



Rural Industries Research & Development Corporation

The *Short* Report

On-Site Processing For Farm Forestry - Does It Stack Up?

SR38

THE FULL REPORT

This is a summary of the 188-page full report of the same title (UM-22A, 98/079) available from RIRDC on phone 02 6272 4819). The researchers, Dr Mark Stewart and Ian Hanson, can be contacted on 03 5321 4150.

A lot has been written about the benefits of planting trees on farms as part of a property management plan and a regional forest industry development strategy.

Where landholders plan to make commercial returns from farm forestry, it is important to have a strong understanding of the markets for their forestry products. Just like meat, fibre and grain products, forest products require processing before markets will buy them.

Forest processing industries have developed around existing natural forests or large plantation forests and there are limited market openings for small forest growers in Australia. One strategy is for forest growers to process timber on-site at the time of harvesting.

The National Commercial Agroforestry Strategy identified that limited information about the viability and management of on-site processing was a barrier to widespread adoption of farm forestry. So the Joint Venture Agroforestry Research and Development Program (JVAP) commissioned research to investigate utilisation practices for the farm forester. The research was managed by RIRDC.

Background

On-site processing of farm-grown timber has been suggested as a means of overcoming marketing difficulties experienced by forest growers because of relatively small holding size, poor timber quality, and inaccessibility of some farm forest plantings for commercial harvesting.

JVAP research into utilisation practices for the farm forester found that the on-site processing system with the greatest potential is portable sawmilling. This is because the returns for sawn timber can be high, and the costs associated with operating a portable sawmill can be relatively low.

Twenty-five portable sawmill operators in Victoria, and 14 portable sawmill manufacturers, were interviewed during implementation of the JVAP research project. This provided an understanding of issues involved with owning and operating a portable sawmill so that the true costs of on-site sawn timber production and its potential returns could be assessed. The JVAP research compared the level of automation, the productivity, and prices of portable sawmill systems.

Information gathered from the JVAP research was used to construct scenarios that indicate conditions which have to be met for a viable portable sawmilling enterprise.

Portable Sawmilling

Portable sawmilling is taken to include production of green, air-dry and kiln-dry sawn timber using sawmilling equipment which is taken to the farm forestry site, operated there, and then dismantled. The JVAP research found that nearly half the portable sawmill operations in Victoria are contract sawmillers on farm foresters.

There are numerous portable sawmills on the Australian market, ranging from simple lightweight frames to which a chainsaw can be attached, to complex horizontal band saw mills, single circular saw units and twin circular saw units.

There are also benchesaws consisting of a stationary headrig and a carriage onto which sawlogs are placed and subsequently moved through the saw. In general, the JVAP research found that the most productive sawmills possess the highest level of automation, and these are relatively expensive.

Portable sawmills have the potential to contribute to both industrial-scale and farm forestry. At an industrial scale, portable sawmills have the potential to use timber resulting from salvage operations following natural disasters and commercial harvesting operations in existing forests.

At a farm forestry scale, portable sawmills have the potential to deal effectively with small-scale and relatively isolated plantings which have not attracted industrial-scale timber processors.

Advantages of portable sawmilling are widely documented and include:

- supplying niche markets which cannot be served from industrial processors;
- adding value to farm forestry timber on the farm, thus capturing more margin for the forest grower;
- return of residues such as bark, sawdust and edgings to the forest site;
- flexibility to meet changing local demand and supply opportunistic markets;
- reducing logs to commercially recoverable timber on-site to reduce transport costs;
- harvesting and milling timber in otherwise inaccessible sites; and
- harvesting and milling timber from plantings which would otherwise be too small.

Nevertheless, portable sawmills have a number of disadvantages, including relatively low productivity, high labour intensity, and a requirement for heavy lifting at or close to ground level. In addition, the working environment may not conform with best industry practise for occupational health and safety.

The dimensional accuracy and product finish of timber sawn with portable sawmills may not be of as high quality as timber from industrial-scale mills. Similarly, portable sawmills are unlikely to be

able to handle small diameter sawlogs from rapidly grown eucalypts with their associated high internal growth stresses.

The full report of the JVAP Research presents detailed findings from a survey of portable sawmills. The survey found that:

- Chainsaw mills - are cheap but labour intensive with low conversion percentage (because of wide saw kerf), a need for double handling and poor timber finish.
- Horizontal bandsaw mills - have high conversion percentages because of a narrow saw kerf and consequently relatively low fuel consumption and can cut wide logs, but these mills require two passes to produce dimensional timber and bandsaw blades require frequent sharpening and setting and are prone to damage in hardwoods.
- Single circular saws - have low power requirements and produce dimensional timber with two passes of the saw over the log but have a wider saw kerf than bandsaws and are labour intensive because they have a low level of automation.
- Double circular saws - can handle very large logs, cut dimensional timber with one pass of the saw and have a facility to return sawn timber to the operator with the return of the saw carriage, but also possess a relatively wide saw kerf and have difficulty in managing partially sawn logs.
- One-person bench sawmills - these portable mills enable accurate sizing of products, have high productivity and have labour saving log handling facilities; but are relatively expensive and are the least mobile of the portable sawmills surveyed.

The JVAP research compared the level of automation per \$1000 of sawmill purchase prices for different portable sawmills. This suggested that the lower priced sawmills such as single circular saws offer more value for money than more expensive sawmills such as some double circular saws.

Table 1 summarises the main advantages of particular types of portable sawmills.

Table 1: Main advantages of Different Portable Sawmills

Sawmill category	Main advantages
Chainsaw mills	<ul style="list-style-type: none"> • Rugged and relatively inexpensive • Extremely portable
Horizontal bandsaw mills	<ul style="list-style-type: none"> • Safe • Increased timber recovery • Simple production of slabs and wide boards
Single circular sawmills	<ul style="list-style-type: none"> • Competitive prices, good value for money • Able to handle difficult timbers • Relatively low amount of sawlog handling required
Twin circular sawmills	<ul style="list-style-type: none"> • Powered saw carriage reduces physical work required • Sawn timber return facility reduces labour requirements
Bench-type units	<ul style="list-style-type: none"> • High productivity makes it suitable for large volumes of low value timber

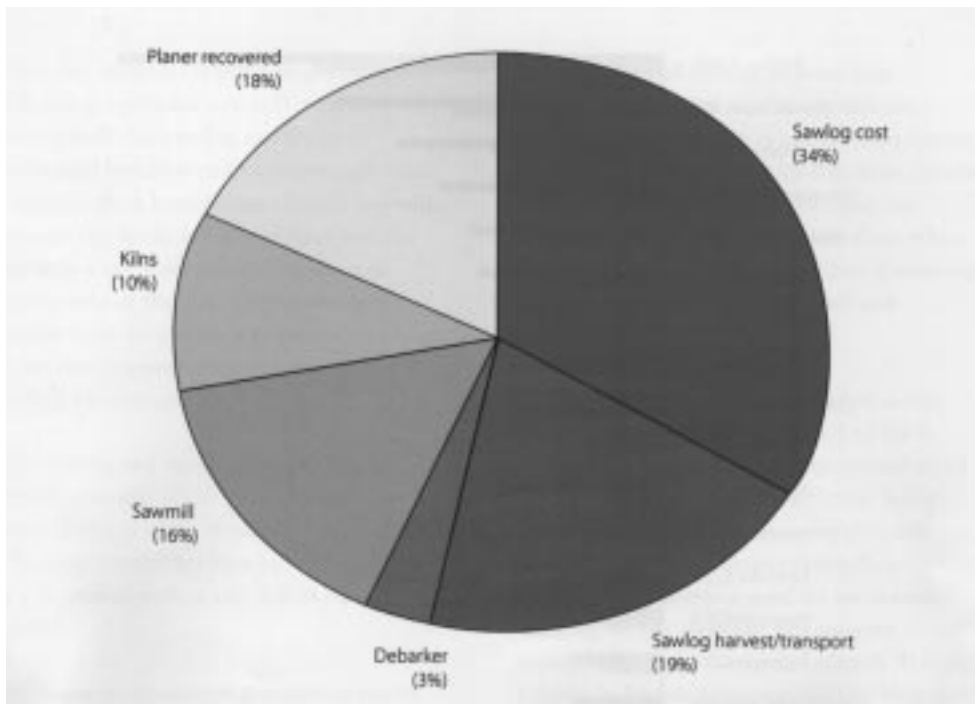
Financial Analysis

There is considerably more to owning a portable sawmill than the actual cost of the sawmill itself. To appreciate the true costs of portable sawmilling, it is important to consider:

- the additional equipment required before sawmilling can begin;
- the sawn timber needs of potential markets;
- matching the sawmill to likely timber resources; and
- labour requirements to load, mill, stack and market timber.

Many potential costs are not considered before a portable sawmill is purchased - for example the time required for producing and marketing sawn timber, safety and log handling equipment, sawlog supply costs, and storage and handling costs for sawn timber. Figure 1 shows the typical distribution of costs for a softwood sawmill.

Figure 1: typical costs distribution for softwood sawmill



The cost of sawlogs used by a sawmill is usually the highest single cost of sawn timber production - often amounting to 60 percent of total costs. Softwood stumpage, harvest and transport typically costs around \$50/m³. Hardwood stumpage, harvest and transport typically costs between \$30 and

\$100/m³ depending on species and quality.

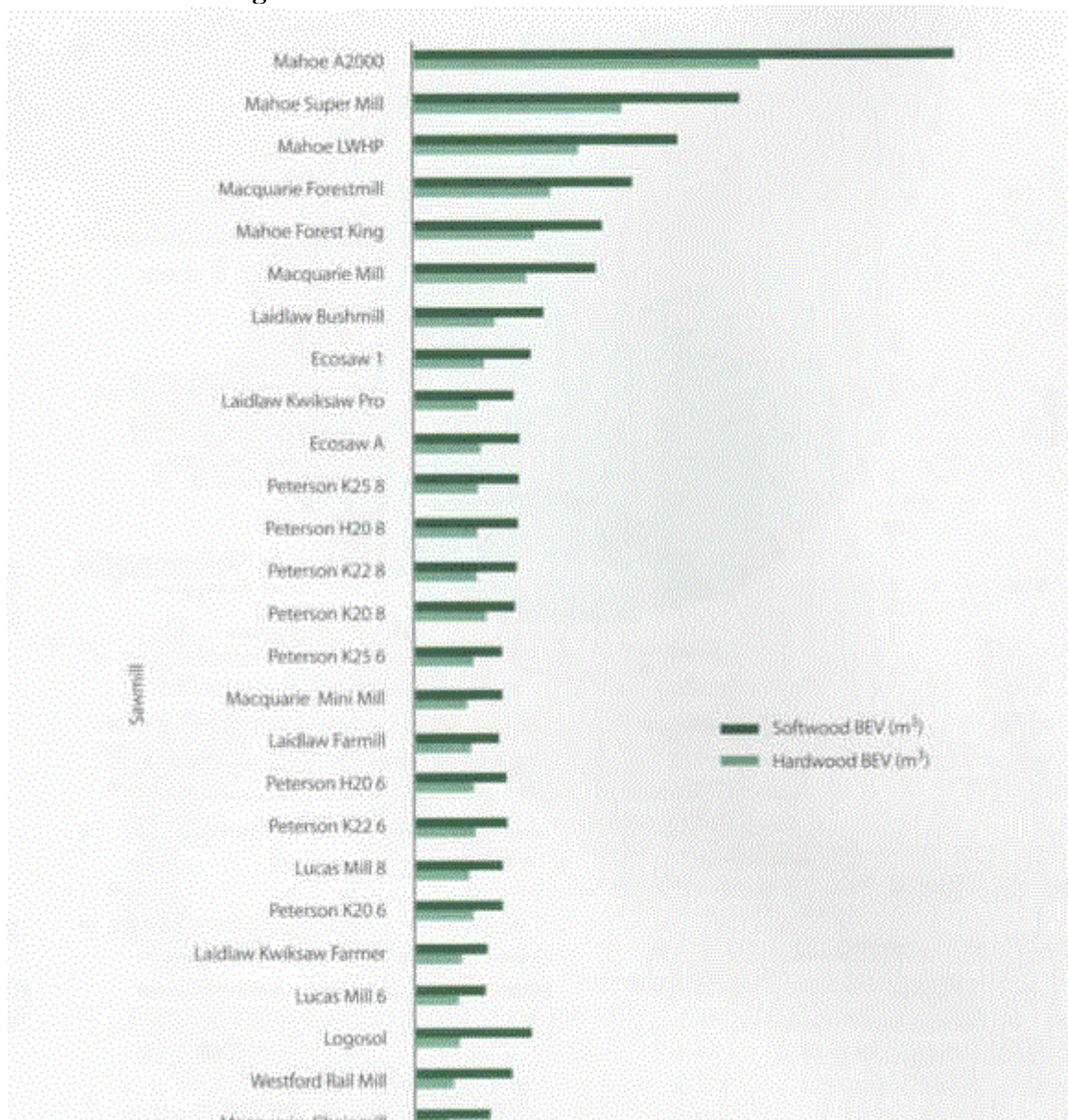
To ensure high returns from quality timber, sawlogs should be processed as soon as possible after felling, especially during warm weather.

The actual time spent sawing is a small proportion of the total time spent producing sawn timber. Therefore, the layout of the site for portable sawmilling should ensure that log supply, loading, and timber handling are as rapid as possible. Log loading is required only for portable mills with a bed or carriage. When using other types of mills, log positioning is the most important issue.

The JVAP research analysed the costs and break-even values for different portable sawmilling options. The details are available in the full report. Figure 2 shows the break-even volumes for individual portable sawmills surveyed.

Figure 2 shows that portable sawmilling is financially feasible if certain conditions are met, not least of which are the availability of sufficient volumes of sawlogs and competitive prices for sawn timber. The smaller break-even volume for hardwood enterprises in all cases highlights the benefits of targeting high value species.

Figure 2. Break-even volumes for different sawmills



However, the technical limitations of milling certain species, such as high internal growth stresses in small eucalypt logs, may make infeasible the processing of sufficient quantities of high value sawn timber. Note that the break-even analysis summarised in Figure 2 does not allow for labour costs - on the assumption that owner operators are making the comparison.

The relatively low productivity of portable sawmills means that the production of industrial wood products may be difficult to achieve competitively. Both milling for high throughput and milling for high recovery highlight the labour intensiveness of portable sawmilling enterprises. There is a tradeoff between productivity and capital outlay requirements in portable sawmilling. The targeting of high value species and products is the most viable proposition for portable sawmilling operators.

Occupational Health and Safety Issues

The most obvious OH&S risk associated with using a portable sawmill is coming into contact with the moving sawblade. Horizontal bandsaw mills are generally safer to operate than bench-type circular sawmills because the blade is well guarded and the operator is normally located on the non-cutting side of the saw. Chainsaws and circular saws do not have a non-cutting edge, so the risk of coming into contact with a moving blade is greater.

The loading and handling of sawlogs and sawn timber can result in injury because heavy lifting is often required. Circular saw mills which move across a log set in position on the ground reduce the risk of lifting injuries.

The noise levels around portable sawmills are high and so sawmill operators should use hearing protection.

Sawdust moved around by wind and draughts can create respiratory and eye problems in operators, as can exhaust fumes. Mills with cable controls such as twin circular sawmills are advantageous because the operator is removed from the carriage when it is passing through the log - thus distancing the operator from exhaust fumes and sawdust.

Related to portable sawmills safety is the issue of sawmill training. Only 2 of the 6 Australian sawmills manufacturers surveyed in the JVAP research offer training. Since many sawmill contractors using portable sawmills have no previous sawmilling experience, there is a need for vocational training. At the moment this training is available from the Logging Industry Training Centre in Mount Gambier and the Victorian Timber Industry Training Centre (VTITC) in Creswick.

Marketing Considerations

It was found that the factor with the greatest influence on the viability of portable sawmill enterprises was the return received for sawn timber. This highlights the importance of marketing in small-scale timber production. This issue is often overlooked during the planning stages of an enterprise.

Many of the problems encountered by farm foresters with respect to sawlogs and other forest products may simply be pushed along the processing stream if potential products and markets are not carefully considered.

The return for sawn timber is greatly influenced by the sawmilling strategies used, the type of logs sawn, the management of the operation, and the handling and grading of sawn timber.

Sawmilling Strategies

The actual sawing pattern employed will depend on the intended product and market demand, the quality and size of the sawlogs, the type of portable sawmill and the skill of the sawmill operator. Quality sawn timber comes from either backsawn or quarter sawn patterns, but a minimum log diameter of 450 mm is required.

Backsawing - production of boards with faces roughly tangential to annual growth rings - is quicker than quarter sawing and permits easier handling of growth stresses. Quarter sawing - cutting boards with faces parallel to the rays - produces boards with a more decorative appearance and less cupping, warping and shrinkage than backsawn boards.

Live sawing - cutting a face, sitting the log on that face and then cutting boards from the positioned log - is possible with chainsaw mills, horizontal bandsaw mills, and bench-type circular saws.

Backsawn and quarter sawn boards are most easily done with single and twin circular sawmills, but it is possible with chainsaw mills, horizontal bandsaw mills, and bench-type circular saws with frequent log repositioning.

Split taper sawing - parallel to the central axis of the log - is the most common longitudinal cutting strategy employed with portable sawmilling and results in least wastage.

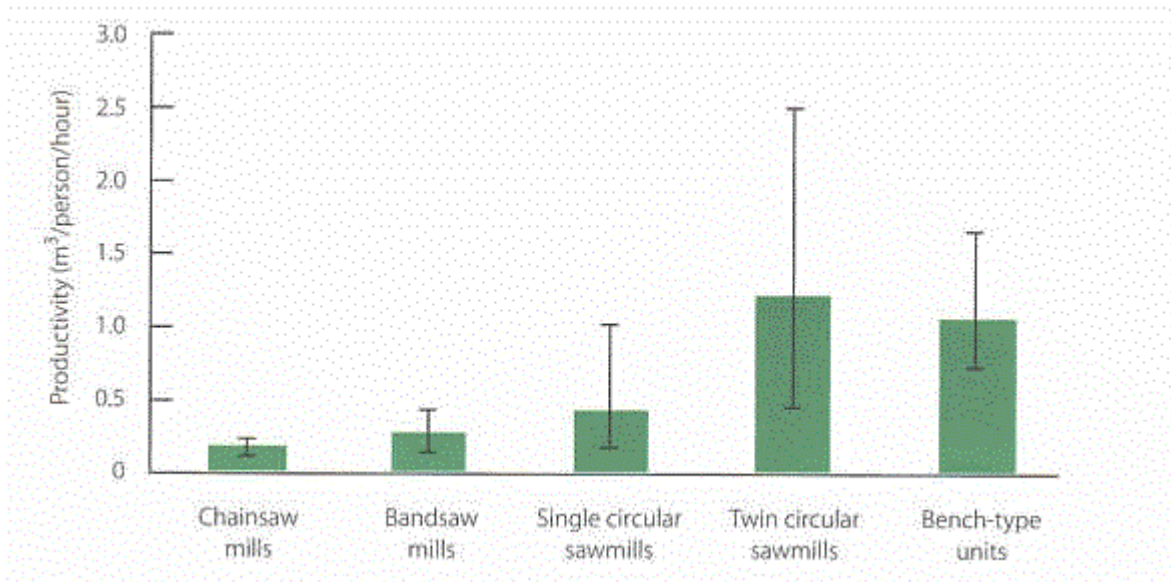
Type of Logs Sawn

Young trees with small diameter trunks have more severe internal stress gradients than older trees. This is especially important in eucalypts. When small eucalypt sawlogs are milled, the growth stresses present are released, resulting in excessive end splitting and shakes (when cross cut) and bow or spring (when sawn to length). Most portable sawmill operators do not have the equipment or skills to cut young eucalypt timber successfully. The log handling systems that can prevent growth-stress splitting and degradation of sawn timber surfaces during drying are provided by specialist mills handling more than 30,000 m³ of logs per year - well beyond the scope and skills which can be developed with portable mills.

Management of the Operation

Figure 3 summarises the productivity ranges for portable sawmills surveyed by the JVAP research. It shows that twin circular sawmills provide the greatest productivity when measured in cubic metres of sawn timber per person per hour.

Figure 3: Productivity ranges for portable sawmills



Handling Sawn Timber

Drying is a prerequisite for the efficient and economic utilisation of timber. The most common form of on-site timber drying is air drying. However, for softwoods and the final drying of hardwoods there is usually the need for some form of controlled drying to produce wood with a moisture content that meets market specifications.

Options available include:

- Air drying - freshly processed timber is stacked under shelter and allowed to dry slowly to a moisture content in equilibrium with the surrounding atmosphere, typically between 6 and 20 percent. Stacks should be sited so that they are parallel to the prevailing wind to ensure even drying throughout the stack. Ideally, a stack should be 1.2m wide and 2.4m high. To prevent degradation associated with air drying is end checking and splitting due to uneven drying. Application of a sealant to the ends of boards or draping a tarpaulin over the ends of the stack reduces the risk of end checking.
- Kiln drying - this allows more rapid drying than air drying but requires greater technical skill and involves higher capital investment. Because of the control it allows, kiln drying can be used to target specific market needs. Conventional kiln drying is unlikely to be appropriate for portable sawmill operators because of its cost. Alternatives are dehumidification and solar type kilns.
- Dehumidification drying - these use a heat pump consisting of an evaporator, condenser, compressor and control system, to remove moisture from a kiln using circulating air which alternatively heats/dries and then cools/releases moisture outside. This form of drying is easy to operate and energy efficient but can take longer and requires electricity rather than alternative sources of energy.
- Solar drying - greenhouse type kilns and external collector type kilns fall into the solar drying category since they generally rely on solar heated air as the drying medium. To be effective,

solar kilns require careful design to balance the ratio of collector area to the capacity of the kiln. However, well designed kilns have been found to require 1.5 to 3 times less drying time than air dried timber. In addition, solar drying has been found to result in less drying degrade because of diurnal fluctuations in temperature.

Grading Sawn Timber

Grading aims to ensure that timber buyers obtain exactly what they need and timber sellers get the best possible price for their timber. There are two major grade categories for softwood and hardwood, based on and related to the end-use of the product anticipated:

- Appearance grade - based on the visual characteristics of the timber and relating generally to boards less than 50 mm thick.
- Structural grade - based on feature affecting the strength, stiffness and practical requirements of structural applications and relating to dimension stock and timbers greater than 50 mm in thickness.

Mechanical stress and machine proof grading are more accurate and time efficient than visual stress grading. A portable sawmiller wishing to produce structural timber can obtain a visual stress grading ticket from the VTITC.

Other Agroforestry & Farm Trees Research Publications

Agroforestry from Existing Timber Resources

by D Thompson

Currently there are extensive areas of native forest on private land in the Northern Tablelands of NSW. This report examines the potential benefits to landowners of managing these privately owned native forests through financial assessments on four farms. Also examines the potential benefits to landowners of more intensive forest management and marketing approaches.

1999, 93pp, Pub no 99/151 \$15

Commercial Prospects for Low Rainfall Agroforestry

by A Zorzetto and P Chudleigh

While commercial agroforestry in the low to medium rainfall zones of Australia is unlikely to be as profitable as in the high rainfall zone due to lower growth rates, less established infrastructure and greater distances to markets, significant prospects do exist. This report therefore, assesses the commercial opportunities for growing a range of tree species in the medium to low rainfall areas of Australia, and establishes priorities by commercial product and species type to assist resource allocation in R&D funding.

1999, 104pp, Pub no 99/152 \$15

National Low Rainfall Tree Improvement

by P Bulman, M Underdown & D Bush

Proceedings of the National Low Rainfall Farm Forestry Tree Improvement Workshop, held to establish priorities and formulate a coordinated approach to low rainfall tree improvement. As a result of the workshop, a national collaborative research program has been established to produce improved seed for low rainfall zones. The Australian Low Rainfall Tree Improvement Group (ARTLIG) will focus on the breeding of hardwoods, softwoods and short rotation biomass crops for low rainfall zones of southern Australia.

1999, 96pp, Pub no 99/66 \$15

Trees Face the Acid Test

by A D Noble & P J Randall

A short report of an unpublished full research report on the impact of trees and fodder shrubs on soil acidification. The research has broken new ground in defining the potential of trees to counteract this damaging phenomenon.

1999, 8 pp Short Report No. 59, free

Practical Farm Forestry - Whole Farm Case Studies

by Campbell White & Assoc & A Black

Despite various policy initiatives over the past six years, the uptake of farm forestry in Australia has been slow. One major factor for this is uncertainty. This report seeks to support farmers in their decision making, decrease uncertainty and promote the faster development of the industry by documenting ten 'real life' case studies of farms across southern Australia. These studies show a multitude of approaches to the solution of common land resource management and economic challenges and demonstrate how individuals have combined commercial opportunities and environmental attributes to produce a forest resource which was achieving many benefits simultaneously.

1999, 134pp, Pub no 99/99 \$15

What's Happening in the Farm Forestry Market?

by Australian National University

A short report that collates all eight editions of the Australian National University's regular national market reports for farm forestry (up to June 1999). These reports provide reliable information on structural timber prices, pulplog prices, log and agricultural product prices beyond 2000, cost of tree seedlings and cuttings, stumpage, log exports, cost of log transport, and woodchip markets and prices.

1999, 28pp Short Report No. 65, free

An Investigation of Aleppo Pine for Low Rainfall Farm Forestry

by RST Technology Pty Ltd

Assesses the feasibility of extending Aleppo pine planting into lower rainfall farmlands for both ancillary agricultural benefits and timber production purposes. The adequacy of mechanical properties of the timber species has also been bench marked against *P. radiata*.

1999, 81pp, Pub no 99/16 \$10

Native Forests on Farms

by M Parsons

Proposes strategies to develop the sustainable management of private native forests on farms – an essential, yet sometimes overlooked resource for agroforestry. Well managed native forests provide important regional biodiversity and other conservation benefits while also offering farms income from timber products.

1999, 47pp, Pub no 99/21 \$10

Agroforestry Over Shallow Watertables: Impact of Salinity on Sustainability

by P Thorburn

Documents the findings of a May 1997 workshop which explored how we can use trees in the fight against rising watertables and salinity. Includes a section on 'best bets' guidelines for revegetating areas with shallow, saline watertables. Fourth in a water and salinity issues series.

1999, 59pp, Pub no 99/36 \$15

The Ways Trees Use Water

by T Hatton

Addresses the key questions about the role of trees in restoring the hydrological balance: Are certain species better water-users than others? Will more efficient users grow quicker? Are different planting configurations better? Does root structure allow greater access to groundwater? Fifth in a water and salinity issues series.

1999, 116pp, Pub no 99/37 \$20

Processing Trees on Farms

by I Hanson & M Stewart

Examines forests and plantations as a resource. Surveys the extent of farm forestry plantings and the economic benefits of farm forestry. Details processing of individual products such as sawn timber, posts,

poles and piles, wood based panels, pulp, paper, and paperbound and on-site timber processing.

1997, 50pp, Pub no 97/20 **\$20**

Farm Forestry in Australia: A Research Update

by *Digby Race and Lisa Robins*

Provides a summary of current farm forestry R&D activities across Australia, and aims to inform more widely on the status of farm forestry research, policy and funding in Australia. Presents the recommendations from a biennial national meeting of the Research Working Group (RWG) 11 (Farm Forestry) held in April 1998 in Canberra.

1998, 44pp **\$10** 98/103

Agroforestry with High Value Trees

by *Dr D Lamb & G Borschmann*

Describes the early results of two trials to examine the growth of several high-value rainforest tree species when grown in farm plantations in southeast Queensland. A potential solution to the cessation of logging high-quality tropical rainforest timbers from the state's wet tropics forests and subsequent decline in the market supply of these timbers.

1998, 60pp **\$10** 98/142

National Classification of Catchments

edited by *Jane Coram*

Presents a catalogue of fifteen generic hydrogeological models of groundwater systems that describe the broad characteristics of salinisation across Australia. Developed in response to the urgent need to predict the likely occurrence of catchment salinisation across the continent and to identify the most appropriate and cost-effective land uses for managing rising groundwater and mobilisation of salt into waterways. No 3 in a series on 'Water & Salinity Issues in Agroforestry'.

1998, 62pp **\$10** 98/78

Agriculture as a Mimic of Natural Ecosystems

by *EC Lefroy & RJ Hobbs*

Details outcomes of a workshop which brought together agriculturalists and ecologists from around the world to explore the concept of natural agriculture systems. Presents a broad approach for the development of such systems. Attempts to identify the steps required to replace the growing external demands of existing managed systems with natural ones.

1998, 32pp **\$10** Pub no 98/066

How Trees Affect Soils

by *AD Noble & PJ Randall*

Reviews the evidence to support both the positive and negative effects of trees on the chemical and physical properties of soils. Extensive clearing of native vegetation has badly affected our natural resources.

Replacing trees in the landscape is seen by many as a way to slowly reverse the degradation.

1998, 125pp **\$15** Pub no 98/016

Biological Control of Scarabs Causing Eucalyptus Dieback

by *AJ Campbell & GR Brown*

Investigates the theory that maintaining or recreating the natural vegetation (trees and shrubs) on farms would retard tree mortality rates by allowing natural control agents of scarabs (parasitoids and predators) to function normally. Suggests this would be a less costly and risky solution than tree planting in pasture areas.

1998, 90pp **\$10** Pub no 98/003

Hardwood Species for Scrimber Production

by *David Sheriff, CSIRO*

Evaluates the growth, productivity and economic viability of selected tree species found suitable for scrimber (reconstituted timber) production and compares the growth of several hardwood species with that of *Pinus radiata*.

1998, 30pp **\$10** Pub no 98/004

Carob Agroforestry in the Low Rainfall Murray Valley

by A Curtis, D Race & B Booth

Presents the results of a feasibility study into the development of a viable carob industry in the low rainfall Murray Valley region. Assesses four economic scenarios for carob agroforestry using a range of different plantation scales and management options.

1998, 35pp **\$10** Pub no 98/008

Links Between Farm Forestry Growers and the Wood Processing Industry

by Allan Curtis & Digby Race

Identifies and assesses the current status of the linkages between small scale forest growers and industry, and recommends a series of strategies for improvements to the current status quo. First in a series of four reports which address key impediments to the widespread adoption of commercial farm forestry.

1998, 75pp **\$10** Pub no 98/041

Priority Setting for the Joint Venture Agroforestry Program

by AACM International

A report commissioned to identify priorities to aid in developing a five-year plan for the Joint Venture Agroforestry Program that has been investing in research and development for practical agroforestry products, increased agricultural productivity and sustainable management of natural resources within the agricultural environment.

1998, 112pp **free** Pub no 98/042

Agroforestry and Hydrology: What Do We Need to Know?

by R Stirzaker, D O'Connell & R Prinsley

Report of a 1996 workshop which cross-examines the current state of knowledge relating to the impact of trees on hydrology, thereby defining research gaps and priorities. Concentrates on the technical aspects of trees and hydrology rather than on policy or economics. First in a series on "Water & Salinity Issues in Agroforestry".

1996, 16pp **\$10** Pub no 96/012

Agroforestry Water Use in Mediterranean Regions of Australia

by G P Raper

Presents a critical review of the research to date on tree water use in Mediterranean climates of southern Australia and the implications of tree water use on groundwater. Also presents a simple model to predict the annual tree water use. No 2 in the "Water and Salinity Issues in Agroforestry" series.

1998, 75pp **\$10** Pub no 98/063 (Free Short Report also available)

The Potential for Tropical Agroforestry in Wood and Animal Feed Production

by JB Lowry & J Seebeck

Assesses the potential for agroforestry in Australia's wet-dry tropics based on trees for both wood and animal feed production. Several timber species are identified which can promote grass production and quality below the tree canopy as well as supply dry-season feed to grazing animals, thus substantially boosting pastoral production.

1997, 85pp **\$20** Pub no 97/073

Design Principles for Farm Forestry

by the Joint Venture Agroforestry Program

A guide to assist farmers to decide where to place trees on farms and in farm plantations. Explains the interaction of trees with other agricultural enterprises and the environment. Provides methods for calculating the economics of planting trees.

1997, 102pp **\$16** Pub no 97/048

Integrating Trees with Livestock Grazing

by Phillip Haines, Agriculture Victoria

Explores four ways in which the use of conventional fencing can be replaced by cheaper options. These include using trees of low palatability, trees that recover well from browsing, the use of repellents to protect trees from browsing, and training of sheep through conditioned feed aversion to avoid eating eucalypt seedlings.

1997, 30pp **\$10** Pub no 97/047

On-site Processing for Farm Forestry

by M Stewart and I Hanson, University of Melbourne

Investigates portable sawmilling as the on-site processing system with the most potential to help maximise the value of farm grown timber. Discusses general issues, analyses financial costs of operations and compares two typical portable sawmilling strategies.

1998, 188pp **\$20** Pub no 98/079 (Free Short Report also available)

Trees for Profit - Integrated Economic Model

by Bill Loane, VIC Department of Natural Resources & Environment

A short report of research that demonstrates, through a series of 8 trials, the benefits of tree growing for multiple benefits - particularly wood production and salinity control on land and water. Provides a view of the positive impact that a new farm forestry industry along the lines of Trees for Profit could have on a region's industrial structure.

1997, 8pp Short Report no 21, **free**

Alley Farming in Australia

by R Stirzaker & EC Lefroy

Describes the scientific principles of alley farming. Includes an economic analysis of a whole farm using this system. Reviews international literature relevant to Australia. Considers research priorities for Australia.

1997, 71pp **\$25** Pub no 97/029 Short Report No 8 available free

Tree Performance Databases and Selection Systems

edited by T Vercoe & B Clarke

Proceedings of a 1995 meeting which represent the current status of a range of different databases and tree selection systems. A natural starting point for those people interested in the field. Systems covered fall into 3 broad groups: models, selection systems and observational databases.

1997, 57pp **\$16** Pub no 95/022

Trees for South Eastern Australia

by Tim Vercoe & Bronwyn Clarke

Gathers growth and associated site, management and genetic information to be used to predict tree performance. Summarises trial results and recommends future work. Aimed as a research report rather than for on-farm use.

1996, 75pp **\$10** Pub no 96/005

Low Rainfall Agroforestry

Proceedings of a 1992 workshop coordinated by RIRDC and the Land and Water Resources Research and Development Corporation. Covers opportunities and constraints of low rainfall agroforestry, promising products derived from woody species, riparian vegetation as buffer strips, use of trees to maintain soil fertility, and planting and management for nature conservation.

1992, 103pp **\$10** Pub no 92/007

Commercial Farm Forestry in Australia

by AACM/CIE

This 3 book kit presents a blueprint for the development of a national commercial farm forestry strategy. It contains A Resource Book, A Quantitative Assessment (first ever quantitative economic assessment of the contribution of farm forestry to the national economy) and A Synopsis, an easy-to-use overview of these two documents.

1996 **\$40** Industry groups **\$20** Landcare groups Pub no 96/026 Short Report No 34 available free

Black Wattle & its Utilisation

by AG Brown & Ho Chin Ko, CSIRO

Presents important information on Black Wattle - a fast growing and adaptable tree indigenous to Australia - including its natural distribution in Australia, its ecology and preferred environment, soils and the details of the features that make it such as special tree. An abridged English version, based on the central material

published in the 1991 Chinese edition. 1997, 400pp \$25 Pub no 97/077

Creating a viable farm forestry industry in Australia — what will it take?

by J Alexandra & M Hall

A short report on the major outcomes of a study to investigate what policies the Joint Venture Agroforestry Program will take to create a viable, self-supporting, plantation-based, farm forestry industry in Australia. The outcomes identify impediments and suggest policy actions to overcome identified concerns.

1998, 12pp Short Report no 35, free

Farm Forestry Newsletter

A RIRDC/LWRRDC/FWPRDC Joint Venture Agroforestry Program Newsletter, free

The biannual newsletter of the Joint Venture Agroforestry Program, which aims to develop practical agroforestry and farm forestry systems. It promotes commercial production and forest products, increased agricultural productivity, and sustainable management of natural resources within the agricultural environment. Issued twice a year, last issue April 1998, 8pp Phone Jenny Baxter, (02) 6272 3736, to receive copies.

1998-99 Agroforestry Research-in-Progress

by RIRDC

Short summaries of all agroforestry continuing and completed research projects funded by the Joint Venture Agroforestry Venture in 1998-99. 1999, 55pp, Pub no 99/100 free (see online version)

R&D Plan for the Joint Agroforestry Program 1998-2002

by the Joint Venture Agroforestry Program free. Online version at <http://www.rirdc.gov.au/pub/aft5yr.htm>

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