

C.E. Lane Poole Memorial Trust

Lane Poole Award Study Tour, 1996-1997

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A REPORT TO THE TRUSTEES

By

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Summary

The purpose of the study tour was to investigate South Australian, Victorian and Tasmanian farm forestry practices with government, industry, farmer groups and individual farmers.

The topics investigated in these States were farm planning, direct seeding, species for sawlog production, species for saline sites, silvicultural management, windbreak design, farm forestry development and marketing, and extension and education programmes.

Major findings of the tour were:

- Property Management Planning workshops need to cater for farm forestry options. Training of P.M.P. Coordinators will address this.
- There is strong government and industry support in these States for the management of hardwood and pine species for high quality sawlogs.
- Markets need to be developed in W.A. for well managed eucalypt stands and a pricing structure set up for high quality sawlogs. There is keen interest in W.A. by landowners growing this product.
- W.A. needs to be more aggressive in sourcing Federal funding to further farm forestry development and education programmes.

Investigation of Farm Forestry Opportunities on Farmland in South Australia, Victoria and Tasmania

Introduction

Farm forestry has potential to meet two important needs; the need to combat land degradation and also to produce wood for industry. As well, there are many "side benefits" to rural communities, such as employment, creation of small business opportunities or assist maintaining dwindling rural populations and community services. Numerous forms of land degradation have been caused by over clearing, such as wind, water and soil erosion, salinisation, eutrophication, remnant bushland and therefore biodiversity decline, lack of shade and shelter for stock etc. This has led to questionable long term farm business sustainability in a climate of uncertain local and worldwide market scenarios. By assimilating, or integrating farm forestry, into farming systems there is strong evidence to suggest that it will assist reversing some of these trends.

For the purpose of this report, "farm forestry" is used to describe the deliberate placement (integrated) of commercial tree crops on farms that address land degradation problems and achieve multi-purpose benefits such as, shade, shelter, income from timber products, erosion, salinisation, water use and erosion control.

The Lane Poole Award gave me the opportunity to investigate South Australian, Victorian and Tasmanian farm forestry practices with government, industry, farmer groups and individual farmers. Particular areas of interest were farm planning, silvicultural management, site selection methods, matching species to soil type, extension and education programmes.

The study tour has increased the linkages and networks between myself and fellow farm foresters - all working towards a common goal of improving land degradation, increasing farmers incomes via diversification and creating new industries and therefore employment opportunities.

All States are in various forms of addressing their own land degradation problems via farm forestry. It is pleasing to report that W.A. (CALM) is leading other States in areas of site selection for various commercial tree species, whole farm or catchment planning, agroforestry research and is well advanced in many aspects of stimulating the adoption of farm forestry.

Itinerary:

South Australia 16 - 19th April, 1997

Places visited were: Murray Bridge, Adelaide Hills, Kuipo and Kanmantoo.

Victoria 19 - 29th April, 1997

Places visited were: a.) North East Region - Benalla, Strathbogie, Merton and Boho South
b.) Western Region - Hamilton, Melville Forest, Branxholme and Byaduk North
c.) Otway Ranges - Deans Marsh, Barwon Downs, Lavers Hill and Colac
d.) Western Gippsland - Strezlecki and Drouin.

Tasmania 29 - 3rd May, 1997

Places visited were: Launceston, Carrick, Tamar Valley and North Central Midlands.

Acknowledgements

I am indebted to the Lane Poole Trustees for giving me the opportunity to study farm forestry developments in the Eastern States of Australia and to broaden my outlook.

I am grateful to Mr Richard Moore for assistance with numerous contacts, places of appropriate study and comments on the report.

The following people are thanked for their assistance in hosting my visit, providing information or touring farm forestry sites:

South Australia - Primary Industries S.A.

Peter Bulman - Leader, Economic Revegetation

Jean Turner - Project Officer

Martin England - Project Officer

Victoria

Angus Howell - Project Officer, FFORNE Project - Benalla

Russell Washusen - farmer, CSIRO Researcher - Benalla

Rod Bird - Researcher, Dept. of Natural Resources and Environment,
Hamilton

Andrew Stewart - farmer, Farm Forestry Coordinator - Otways

: Frank Hurst - farmer, N.R.E. Officer - Leongatha

Tasmania

Mike Castley - Private Forests

The following aspects of farm forestry developments are discussed in detail:

1. Farm planning
2. Direct seeding
3. Species for sawlogs
4. Species for saline sites
5. Silvicultural management
6. Windbreak design
7. Farm forestry development and marketing
8. Extension and education programmes

1. Farm Planning

Property Management Planning (PMP) is a farm business planning exercise that integrates personal goals with enterprise production, economics, marketing and natural resource management. The delivery of PMP's, in South Australia for example, are through 8 separate workshops that involve 40 hours of study over a 4-6 month period for landowners.

The South Australian approach to P.M.P. is planning revegetation and management of remnant vegetation during the Property Layout and Improvements Module. This Module addresses the revegetation component and enables the participant to define long term physical improvement objectives, optimise land management, stock and vehicle movement and ensures natural resource protection. This module is the opportunity to introduce farm forestry options! My discussions with Jean Turner, a Revegetation Officer in the Clare Region (north of Adelaide), indicated that new enterprises such as farm forestry, fodder shrubs, native cut flowers etc are evaluated during the Enterprise Planning workshop, but there is no PMP workshop specifically tailored for farm forestry options. This is being reviewed at present. During the Bridgetown/Boyup Brook Rapid Rural Appraisal (R.R.A.) in Sept. 1996, it was clear that farm diversification was vital for farmers economic survival, and an example of this was tree planting, via the sharefarming agreements or private plantings. Other forms of diversification of farm incomes may include viticulture, olives, farm stay or bed and breakfast accomodation, native seed collection from farm remnant vegetation, aquaculture, floriculture, etc. However these do not always address land degradation issues.

Jean Turner is also currently undertaking a survey of farmers in her region to determine their attitudes to trees on farms and to evaluate the current PMP program. This involves filling out a 9-10 page questionnaire sheet. I advised her of the Rapid Rural Appraisal methodology and its outcomes in the 1996 Bridgetown/Boyup Brook Survey. This is an excellent way of doing market research ie farmers attitudes, sociological and economic problems, when human resources and time are critical to the outcome. Her method is time consuming and could be streamlined via the R.R.A. method.

Implications for W.A. P.M.P.

The W.A. approach to PMP is from an agricultural background, ie training from AgWA staff to farmers without discussing the roles that commercial trees play in farming systems. Unfortunately there is little emphasis placed on farm forestry options, which could be slotted into the Enterprise Planning Module. In other words, the role of trees in repairing land degradation and diversification of farm

income from timber products are not considered at the PMP workshops. I see this as a major deficiency to farm forestry potential and one that needs urgent attention. Considering that \$40m has been spent on the delivery of PMP Australia wide, and a further \$40ml allocated, the implications for farm forestry, or revegetation, need to be addressed for numerous reasons.

In Victoria, there are many examples of well planned farms that have integrated plantings of commercial tree species. The farms which I inspected indicated that the farmers had committed themselves to the whole farm planning methodology to address various forms of land degradation issues that were occurring. Numerous commercial tree species were integrated within the properties to provide shade, shelter, wind or soil erosion, salinity control and above all, to diversify their income from timber products.

One such example, is Don Jowett's 300 ha property near Hamilton, which has integrated plantings of about 100 ha of commercial species. Trees had been planted because stock shelter is a major priority. About every 10 years there are considerable stock losses due to extreme cold and winds. Don lost 10,000 sheep during such an event and this led him to plant trees. His farm averages 32 Dry Sheep Equivalent (DSE) but this is due to applying 400 kg/ha of superphosphate and a combination of good shelter. This is double local rates of fertiliser and DSE's. Last season he ran 680 first-cross ewes on 60 ha and produced 680 lambs at \$57/head.

Another example of a well planned integrated commercial farm forestry layout was Frank and Sharon Hurst's 57 ha grazing/agroforestry farm near Strezlecki in the West Gippsland area of the Strezlecki Ranges. This property had significant land slip problems when the property was purchased 12 years earlier and was planted to wide-spaced agroforestry to stabilise the slips. This has been achieved on the 25 - 36° slopes by careful farm planning and good land management with the following planting strategy:

- pre 1990. 1500 trees planted on steepest country and worst land slip area. Fenced off remnant bushland (1.2 ha) and planted *E.globulus*, *E.regnans* and *Ac. melanoxylon*.
- 1990 - 9.5 ha of *E.nitens*, *E.globulus* and *E.regnans*
- 1992 - 5 ha of *E.globulus* and *E.nitens*
- 1990 - 92. *Populus deltoides* planted for tunnel and gully erosion control.

The land slip problem had been halted by tree planting and this had also improved the landscape and aesthetic value of the property. Choosing a number of fast grown commercial species also provides income. All eucalypt species are grown at wide spacing for sawlogs and were pruned to at least 6 metres.

I was impressed with the remnant bush area which had been fenced off from stock. This has attracted up to 76 species of birds and is a natural habitat for wombats and wallabies. A series of paths throughout this area has been created as a "natural" bush walk which has added a special attraction to the property. Although it is only 1.2 ha, I got the impression that the area is more like 5-6 ha in size. Regeneration of *Ac. melanoxylon* has occurred among the numerous native species including tree ferns and *E.elata*.

The whole farm planning approach was also applied to integrate farm forestry on Andrew Stewart's 230 ha farm near Deans Marsh on the Otway Ranges. The farming enterprise, which supports two families, comprises prime lambs, wool, beef cattle and commercial timber. Land use problems included salty areas, waterlogging, lack of shade and shelter, lack of ecological balance, lack of land class subdivision and paddocks were too big.

It was decided that these problems could be solved using a whole farm planning approach with the integration of commercial and habitat trees which would enhance the property aesthetics and value. A long term view was adopted to achieve sustainable production and to develop income security with commercial trees playing an integral role as superannuation.

Considerable erosion had occurred on the Yan Yan Gurt Creek which runs through the property. In fact, in places the creek is 40 metres deep and has had to be fenced-off for stock and human safety reasons. A Landcare grant has assisted the 12 landowners along the Yan Yan Gurt Creek to fence-off the entire section. The planting of species on Andrew's property such as *E.nitens*, *E.globulus*, *E.maculata*, *E.camaldulensis*, *Cas. cunninghamiana*, *Cas. glauca*, *Calistemon* and about 30 others has stabilised this system by "streamlining". Fencing-off an area of native bush and a combination of direct seeding has led to the creation of a nature conservation area which has increased stock shelter on a wind-swept part of the farm. Good natural regeneration of *E.obliqua* and *E.viminalis* is occurring already within the fenced off area.

8 ha of *E.globulus* has been planted in belts and blocks in 1994 under a sharefarming agreement around the property. A further 3 ha of *P.radiata* cuttings were planted at 830 spha in 1995 and 1996 and will be grown as pruned high quality sawlogs.

I saw examples of the "Potter Farm Planning" method in the Melville Forest area. This project, costing about \$1 million, was set up on 16 farms over a 3 year period from 1985. The standard "Potter shelterbelt" is a 4 row combination of small, medium and tall species (2 outside rows) planted at 1000 trees/ha. Local tree species were integrated on these farms, but unfortunately there were no commercial species planted. This may be a major failing of the project because farmers will have achieved some great shelter benefits, but not derive any income from them.

2. Direct Seeding

Direct seeding of eucalypt species has been successful on a range of soil types in Victoria for some time. For example, during the trip from Ballarat to Hamilton, I was impressed with 40-50 year old direct seeded *E.cladocalyx* shelterbelts. These belts are well established and appeared to be the main source of shade and shelter on the overcleared Tablelands. They are currently being partially clearfelled and harvested for commercial firewood. Recoppicing of the stumps is providing ongoing shelter. Although unmanaged during their lifetime, another market for the thinnings could be sawlogs.

Farmers participating in the Glenelg Region Integrated Farm Forestry Project (or GRIFF Project) are being encouraged to revegetate their properties by direct seeding with species such as *E. maculata*, *E. viminalis*, *Acacia melanoxylon*, *Ac. mearnsii*. These sites, on "hard cracking clay" soils, were direct seeded the previous October (seedlings were 6 months old). Following ripping and spraying with *glyphosate* (2-4 l/ha), the sites receive a second application of *glyphosate* 6 weeks later. Where scalping is used as well, residual herbicides such as *chlorsulfuron*, *simazine*, *atrazine* or *oxyfluorfen* is added. Except for one site, (located 50 km south of Hamilton) where weed control was poor, these sites had very good germination of most species. These species were well established, and I was impressed with the growth and general form of *E. maculata* and *E. viminalis*. In W.A., *E. viminalis* has very poor form, making it useless for sawlogs or pulpwood. However, I felt that the initial stocking rate was too high, indicating that the seed mix was excessive. Culling is necessary to release well formed trees from competition.

During our visit to these sites, form, or corrective, pruning was demonstrated to farmers on *E. maculata* using small secateurs. These trees ranged in size from 1-2 metres high and nearly all required form pruning. The farmers were receptive to our demonstrations. The direct seeded species were being grown specifically for high quality sawlogs.

A low rainfall site at Peter Bulman's farm at Katmantoo in South Australia, has been revegetated using a combination of direct seeding and hand planting a range of species. This 80 ha farm is located in a 420mm rainfall zone on medium shallow clays - a challenge for any tree planter! Peter has numerous aged plantings of commercial species such as: 16 year old *E. cladocalyx*, 5 year old *Callitris collumellaris* and *Callitris preissiana*, 3 year old *Melaleuca uncinata*. and 2 year old *Pinus canariensis*. *Melaleuca uncinata* is being grown for the brushwood fencing market and was direct seeded in a twin row spiral arrangement. An area of 3 ha was fenced off and direct sown with native species to create an idilic nature conservation habitat where numerous species of birds were observed. The surrounding farmland is totally devoid of trees and vegetation and this farm serves as a useful model in a rather desolate landscape.

In Tasmania, direct seeding has been successful in assisting replacing vegetation on farmland due to rural tree decline of the native species *E. amygdalena*. Direct seeding is also aiding biodiversity repair, bush restoration and conservation of remnant vegetation (*E. pauciflora*). Areas which are to be rehabilitated are fenced off and sprayed with herbicide prior to seeding. It appeared to that most Landcare Grant plantings were direct seeded with native species with no potential commercial species included.

3. Species for Sawlogs

There is a big push from Government and agency groups for clearwood timber regimes using a range of eucalypt and pine species in the Eastern States. Funded groups such as the GRIFF Project, Agroforestry Networks and FFORNE Project, are fostering the movement with strong educational emphasis on early pruning and thinning with the objective of high quality sawlogs.

Species that have been grown specifically for this purpose are: *E.globulus*, *E.nitens*, *E.maculata*, *E.grandis*, *E.saligna*, *E.regnans*, *E.viminalis*, *Acacia melanoxylon*, *C.lusitanica*, *C.macrocarpa* and *P.radiata*.

Agency groups, such as CSIRO and Melbourne University, are investigating the sawn timber properties of some of these species which may justify government and farmer investment in short rotation sawlog regimes. For example, Russell Washusen is undertaking a PhD on the sawmilling properties of 25 year old *Eucalyptus globulus*, *sideroxylon*, *cladocalyx* and *maculata*. This is being done in conjunction with Gary Waugh (CSIRO) and Melbourne University. During discussions with Russell, he made the point that the W.A. study on 13 year old *E.globulus* (R.Moore et al, 1996) should have got at least a 50% recovery on its green sawn timber, instead of the reported 34.7%. This indicates that sawmill technology and knowledge in W.A. needs to be upgraded. The Victorian Timber Industry Training Centre at Creswick, is an example of using sawmill technology to improve timber recovery rates. This sawmill, air-drying sheds and high technology planer shed was inspected with former CALM officer, Rob Rule. The sawmill was unique in that it uses two line-bar carriages during the milling process. The larger line-bar carriage is part of the initial log breakdown and a smaller one is used during the re-saw process. The advantage of a line-bar carriage is that it is designed for tapered logs and is useful in cutting malformed or bent logs. The main species milled at Creswick are *E.regnans* and *E.obliqua* from native forest.

One of the best demonstrations of farm forestry design options was seen at the Landner Park Agroforestry Demonstration site near Drouin on West Gippsland. A range of species suitable for high quality sawlog production were observed. This project commenced in 1978 with a 2 ha block of *P.radiata* planted to demonstrate a "traditional" woodlot planting (ie, high initial stocking and no pruning) and a wide-spaced regime of 140 spha. Other demonstrations are:

- single row of pruned *P.radiata* and low shelter species of *Pittosporum undulatum* - planted 1989-90
- double rows 15 metres apart of *P.radiata* at 550 spha - planted 1988
- a dense planting (1,330 spha) of *Ac. melanoxylon* grown for sawlogs (80 spha final crop) - planted 1992.
- native timberbelt 3 rows 7 metres wide using *Ac. melanoxylon* and *Cas. cunninghamiana* (centre rows) and *E.maculata*, *E.nitens*, *E.muellerana* (outside rows). Other species in belt are *Hakea salicifolia* and *Mel. ericifolia* - planted 1993-94.
- *E.regnans* planted at 600 spha in 1978.
- *E.globulus* planted at 1000 spha in 1992 and reduced to 500 spha at age 2 pruned to 6 metres at age 5.

The soils were deep reddish/brown loams which reflected the very good tree growth rates.

Fencing off creeks and streams from stock can minimise erosion and prevent excess nutrients from reaching major water bodies such as estuaries and lakes. Planting a range of commercial tree species in conjunction with native species can act as a biological filter to these nutrients. In W.A. this process is known as "streamlining". Planting 30 "biodiversity species" with species such as *E.nitens*, *E.globulus*, *E.maculata*, *E.camaldulensis* and *Cas. cunninghamiana* is well demonstrated on the Yan Yan Gurt catchment near Deans Marsh in Victoria. As farm forestry coordinator for the Otways Network, Andrew Stewart has been responsible for organising the twelve farmers on this sub-catchment to fence off the river. Financial assistance from government grants has assisted this process and also added a wildlife corridor to the area.

On Andrew's property, the objective is to prune the commercial species for sawlogs. As these trees were two years old, I was able to demonstrate form, or corrective, pruning on these species.

4. Species for saline sites

Saline creek plantings on the Dundas Tablelands area near Mooralla, 40 km north of Hamilton were inspected with Dr Rod Bird. These soils, which are similar to W.A. (laterised tablelands of sedimentary origin), have natural stands of *E.camaldulensis*, *E.ovata* and *E.melliodora* in the 650mm rainfall zone. *E.melliodora* is one of the species I recommend for planting in W.A on sites which are between 50 and 100 mS/m for its timber, aesthetic and honey usage.

Salinity in this area generally occurs within the narrow confines of creeklines, but was observed to be spreading to adjacent farmland in some cases. Salt creep was halted at one site where tall wheatgrass had been sown in conjunction with a planting of trees. The adjacent farm without tall wheatgrass was glistening with salt crystals. The best performing species in the plots were *Euc. occidentalis*, *Euc. camaldulensis* var. *albacutcha* and *Casuarina glauca*. These species were showing signs of nutrient and salinity effects. Rod commented that *Cas. glauca* is not recommended for future plantings because of its ability to sucker and take over sites. He has also shown in trials that *E.maculata* has shown moderate salt tolerance but is susceptible to frost. Although it is adaptable to a range of soil types, it dislikes heavy clay soils.

Chris and Irene Callahan's 150 ha dairy farm, 20 km south west of Deans Marsh, near Barwon Downs is an example of early (since 1989) trial and error plantings to combat encroaching salinity. This property has 12% of recharge sites planted to assist salinity control. Plantings began on a saline patch in 1989 with *Acacia mearnsii*, *E.viminalis* and *Casuarina cunninghamiana*. These trees were observed to be suffering the affects of salt and nutrient problems, although *Ac. mearnsii* was the best of them. Poor early weed control was also suggested as affecting tree stress. It was not known what the Electrical Conductivity was at this site, but I suspect that it was too high for these species. A nearby belt of 4 year old *E.globulus*, *E.nitens*, *E.cypellocarpa* and *Ac. melanoxylon* were not growing well due to poor form and a shallow to clay soil type.

Tree establishment of recent plantings, such as the 4 year old belt, were much better due to improved knowledge of site preparation and weed control. However, I felt that there was not enough emphasis placed on soil type/species selection, which could make the commercial viability of the species questionable. They were being grown as high quality sawlog production.

The Corangamite Salinity Region (1000 mm rainfall zone), has been mapped for salt. It has shown that there is 13,000 ha of affected farmland, and in some areas, such as the Heytsbury, it is increasing at 9% a year. Calahan's property is within this Salinity Region, and it has been suggested by the Dept. of Natural Resources and Environment (N.R.E.) that 20% tree coverage of farms will combat salinity. Commercial species recommended for this are *E.viminalis*, *E.obliqua*, *E.maculata*, *E.saligna*, *E.globulus*, *E.cypellocarpa* and *Ac.melanoxylon*.

5. Silvicultural Management

There is considerable effort being spent by government agencies on the education of farmers in tree management (pruning and thinning) of radiata pine and a range of eucalypt species. *Eucalyptus nitens*, *maculata*, *sideroxylon*, *regnans*, *saligna*, *globulus*, *viminalis* are some of the species grown for high quality sawlogs. Existing markets for thinnings are fence posts for preservation, pulpwood and Medium Density Fibreboard. Future markets will revolve around sawn timber from fast grown, wide spaced eucalypts.

At the Dept of N.R.E.s' Pastoral and Veterinary Institute, Hamilton, they are demonstrating using a selection of improved cutting material of *P.radiata* which was planted in single row windbreaks and high pruned for sawlogs. It was interesting to note that the pines are overpruned to retain between 20-30% of green crown. The reason for this is that tree growth is sacrificed to maximise the pruned log length of 6-7 metres. This is pertinent when the last pruning lift is carried out at about age 8-9 years when knotty cores become large. In W.A. it is common to retain at least 40% of tree crown during any pruning lift.

Another example of overpruning sawlog species occurred at Don Jowett's 4 year old *E.maculata* and *Acacia melanoxylon/mernsii* provenance trials. These were to be grown as a sawlog regime and were overpruned, which will slow their growth rate. Don's "reasoning" for this that he only had time on weekends, so tends to overprune even though he would be culling some of those trees anyway. It was pointed out to him that he could save time by pruning only those trees that required pruning.

John Fenton's Lanark property near Braxholme has trial plantings of 5-8 year old *P.radiata* cuttings, 4 year old *Cupressus lusitanica* and *macrocarpa* provenances and windbreak demonstrations of *P.radiata* with native shrubs. The cypress was showing evidence of canker disease, caused by pruning too early. This is one of the problems of this species where pruning needs to be done at an early age to minimise the defect core size. This 800 ha property is unique for the area because of its integrated commercial tree species and windbreak systems across the farm. Farm forestry and shelter/habitat plantations account for 9.8% of the farm, or 78

ha. As well, 51 ha, or 6.4% of the farm, has been set aside as permanent wetlands. John Fenton claims that *P.radiata* is his "bread and butter" species and plants 1-2 ha each year.

When growing wide-spaced sawlog regimes, it is generally recommended that a thinning be carried out at the time of pruning. This releases the competition of the crop trees and pruning is concentrated on crop trees. Thinnings can be used for firewood, dried and used for preserved fence post or left to decompose on the ground. Fence posts which are preserved using creosote or C.C.A. can save the farmer about half the normal retail price of a post. This example was demonstrated on Frank Hurst's property. Thinnings from this farm have produced a quantity of fence post material which was dried on site and treated at a local CCA plant for about \$1.53 per post. Inspection of these posts showed that there was minimal end and surface checking, indicating that drying was at an even temperature. The logs were also left in the paddock in long lengths after debarking and this may have reduced checking during the drying process. Other thinnings have been stacked to dry and will be used for firewood.

Growing and managing commercial species such as *E.nitens* and *Acacia melanoxylon* were grown specifically to stabilise a land slip problem in the Tamar Valley region of Tasmania. Alternate rows were planted with these 3 year old species and were in the process of receiving their first form pruning. Stabilisation of the hillside had occurred at this stage.

It is interesting to note that Pruned Stand Certification is being established as a means of ensuring that pruning is done on time and small knotty cores produced. This assists the buyer, or sawmiller, at the time of purchase/harvest, as there is a guarantee that the size of the diameter over the stubs (DOS), or knotty core is known. People have been trained so they are certified to carry out inspection of farm grown pruned stands. Measurement of diameter over stubs and pruned height are taken. Farmers are therefore urged to keep records of pruning dates and obtain certification following each operation.

The Australian Forest Growers Association is looking at implementing this system in W.A. at present and this will be of benefit to growers and sawmillers alike.

Although not related to directly to silvicultural management, the Tasmanian Government's approach to feral weed management could be a useful model to communities elsewhere. It has been reported that weeds cost about \$4 million in lost production and control in the Tamar Valley and about \$33 million in Tasmania. The Tamar Valley Weed Strategy is a community based organisation that is trying to combat the spread of weeds within the Tamar Valley region. It is effectively using community feelings of ownership and cooperation and is based on landowner information to assist identify infested areas. Weeds under scrutiny are Crack Willow, gorse, hawthorn, ragwort, pampas, fennel, blackberry and radiata pine. It was clear that legislation to enforce weed control since 1904 had not worked. Landowners are supplied with an aerial photo enlargement of their property and given advice on weed species for easy identification. The use of an aerial photo has other potential land management advantages for the landowner besides weed identification, such as farm planning, farm forestry options, remnant bush preservation and management and erosion control.

6. Windbreak Design

Numerous windbreak layouts and designs were seen in the various states, which were providing many uses to the farm properties. Rod Bird has been researching design patterns of integrating windbreaks on farmland with a range of commercial and shrub species and the associated tree management. The main emphasis with windbreaks has been on commercial tree species, such as improved selections of radiata pine (cuttings), *acacias*, *allocasuarinas*, cypress, eucalypts etc.

This research has highlighted the increase in agricultural production from well designed windbreaks or timberbelts. Windbreaks have been reported as having numerous shelter benefits, such as, improved plant growth, reduced animal stress, reduced stock losses from exposure and reduced windspeed across farmland which also improves fire suppression.

Various types of windbreak designs were inspected which provided excellent shelter for stock. An example of a well designed narrow two-row windbreak, occupied a width of 3 metres and included a single row of *P.radiata* cuttings, 2.5 metres apart with the second row of *Acacia verticillata* or *iteaphylla*. One of farmers' frequent excuses for not planting trees is that "trees occupy too much good land", which is a poor excuse for little commitment!! Another example of a narrow effective windbreak design with good permeability was a single row of *P.radiata* cuttings with a low species of *Pittosporum undulatum*. The pines were again overpruned, in my view, to 8 metres "to maximise the clearwood bole."

An example of a poorly designed shelterbelt with *Acacia plessima*, *mearnsii*, *melanoxylon*, *falciformis* and *longifolia* was also observed at Hamilton. As many of the Acacias are short lived, careful selection and placement of them within a windbreak is important. For example, *Ac. mearnsii* or *melanoxylon* should not be planted on the outside rows. *Mearnsii* tends to spread out across the fenceline often breaking the fence with its branches and it is also root competitive with pasture. Both of these species should be grown inside the belt to push their form upwards, especially if grown for commercial use. Pruning of these two species make them suitable for sawn timber. *Ac. falciformis* also had straight form and is a species that should be tested under W.A. conditions.

One of Rod Bird's interesting designs for overall paddock shelter is the "Icosapentagon woodlot" layout. This has a fenced diameter of 79.5 metres, circumference of 250 metres and encloses 0.5 ha. Depending on paddock size, 5-6 of these woodlots are planted across the field. There are 25 wood fence posts and 25 metal posts alternating at 5 metre intervals around the circle. There are typically 430 timber species planted at 3 x 3 metre spacing and 120 shrubs spaced 2 metres in a ring.

7. Farm Forestry Development and Marketing

The Dept. of Natural Resources and Environment is fostering the development of industries via the "Farm Forestry North East" Project (FFORNE). This is a State Government funded tree planting project on farmland, injecting \$3.6m over three years. The three main aims of this Project are:

- To commence building a hardwood resource to demonstrate a model to industry and potential investors that they can invest in future development of that resource.
- To pursue the involvement of local government, industry and investment to develop the future of farm forestry on a regional level.
- To provide quality and consistent information on farm forestry.

The Project is to establish 800 ha each year primarily for sawlog production and aiming for a resource of about 16,000 ha. 340 ha was planted in 1996 on 26 properties and a further 700 ha for 1997 is proposed. Species to be planted on irrigated sites are *E.globulus*, *E.grandis* and *E.saligna*. High rainfall sites (>700mm) will be planted with *E.globulus* and rainfall >900mm with *E.nitens*. Markets are several post preservation plants using young thinnings; a Medium Density Fibreboard mill utilising thinnings and residues from harvesting and processings, a sawmill utilising sawlogs, and a Laminated Veneer Lumber plant utilising high quality sawlogs.

Landowners commitments are to provide at least 10 ha of cleared land and \$500 cash per ha towards the cost of plantation establishment and management. Planting areas are to be fenced-off prior to planting and fencing costs are met by the landowner as well. On irrigated sites, the equivalent of 650mm rainfall is to be applied in two weekly applications between November and April by landowners. They also provide the insect and vertebrate control measures and firebreak system. An example of farmer's net returns under this Project for 10ha of *E.globulus* in 750mm rainfall zone and a soil depth of 85cm are \$108,540. This figure depends on distance to mill, site factors, climate and products harvested.

Some of the sites I visited at Strathbogie and Merton with the Project's Field Manager, Burnie Robb, were steep (>16°) and will have some harvesting problems, especially for low volume early thinnings.

This Project has some other problems regarding timing of pruning and thinning. 10 ha is a substantial area for a farmer to manage on his own to produce sawlogs while maintaining his farming business. This probably opens the door for regional tree pruning teams to be set up which will assist the rural unemployment problems that exist. However, this will depend on farmers having the finances to employ them.

Some form of inspection or quality control of the sites will need to be undertaken by N.R.E., so that pruning is done on time.

8. Extension and Education programmes

An education programme is urgently required in W.A. to address the problem associated with Property Management Planning, where farm forestry options are not presented to farmers. I believe that CALM's Farm Forestry Unit needs to run courses for Agriculture W.A staff members who are presenting P.M.P. workshops. It may also be possible to present this directly to farmers.

My interaction with fellow farm foresters was an important part of the study tour because it increased the linkages and interstate farm forestry network. For example, I gave a three and a half hour presentation to the South Australian Department of Primary Industries Farm Forestry Group comprising Peter Bulman, Hugo Hopman, Sally Collins, Martin England and Jean Turner, regarding developments of CALM's Farm Forestry Unit, CALM's Sharefarming Schemes and our approach to whole farm planning. There was considerable interest and interaction between the group and myself and I considered this was a useful exercise by the sharing of information. This typified the tour, as my hosts and I shared our experiences with agroforestry or farm forestry development. Meeting a number of farmers who are practising their own form of farm forestry was also a useful experience of mutual benefit. I was able to pass on my silvicultural knowledge to these people, which was appreciated.

Another useful extension activity on tour was meeting the Chairman of the Otways Agroforestry Network, Mike Edwardes. Mike has a 90 ha sheep farm and tree nursery near Lavers Hill at the southern end of the Otway Ranges (1800 mm rainfall zone and steep). Mike was also a participant on the Master Tree Growers Course. I gave advise on tree management (pruning) and weed control. His farm is planted with various species including 29 year old unmanaged *P.radiata*, 18 month old *Cuppressus lusitanica/macrocarpa* provenance trial, *E.nitens*, *E.globulus* and *P.radiata* hedged cuttings. Some of the 18 month old *E.nitens* were 5.5 metres high!!

A very useful extension package was demonstrated by Martin England, a Revegetation Officer at Kuipo with Primary Industries S.A. He gave a presentation of the Geographic Information System (GIS) computer model. The GIS data base showed potential farm forestry sites which could be planted to potential commercial tree species in S.A. This package shows locations of farmers' land use type, rainfall zones, particular soil types, suitable species such as *E.maculata* or *E.globulus*, competing land use types etc. This has useful resource inventory possibilities for industry and markets. A quick pass of the potential of farm forestry for a particular locality could be done over the phone. Using this model may save a lot of time for extension officers doing field inspection of farmland for farm forestry. In-paddock soil surveys would need to confirm the potential site.

One of the most successful Federal funded education and extension programmes observed was The GRIFF Project in the North East Region of Victoria. The GRIFF Project was aimed at increasing the economic and environmental benefits to farmers in through the establishment and management of woodlots and timberbelts for high value clearwood.

This was achieved by:

- Initiating a planned farm forestry industry through Landcare groups - beginning with establishment of small-scale demonstration woodlots and timberbelts
- Encouraging farmers to integrate tree planting options into their farm plan to satisfy multiple objectives (timber, shelter, land protection, wildlife conservation and stream water quality).
- Promoting and demonstrating best practice (weed and pest control, pruning and thinning) for existing and new stands of native and exotic timber species for clearwood timber production.

As a measure of success over three years this Project achieved:

- Establishment of 209,075 trees plus 6 ha of direct seeded trees. Species which were planted for research purposes included provenance trials of *E.maculata*, *E.viminalis*, *E.sideroxylon*, *E.cypellocarpa*, *E.dunnii*, *E.grandis*, *E.saligna*, *Acacia melanoxylon*, *C.cunninghamiana*. These were planted on 43 farms and approximately 41 ha.
- A total of 87,700 trees were planted for demonstration purposes on 112 ha involving 82 farmers.
- Numerous field days, workshops and seminars involving more than 400 landowners.

Educational workshops for farmers have been developed under a program known as Wool and Rural Industries Skill Training (WRIST) which is based at the Pastoral and Veterinary Institute at Hamilton. This Group delivers courses around Australia to industry groups with programs tailored to suit their needs. For example, land management tours, farming and computers, chemical residues in wool, shearer training and wool marketing. The managers of WRIST were receptive and interested to learn how my field days in W.A. were structured and delivered. It was suggested to them that a one-day course could be a successful method of delivery with inside classes followed by outside practical work to reinforce the theory. Handout notes were added to complement the session.

One of Victoria's most successful extension activities has been through the Otways Agroforestry Network. The Otways Network has employed a part time Coordinator, Andrew Stewart - who is also a farmer at Deans Marsh. It is funded under the National Farm Forestry Program and is aimed at providing a timber resource for industry, improving tree growing skills of landowners, addressing land degradation concerns and other farm management concerns and developing a strong self reliant community group. The network is made up of the following stakeholders: The Barwon Valley Farm Trees Group, Heystsbury-Otway-Colac Trees Group, Vic. Farmers Federation - Birregurra branch, Apollo Bay Landcare Group and the East Otway Land Protection Group.

The impressions I got were that these objectives were being met in a great way. Having a part-time coordinator makes this network a very efficient provider of farm forestry initiatives by producing local newsletters, organising field days and providing assistance to landowners.

Andrew also explained how the Network had set up The Master Tree Growers Course through Melbourne University. This course was attended by 18 landowners to improve their farm forestry skills and identify and evaluate opportunities for

other farmers. The Course involved 20 hours of workshops and presentations and 16 hours of field inspections. As a follow-up to the course, participants were asked to interview 90 farmers who had answered a mail survey about farm forestry options for their properties.

The Master Tree Growers Course was run in W.A. during 1997 with participants.

The neighbouring farm forestry network to the Otways is the Corangamite Farm Forestry Network, which has similar aims to the Otways Agroforestry Network. The Farm Forestry Project Coordinators at Dept. of N.R.E. at Colac, since 1993 are Liz Hamilton and Sue Harris. The Network is made up of hundreds of people with a common interest in farm forestry and include landowners, industry representatives and government field officers. Many of the Field Days that are organised by them are aimed at growing commercial tree species which are managed to produce sawlogs or other commercial use. Liz and Sue were keen to learn of our site selection methods in W.A. and the role of CALM's F.F.U. in W.A. This was a useful interaction with fellow farm forestry workers who have similar roles with farmers in the planting and managing of commercial tree species. Farmers need to realise that timely and correct methods of tree management can add value to their trees and still provide the landcare benefits such as salinity control, shade and shelter, habitats for birds and mammals etc.

The Gippsland Agroforestry Network and Dept. of N.R.E. have set up one of the oldest and most frequently visited farm forestry sites in Victoria. This 8 ha "Landner Agroforestry Demonstration" site south of Drouin (West Gippsland), is often used for Field Days and tree seminars discussing tree layouts, design or silvicultural management. The earliest planting commenced in 1978 with *P.radiata* woodlots. Other examples of species and layouts at this site are described in the earlier section titled "Species for Sawlogs".

Conclusion and recommendations

The following highlight some "take home messages", or my impressions of aspects of farm forestry which may have some application for W.A.:

- **Farm forestry planning.**
 - Property Management Planning (P.M.P.) needs to identify farm forestry within its current framework, so that land degradation issues, income diversification and landcare benefits are identified. This can be achieved by training AgWA staff involved in P.M.P. workshops with farmers in matters relating to farm forestry during the Enterprise Planning Module.
 - Farm forestry in W.A has identified predominantly commercial tree species whereas examples such as the Victorian Potter Farm Planning scheme did not. This scheme will supply shade and shelter benefits to farms, increase wildlife habitat corridors and add biodiversity status, but farmers will not receive any income from their plantings as timber was not considered an end use.
 - Whole farm planning methodology will continue to supply long term advantages to farmers where farm forestry is adopted. The "partnership" between share farming agreements will become more beneficial to both parties where the holistic planning approach is utilised because of its "intimate"

diagnostic and design system.

It is clear to me that the approach of CALM's Farm Forestry Unit to whole farm planning is way in front of any I saw during my visit.

- **Silvicultural management.**

There is strong government and industry support in South Australia, Victoria and Tasmania for the management of radiata pine and eucalypt species for high quality sawlogs. Markets have been recognised and farmers are partially subsidised for the establishment of this type of farm forestry.

Although there is considerable amount of interest from landowners in W.A. growing and managing eucalypts for high quality sawlogs, markets are not yet established. This may be possible through the formation of cooperatives to assist marketing of this product.

It may be useful testing *Acacia mearnsii* for use as high quality sawlogs, as this species has acceptable growth rates and is currently being trialed for pulpwood in W.A. This may add another dimension to the utilisation of this species, as it was observed growing on saline sites and has an attractive sawn appearance.

- **Site selection methods.**

It is pleasing to report that CALM's site selection system for the establishment of *E.globulus* plantations is clearly better than any system observed during my tour. In fact, many groups were keen to learn about our system, especially regarding soil depth and drought susceptibility.

- **Matching species to site.**

As *E.maculata* is widely grown in W.A. as a potential species for high quality sawlogs, particular provenances are susceptible to frost damage. This is one of the species that will have potential as a "supplementary species" in the lower rainfall zone, as it is readily adaptable to a range of soil types and has moderate salt tolerance. Potential sites for Maritime pine in the wheatbelt are prone to frost, and will therefore need scrutinising with the "other" species. *E.cladocalyx* and *E.sideroxylon* may also be included in this category for firewood and sawlog purposes. Some tree breeding work may be required to screen the best provenances. The performance and tolerance of *Acacia mearnsii* and *Casuarina cunninghamiana* to saline sites needs evaluation, as it was observed to be growing well there.

- **Extension methods.**

Farm Forestry networks are well established in Victoria due to widespread Federal funded programmes. When one compares the awareness of farm forestry among farmers there, compared to W.A., it appears that this funded extension activity is highly successful. I therefore believe that we in W.A. need to become more aggressive in sourcing external funding for farm forestry education programmes. This will assist cover the wide geographical gaps that occur in W.A. that are not being serviced at present.

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