains Victoria' s two largest regional cities, as well as dozens of large and small towns. The northern third has rainfall of about 650mm rising to 900mm in the native forest on hills in the north, and an increasing spread of 'lifestyle', or hobby farms. The central third of the area is flat farmland with rainfall of about 600mm, and increasing levels of dryland salinity. The southern third is predominately forests, dairy farms and intensive beef and lamb raising, with rainfall from 650mm rising to 1100mm in the coastal ranges in the south. Tourism is a major industry along the coast, and the scenic forested coastal ranges are the water catchment for the regional towns and cities.

Within its area the CCMA has four catchment basins which contain 11 sites (lakes or wetlands) listed under the Ramsar convention, among a myriad of other lakes and wetlands. The CCMA contains three marine National Parks, five marine sanctuaries, and 123 listed waterways, 28 of which are regarded as being of particular environmental, social or economic importance. In 2004/5 the CCMA managed $17 million for significant environmental works across the catchment. Another $1.3 million went into the region's Landcare program with its 103 volunteer groups, for replanting indigenous vegetation, mainly along waterways. A four year $3.8 million Volcanic Plains project is for management of remnant ecosystems and biodiversity, being mainly the remnant native grass sites. (CCMA 2004 report)

As with other CMAs, all this good work is not preventing or reversing environmental deterioration, but simply slowing the rate. Now, due to changes in native forest logging management and the projected shortfall in sawlogs for industry, the CCMA has the opportunity to add to environmental works by facilitating the planting of an NIPF hardwood sawlog estate of up to 2000 ha a year on privately-owned sites of high environmental priority. The woodlots would generally be contiguous with permanent non-commercial plantings of indigenous diverse species of at least a tenth of the commercial area.

Similar volumes of both types need to be planted every year for about 30 years (the average sawlog rotation) to have the basis for a sustainable timber processing industry. The timber harvested has the scope to not only regenerate a viable enduring processing industry, but it will be accompanied by biomass volumes adequate to produce heat and electricity. This substitution of energy from woody biomass for that from coal, in addition to the carbon sequestered in the milled timber and growing trees, can bring the CCMA toward the point of being carbon neutral.

In this region rotation lengths of well-managed plantation trees are conventionally from 25-35 years, though 40cm dbhub sawlog trees are able to be grown in only 14 years with intense thinning in the southern higher rainfall. Normal rotation length of eucalypts such as *E.obliqua* in unthinned native forest may be 80 years or more. The NIPF sawlog woodlots are of eight to ten main species, half of which are suited to the higher rainfall. These are able to grow at an MAI of 15-25 m^3/ha/yr, with a

final spacing of 150-250/ha. The other half are slower-growing, denser species suited to the lower rainfall plains. These have an MAI of 5-12 m^3/ha/yr, with a final spacing of 80-125/ha.

The timber of most species is already in demand, with both sawlogs, and residual logs having a ready market. The market, silvicultural management, and the timber qualities are already proved. Production from sites will begin from 5-7 years with thinnings harvest of firewood, chip biomass, and poles. Returns to the farmers begin with improved shelter from only two years.

THE PROCESS, AND ISSUES INVOLVED IN LARGE SCALE PUBLIC-PRIVATE PARTNERSHIPS

Legal aspects.

Victoria has a land title system that is now fully accessible electronically, and that is suited to transfer of forestry rights and carbon rights, as well as for the usual transfer of land. The financial interest by one or more investors in a woodlot on a title is able to be simply and cheaply recorded, and can be relatively cheaply altered when necessary. The same system can be adapted to record the interest of one investor in the production trees, one in the salinity benefit of the trees, and one in the land. However legal cost of dealing with titles means that to date the minimum size of woodlot funded on any one title is ten hectares, and more normally it is 20 ha. In some cases this may be made up of several smaller areas of about 5 ha.

Raising investment funds

The cost for a farmer of preparing and planting NIPF sawlog woodlots is normally about $1200/ha, when all work is done by contractors. Cost of extra fencing adds to this. This figure assumes that there is no ongoing external management service, and that the farmer will bear the cost of further silvicultural work. However for the larger scale planting planned, to cover the payment of an independent manager, and the necessary administrative staff for legal and accounting work, the cost will be about $2000/ha plus cost of fencing. For a total of 2000ha annually the forestry investment manager will have to raise about $4 million per year. Essential to raising the funds for annual plantings of this scale is the process for aggregating the sites to give a land area total, and totals of carbon and other credits. The amount of money sought is relatively small on the scale of other investment.

The key issues governing the success of finding investors is that the investment is seen as having low risk, that it is well managed and that the objectives of the investor will be met. All of the detail needs to be adequately summarised in various prospectus issued to investors. Different investment formats will apply to commercial plantations, and to the environmental benefits and carbon credits involved with them and with the permanent plantings.

Landowner attitudes to investing in NIPF woodlots

In Victoria a number of previous schemes have provided useful models for the establishment of commercial hardwood sawlog woodlots on farms, with landowners in a formal partnership with an external investor. Recent examples of these are the FFORNE project, West RFA sawlog project, the Grow West project, Plantations for Greenhouse project, and the Box-Ironbark project. There are several features common to all.

- They all show that landowners will readily contribute their time and money if there is at least half the initial cost provided by an external investor, with the landowner retaining management control, and the timber rights. Landowners also readily become involved in profit sharing joint ventures, or in lease arrangements where the investor pays all establishment cost plus an annual lease payment..
- They all show that careful selection and support of landowners is clearly repaid in better quality site management.
- They show that landowners, once they achieve initial success with the initial plantings, and understand the main simple management principles, will often fund further woodlots.
- They show that it is quite practicable to

establish woodlots that achieve multiple benefits – stock shelter, farm aesthetics, improved water quality, wildlife habitat, timber production, carbon sequestration. They are no more costly than simple production woodlots, apart from some added fencing cost.

- Woodlot plantings tend to be concentrated in proximity to each other.
- There is a critical threshold point where landowner confidence in market reliability and timber profitability means that further planting happens without subsidy.

The external investor to date in these situations is almost always the government. To date projects stimulating NIPF sawlog woodlots have not reached the point where landowners take on planting woodlots in the same way they will plant an annual crop. Duration of subsidy schemes in Victoria has been for only two to four years, have cost the state government less than $1 million a year, and often resulted in very dispersed woodlots.

Projects in Western Australia and South Australia have resulted in greater landowner activity, due to their confidence from a longer-term government view, and its greater willingness to invest the more serious sums of A$5-10 million for each project.

However some significant landowner-funded short rotation Tasmanian Bluegum (*E.globulus*) plantations have demonstrated the validity of the last point. Here in south-western Victoria many thousands of hectares were established by landowners over the years 1996-2002, during times of good farm income surpluses, when commercial companies were very active in the market. (Geddes. Timber 2000 report)

Provision of extension and training

A key feature of the Scandinavian NIPF owners' associations is the role that the association foresters play in providing extension and grower support. In Finland all extension is supplied by the grower association foresters. In this case all forest owners are obliged to be members of the association. So the forest owners control the association, and employ the providers of their own training and marketing. The process appears to work extremely well. Denmark has a similar approach, though without the compulsory membership. In Austria, Bavaria, Norway and Sweden, associations work in parallel with the government forestry officers, with most extension and training being provided in some sort of joint approach, but with most marketing being administered by the associations. (Lang)

In Australia a unique training system called the Master Tree Grower Course has had a dramatic effect in lifting levels of technical management skills among landowners. Many of the grower groups and networks, and innovative developments in all states, have evolved in some way from one of these courses. It demonstrates that committed growers strongly support forestry education when it comes with informal support and expertise.

The system of development of NIPF across the CCMA would build on the existing four grower networks to provide training and extension, with support from the Department of Primary Industry staff in the region, and Melbourne University forestry school. The outcome will be initially more like the Master Tree Growers courses, which have 5 months of one day a week, than attendance at places like the Austrian forestry training centre at Alt-Ossiach, which has intensive live-in courses of five days or more. As the NIPF owners approach second thinning and harvesting stages of their own sites, the Alt-Ossiach model may become more relevant, so they can be safely trained with up-to-date harvesting and processing equipment. Victoria has a number of live-in institutes currently providing this sort of training.

Certification and chain-of-custody

To date in Victoria, certification has only been achieved by several major plantation companies, in order to export chip to Japan. The newly-developed Australian Forestry Standard (AFS) is now being adapted for small-scale, dispersed NIPF as a group certificate. A parallel chain-of–custody certification will soon be available. The development of a prospectus for investors in various products from dispersed woodlots will critically rely on the management of all woodlots being guided by some stringent code. This

independently audited code will significantly reduce risk for investors, will be a warrant that environmental issues are properly recognised and that all sustainable management guidelines are followed.

The present options are to use the AFS system or Forest Stewardship Council (FSC) equivalent, with the CCMA, or its delegated management body, having the certification. This is the approach used in some counties of states in the USA. Another approach to certification is where the signatories to the Managed Forest Law in Wisconsin are automatically covered by the American Tree Farm System (AFTS), now recognised in the USA as one of the principal certification systems of sustainable forestry management. However in Victoria there is already in use another level of sustainable management planning called an Environmental Management System (EMS), which would be far cheaper to implement and maintain, and which may serve as an intermediate stage.

Management of woodlots

Annual establishment of 100 to 200 woodlots across the CCMA requires a team of competent extension officers. Many will be local farmers prepared to work part-time, already with practical silviculture experience and already knowing many of the landowners. They will be given basic training for the job. They will assess each site nominated, choose finalists using predetermined priorities, and will supervise the preparation and planting. The species, width and configuration need to be specified, seedlings ordered, spraying overseen. Stockproof fencing has to be erected before planting and after ripping and spraying. Post-planting survival is assessed and gaps replanted.

The existing government extension staff are not numerous enough to cover this job. One obvious option is for the four existing forest-grower networks to be funded to provide this service. They are based in the area, their members who know most landowners and can work within the local networks, and they have a structure that is able to grow and expand. They have the basic management skills to be able to deal with all practical situations, to assess soils, recommend options for species, and to assess landowner skills. It is the logical and practical approach presently being used in the majority of countries with large-scale NIPF.

Carbon sequestration and trading

Currently to maintain the lifestyle in Australia about 27 tonnes of CO_2-equivalent gases (CO_2-e) are emitted per person per year, for Americans about 21 tonnes, Britons 11tonnes, and Swedes four tonnes (ACF). The differences are due to energy efficiencies, use of public transport, and most importantly the use of fossil fuels for generating electricity. Global warming is increasingly an international concern. Already international groups are investing in sequestering carbon in Australia by investing in permanent and production forestry. Victoria does not yet have a functioning carbon trading scheme.

One business in Victoria, Treesmart, has developing an annual carbon lease option for landowners with established sawlog woodlots. The payment is about $70/ha/year for managed sawlog woodlots, with the money coming from car owners who are paying to offset the carbon emissions of their vehicle. This business already has about 2500 ha signed up in principle, including with three grower groups within the CCMA. Another business, Greenfleet, sells a similar concept to corporations with car fleets, and other groups of vehicle users, but the payment in this case is put to planting permanent sites into diverse species. Other permanent plantings are funded by contributions by listed public companies, in return for shareholders opting to receive company reports and other notices electronically.

The indication is that there will be increasing interest by industries, especially those at the heavy emission end of the spectrum – electricity generating companies, metal smelters and transport companies – to invest in offsetting their carbon emissions. There is a real scope here for attracting investment funds for NIPF sawlog woodlots, and for the diverse species plantings for environmental benefits.

The overall amounts of carbon able to be sequestered are very large. The Goulburn-Broken CMA report estimated a total from the lower figure of 100,000 ha planted over 30 years would be 38.5 million tonnes. At a conservative value of $20/tonne C, the value of this would be $$770,000,000. The CCMA figures would give about half this total. The valuation of sequestered carbon is likely to rise. In addition to the sequestered carbon value, this report gives the solid wood value of an estimated 12.6 million m^3, conservatively valued at the time at about $675 million. (Alexandra)

Climate change

Forecasts of rising temperature and CO_2-e concentrations are increasingly concerning scientists, politicians, and the public. In Australia, greenhouse gas production from agriculture and landclearing are two significant contributing factors in the rise. Any forestry investment will need to factor in the increased risk factors of climate change. However, if climate change has the dramatic impacts that are forecast, increasing efforts will be made to reduce national CO_2-e emissions. In this situation government, corporate, and philanthropic investors wanting to invest in carbon sequestration will be looking for well-managed forestry enterprises with a large volume of actively growing trees in the ground, or able to effectively aggregate woodlot hectares for future planting. Farmers may eventually be required to sequester carbon to offset the emissions of greenhouse gases from farm animals and farming activities. Lastly, the low environmental impact of timber-framed buildings is likely to cause a significant return to the need for structural timber when the real energy costs, or carbon emissions of production of steel and cement, are included in prices of building materials.

Well- sited woodlots can buffer the immediate impacts of climate change on farm productivity. The planting of large areas of dispersed woodlots on selected sites will play a significant role in sequestering carbon, as well as adding a potentially profitable new enterprise to the existing enterprises. The south-west of Victoria is taking a lead in developing the approach. SMARTimbers cooperative is commencing a project in the second half of 2006 that will develop a carbon-brokering model suited to aggregated NIPF sawlog woodlots in the CCMA.

Biomass and bioenergy

Australians produce the most greenhouse gases per capita in the developed world, exceeding even the United States (ACF). This is due to reliance on power principally from cheap fossil fuels, a high car ownership and large transport distances. Inefficient building design is coupled with a growing increase in energy-consuming household goods, and household heating and cooling systems.

At the same time, production of bioenergy from biomass lags behind well wind and solar power adoption. To date it has barely figured in the public debate, despite its accessibility. In fact in some states, including Victoria, generating energy from biomass sourced from native forest harvest is prohibited under the government policy, though there is no problem with energy from plantation biomass.

Presently, residual logs from native forest harvest in Victoria are chipped for export for paper production. In fact well over half of native forest harvest volume is presently chipped. This amounts to approximately a million tonnes, enough to fuel a 100 MW bioenergy plant. For the CCMA the 2000 ha/year of sawlog woodlots will produce at least 50,000 tonne of biomass annually from the fifth year after planting. Coupled with harvest waste from bluegum woodchip plantings and processing waste (and possibly flammable household waste) already being produced in the CCMA, this is enough to fuel a 10 MW bioenergy combined heat and power (CPH) plant. This energy production replaces the equivalent amount of power derived from fossil fuel. Coupled with the carbon being sequestered by the NIPF plantings, this substantially offsets the carbon emitted in the CCMA region. The government bodies involved with initiating a small commercial CPH bioenergy plant in the CCMA are being brought together. Potential sources of funding are already identified.

Thinning and harvesting dispersed woodlots

Harvesting and processing systems for forestry in most countries with high wage rates uses expensive machinery working at high production rates. Harvest sites in some of these, such as Canada and Australia, are 40 ha or more. In countries with small harvest coupes, as in the 1-2 ha coupes in Scandinavia, they are close together. In these latter sites, the small parcels of logs being sold by different families are efficiently collected and trucked away in self-loading, self-weighing transports. The issue with the Victorian NIPF harvest handling is how to economically thin and harvest small, dispersed sites.

Trials are already funded in Victoria to assess various product handling approaches, and modify existing systems, or develop new equipment, designed to suit the situation in these woodlots. Work on this area has been also done recently in South Australia, and Western Australia. Solving the issues is a key step to getting positive economics for dispersed woodlots

The machinery must be able to process even-sized thinnings in one pass within plantations on relatively flat sites. It should be relatively cheap but still have high processing rates. It must be safe to operate, and able to travel from site to site on public roads. The aim is to have harvest of first thinnings being revenue-positive. The product of first thinnings will be some mix of firewood, chip, posts and poles. The markets for volumes of the latter three products are presently being developed. The first is in high demand, with plantation-sourced firewood able to command a premium, and with native forest-sourced firewood resource already badly over-harvested, and being trucked up to 600km into major cities.

Processing and value-adding NIPF product

Establishment of sawlog woodlots on purchased land can be very marginal economically, or even revenue-negative, if sawlog is the sole product. Risks are high, and the low establishments of industrial-scale hardwood sawlog plantations are an indication of this. However, if in addition to the butt log there is also a return for carbon, biomass, and environmental benefit, the return is substantially improved. For a landowner with well-sited woodlots, improved farm productivity, and raised land value can add considerably again.

Processing of the sawlog by the grower significantly lifts returns. SMARTimbers cooperative in Victoria is proving that this increased grower return from value-adding applies to harvested NIPF sawlog and thinnings. Products being produced from NIPF logs and sold in commercial volumes by SMARTimbers into niche markets include decking, flooring, cladding and furniture timbers.

New products are being investigated by the cooperative including veneer, and bridge and jetty timbers. A further product being developed from thinnings is debarked 2.4m x 100mm diameter poles for vineyard trellis. The existing grower associations in partnership with state and federal research bodies are developing the data on the various products from woodlots, and are preparing knowledge and acceptance for the products by the market.

A critical part of value-adding is innovative design into joints and framework, as well as into furniture items. The dense native hardwoods have far greater strength and less flex than softwoods or less dense hardwoods. Tertiary design schools and research organisations are involved in a number of aspects of this work.

Local and regional benefits of NIPF

Establishment and harvesting of NIPF woodlots in Victoria's south west have shown that economic benefits largely stay within the community. While with IPF much of the establishment work is done with large contractors who travel widely for the work, the NIPF situation uses local contractors to prepare sites, sources seedlings from within the CCMA, and uses local teams to plant. The Bluegum plantation industry has recently gathered figures indicating that for every $1 million dollars invested between 8.3 and 15.7 jobs are created. Every direct job in the industry creates between 0.8 and 1.3 jobs in the wider community. With the expansion of NIPF in the region within the current

strategy up to $4 million will be invested each year, and it is expected that the economic benefits will be at least as good.

Social benefits are similarly enhanced within the community, with more jobs meaning a more stable population, and with earnings from seasonal work magnified several times. Schools, social and sporting clubs, and local businesses all benefit. A more prosperous and stable farming sector also assists the community remain prosperous.

Conservation of native flora and fauna

Australia has the unenviable reputation of being a leader internationally in loss of biodiversity. Nineteen mammal species have become extinct in the last 200 years. In that period we have also lost 21 bird species and 79 plant species. Currently 50 bird species, 43 mammals, 17 fish, 29 amphibians, 51 reptiles, 118 insects, and 1009 plant species are classified as endangered or vulnerable.

Of Australia's 80 terrestrial bioregions only five have natural ecosystems with no known risk (these are principally in waterless desert). Fifty six are substantially altered, and 16 almost totally modified. Australia has the highest rate of vegetation clearance in the developed world, exceeded only by Brazil, Indonesia, Congo and Bolivia.

Australia has the worst land degradation, in terms of percentage of arable land affected, in the developed world (ACF). While figures differ, it is generally accepted that 6 million hectares in Australia are presently affected by salinity, resulting in reduced or no agricultural production. The forecast is for this to increase to about 20 million ha by 2020. Much of this is lower rainfall cereal growing or irrigated country where sparse forest and scrub were cleared during the period 1960 to 2000.

The CCMA region has lost its share of habitat and native flora and fauna. There are few of either the original mammal or large bird species native to the area, and the native grassland ecosystem has almost disappeared, with its indigenous reptiles, small marsupials, and ground nesting birds. Efforts to protect the remnant habitat in this ecosystem (almost entirely in private hands) is ineffective, largely due to the unspectacular nature of the fauna, and consequent lack of funding.

Dispersed NIPF sympathetically integrated into conventional farming has major habitat benefits. A study commencing in south-west Victoria is documenting the fauna in plantations. It compares the older plantations which include hollow bearing trees, with the younger monoculture plantings, and the plantings of diverse species. Data are gathered from 10-12 sites at set intervals from winter through summer. This information will add to existing data and help guide best practice. A general guide for landowners to enhancing biodiversity in plantations is also about to be released for the CCMA region.

Water quality and salinity

Availability of fresh water is an increasingly important issue in most countries. Australians use more than one million litres of fresh water per person annually. This compares to 2 million litres for Americans, 600,00 for Europeans, 350,000 for South Americans, and 200,000 for Africans (ACF). In Australia the expansion of residential developments, the lack of household water efficiency and grey water recycling, the changes in forestry practices in catchments, are all concerns. Water in Victoria, after five years of below average winter rainfall leading to severe water restrictions in many towns and cities, has become a major political, planning, and environmental issue.

The result is that there is growing interest now for developing environmental credits covering water quality. It is obviously relevant to the CCMA area, as it covers the catchments of streams flowing into reservoirs that supply up to 300,000 people. The planting of up to 2000 hectares a year for 30 years, targeted particularly at high priority sites, provides a rapid improvement in most problem areas, without reducing run-off and stream flows significantly.

Over-clearing and loss of habitat, the rising saline water table, and outbreaks of dryland salinity. Rising salt concentration in many waterways. Dairy effluent polluting streams in the higher rainfall part of the region. Erosion of stream

banks by uninhibited stock access. All of these are mitigated by a planned, dispersed estate of well-sited well managed NIPF woodlots in conjunction with perpetual diverse plantings of indigenous species.

Putting values on environmental benefits

A major part of the returns on investment into NIPF for the lower rainfall areas of the CCMA will come from the value of environmental credits. These areas have forestry MAIs as low as $5m^3$/ha/yr, but planting the sites is critical for reducing saline discharge into waterways and for enhancing or restoring habitat for native fauna. The whole issue of environmental credits is still being worked through in Australia.

There are some projects that have led the way. A project in Tasmania is a model for provision of environmental and production benefits by NIPF woodlots. It attributes dollar values to the various benefits. The figures used were developed in *An evaluation of environmental services provided by farm forestry- a discussion paper. URS Australia Ltd, 2003*, a paper commissioned by Private Forestry Tasmania PFDC. In this paper the estimations for environmental benefits provided by NIPF are as follows –

- drinkable water
- conservation of plants and animals
- soils for sustainable agriculture
- wood
- landscape
- green house gas abatement

Farm forests, both plantations and native forests, can provide a wide range of environmental services if they are properly integrated into farming systems and managed for sustainable outcomes. Few of these environmental services can be directly realised in monetary terms by landholders and in many cases salinity and water quality incur a cost to the landholder or consumer. Estimates of the values of environmental services from plantations under the farm forestry devolved grant project are shown below as assigned values. The base values are those reported in RIRDC Publication No 03/042.

ESTIMATED VALUES FOR ENVIRONMENTAL SERVICES ($/HA/YR)

Services	Value Range	Assigned value
Bio-diversity	3 - 22	5
Salinity and water quality	10 - 85	15
Watertable control	0 - 9	3
Landscape	8 - 23	8
Crop and livestock shelter	14 - 21	14
Fodder	3 - 10	3
Riparian Zone	0 - 2	2
Total ($/ha/yr)	38 - 172	50+

Carbon sequestration is another environmental service for which 1,000 ha of low rainfall farm forestry is estimated to sequester 65,000 tonnes CO_2 (during 2008-2012) and 2,000,000 tonnes CO_2 over 35 years. A CO_2 trading value of $20 per tonne is assumed.

Each hectare of plantation, planted for $1,500/ha, being the costs of materials and labour, returns an estimated:

- $50 per year of environmental services
- $40,000 or 2,000 tonnes of CO_2 taken up over 30-40 yrs
- $20,000 minimum profit from the sale of wood at harvest.

A $1.6M NHT investment in the Farm Forestry Devolved Grant resulted in 1,000 hectares of new plantation, or 1M trees, which over 35 years yields about $100M worth of services, employment and products:

- $2M worth of environmental services
- 2M tonnes CO_2 absorbed (equivalent to the annual exhaust from either 50,000 cars or 12.5M sheep) or $40M if CO_2 is traded at $20 per tonne
- $13M worth of standing trees at time of sale for harvest
- 3 full time plantation forestry jobs

This section is inserted with permission, from *An Integrated Farm Forestry Planning and Establishment Project – Stage 2. 2001-2003*, written by Arthur Lyons, of the Tasmanian PFDC, which commissioned the URS report.

Values for carbon sequestration and other environmental benefits are still plastic. However these figures from this real project provide a useful working basis at this time. It is likely that they will go rise.

CONCLUSION

NIPF has the scope to produce substantial amounts of sawlogs, energy, and value-added products in Victoria, as it does in many other countries. It offers the potential to reduce or reverse the serious environmental issues in rural areas. It diversifies and improves farm incomes, and, on adequate scale, it boosts local and regional economies. Investors seek well-managed sustainable forestry production that can produce commercial returns. NIPF to date has not been eligible because it was not aggregated into large enough parcels. Now the process of developing this has commenced. Political interest is focussed, and support is reinforced by evidence that global warming appears to be developing as forecast.

The economic benefits are considerable. Using figures given above each hectare of sawlog woodlot can yield a gross return of about $75,000, for an initial investment of about $2000, and a time period of about 30 years. Added to this are farm value rises, replacement of fossil fuel energy, import replacement, improvement in habitat, job creation and general community social, environmental and economic improvements.

Large aggregations of NIPF in Victoria can fill the shortfall in sawlog supply from native hardwood forests. Timber production by this approach does not attract the growing public opposition that both industrial scale plantation forestry and native forest harvesting often attract. The link essential to greatly expanding NIDP in Victoria has been the development of grower associations to manage large numbers of dispersed sites to a high standard.

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