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Farm Forestry in Australia: A Research Update

Volume 1

**A report for the Research Working Group 11
(Farm Forestry) and Rural Industries Research
and Development Corporation**

by Digby Race and Lisa Robins

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Researcher Contact Details

Digby Race
Department of Forestry, Australian
National University,
Canberra, ACT. 0200.
Phone: 02 6249 2737,
Fax: 02 6249 0746.
Email: Digby.Race@anu.edu.au

Lisa Robins
Robins Environmental Consulting,
16 Condamine St, Turner,
ACT. 2612.
Phone/Fax: 02 6230 6779.
Email:
robins.consulting@bigpond.com

RIRDC Contact Details

Rural Industries Research and Development Corporation
Level 1, AMA House
42 Macquarie Street
BARTON ACT 2600
PO Box 4776
KINGSTON ACT 2604

Phone: 02 6272 4539
Fax: 02 6272 5877
Email: rirdc@netinfo.com.au
Website: <http://www.rirdc.gov.au>

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Foreword

The biennial national meeting of Research Working Group (RWG) 11 (Farm Forestry) was held in April 1998 in Canberra. The major objectives of the meeting were:

- the definition of gaps in present knowledge and identification of R&D priorities,
- consideration of how to rationalise and coordinate the work of various State/Territory/Commonwealth and private organisations; and
- to determine how best to disseminate outcomes and information to a wider audience.

In particular, it was seen as important that the relevance of RWG 11 within the national debate on farm forestry R&D issues should be enhanced.

This report provides some background information on farm forestry R&D and presents recommendations compiled from the outcomes of the meeting and submissions from state agencies.

The RIRDC/LWRRDC/FWPRDC Joint Venture Agroforestry Program assisted the meeting by sponsoring this report.

RIRDC's involvement in this project and in the Joint Venture Agroforestry Program, is part of the Corporation's Agroforestry and Farm Trees R&D Program which aims to foster integration of sustainable and productive agroforestry within Australian farming systems.

Peter Core

Managing Director

Rural Industries Research and Development Corporation

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List of Abbreviations

ABARE	Australian Bureau of Agricultural & Resource Economics
ACIAR	Australian Centre for International Agricultural Research
AgWA	Agriculture Western Australia
ANU	Australian National University
CFTT	Centre for Forest Tree Technology
CSIRO	Commonwealth Scientific & Industrial Research Organisation
CaLM WA	Conservation and Land Management Western Australia
CIE	Centre for International Economics
DNRE	Department of Natural Resources and Environment
DPIE	Department of Primary Industries & Energy
FFP	Farm Forestry Program
FWPRDC	Forest & Wood Products Research & Development Corporation
JVAP	RIRDC/LWRRDC/FWPRDC Joint Venture Agroforestry Program
LWRRDC	Land & Water Resources Research & Development Corporation
MCFFA	Ministerial Council on Forestry, Fisheries & Aquaculture
NFFR	National Farm Forestry Roundtable
NFPS	National Forest Policy Statement
NHT	Natural Heritage Trust
PIRSA	Primary Industries and Resources South Australia
QFRI	Queensland Forestry Research Institute
RPCC	Research Priorities & Coordination Committee
RWG 11	Research Working Group 11
RIRDC	Rural Industries Research & Development Corporation
SCF	Standing Committee on Forestry
WAPIS	Wood & Paper Industry Strategy

Executive Summary

Research Working Group (RWG) 11 held its biennial meeting in Canberra on 28-29 April 1998. This report, prepared at the request of the organising committee, provides a summary of current R & D activities across Australia, as synthesised from State, Territory and Commonwealth member reports as well as other sources, and outcomes from the Canberra meeting.

In addition, it aims to inform more widely on the status of farm forestry research, policy and funding in Australia. In doing so, it is hoped that this report will heighten the awareness of RWG 11's role in providing a national focus in this area. RWG 11 reports to the Standing Committee on Forestry.

This paper is framed on five research themes, identified at the Adelaide (1996) meeting of RWG 11, namely:

- farm forestry systems;
- low rainfall systems;
- tree-agriculture interactions;
- social, economic and policy issues; and
- education, training and extension.

RWG 11 recommendations

The 1998 Canberra meeting of RWG 11 reviewed the five research themes, and the key R & D issues to be addressed within each theme. The broad research and development gaps, and recommendations to address these gaps, are reported below.

The recommendations shown here are mostly those presented to the meeting following deliberation of discussion groups, but they also include some formulated on the basis of recommendations made in State/Territory/Commonwealth member reports and subsequent submissions by members (indicated by a *).

RWG 11 will aim to develop a work program linked to the recommendations below in consultation with RPCC and other member RWGs. It is expected that RWG 11 would work through member organisations to implement recommendations agreed by RPCC. RWG 11 encourages RPCC to foster synergies between RWG 11 and related RWGs with respect to inter-disciplinary R&D issues.

Additional research recommendations made outside the RWG 11 process are provided in section 6 and 7 of this paper. It was agreed that the RWG 11 research theme 'Tree-agriculture interactions' would be renamed 'Capturing multiple benefits'.

Three research areas spanning all five themes that require particular attention were identified by both the meeting and during the development of this report:

- sustainable management of private native forests;
- contribution of farm forestry to farm and regional biodiversity values and environmental benefits more generally; and
- the role of and potential for carbon credits and carbon trading in farm forestry development.

General Recommendations

- Rec 1: R&D priority setting should be coordinated and stream-lined across organisations. The RWG 11 process should be managed so that it can contribute advice to the JVAP priority setting and project development.
- Rec 2: Future RWG 11 meetings should focus on (a) sharing information on innovative farm forestry research and (b) developing specific research projects with national significance. Membership of RWG 11 should be reviewed to ensure representation of FF R & D and extension stakeholders.
- Rec 3: State/Territory governments should identify the roles and responsibilities of agencies for farm forestry (notably: policy, planning, regulation, extension, and research and development), and improve communication pathways between these agencies.
- Rec 4: Priority should be given to assessing the applicability of research undertaken in both forestry and agriculture to the development of farm forestry, implications to research priorities and opportunities for collaboration.
- Rec 5: That research and development programs give particular consideration to private native forest management, biodiversity values (and environmental benefits more generally) and carbon credits.
- Rec 6: Priority should be given to the development of and access to national databases, particularly for results from national research projects.
- Rec 7: Develop a protocol to assist project proponents in developing effective national projects.
- Rec 8: Develop mechanisms for better communication between RWG 11 members and between RWG 11, other related RWGs and the farm forestry sector in the interval between biennial meetings, and publish outcomes of RWG 11 meetings as a report for wider circulation.

Recommendations under RWG 11 research themes

Theme 1 - Farm forestry systems

- *Rec 9: Develop tree improvement programs for a range of prospective species.
- *Rec 10: Undertake research and development on management options for private native forest that protects biodiversity values and assess the value of ecological research to determine its usefulness to farm forestry.
- *Rec 11: Explore the sustainable use of herbicides, non-chemical weed control methods, and insecticides for different farm forestry systems.
- Rec 12: Develop and provide ready access to databases, and standardise experimental and demonstration design protocols for silvicultural trials, including: genetic material, silvicultural practice, replication, recording, data collection, and index systems that reflect wood quality parameters.
- Rec 13: Develop and assess common or generic response models (perhaps based on the New Zealand format) which allow data integration and model validation using existing simple parameters, such as total crown length and leaf-area index.

- Rec 14: Develop growth models and yield prediction tools for a range of major and minor species, for varying site and silvicultural options, and appropriate methods for incorporating such models into widely available decision-support systems.
- Rec 15: Develop a national feasibility study of eucalypts for sawlogs as a commercial tree cropping option (eg. Young eucalypt project no. 2).

Theme 2 - Low rainfall

- Rec 16: Evaluate the costs and benefits (environmental & otherwise) of a range of farm forestry opportunities for low rainfall areas on a national basis.
- Rec 17: Implement a national project to select and develop improved genetic material of commercial farm forestry species suitable for low rainfall areas (eg. National Farm Tree Improvement Project). (I)
- Rec 18: Undertake product and industry development for private native woodlands in low rainfall areas.

Theme 3 - Capturing multiple benefits

- Rec 19: Review and research attributes (eg. rooting patterns & canopy dimensions) of species (& provenances) with potential for capturing multiple benefits.
- Rec 20: Investigate the effects of species and planting arrangements to quantify the site-level outcomes on microclimate, soil chemistry and structure, hydrology and water balance, wind and water movement, competition and interaction with crops/pastures.
- Rec 21: Undertake cost-benefit analyses of the effects of farm forestry options against agricultural and environmental criteria at local and regional levels.

Theme 4 - Social, economic and institutional issues

- *Rec 22: Undertake regional appraisals of market prospects in prospective farm forestry regions.
- *Rec 23: Develop cost sharing frameworks, building on the work of the MDBC.
- *Rec 24: Analyse State/Territory and overseas policy approaches to farm forestry and identify best bet options.
- Rec 25: Develop a standard approach to social, economic and environmental monitoring and evaluation of farm forestry development at the farm, regional and national levels.
- Rec 26: Identify and develop socio-economic mechanisms (eg. planning) to assist the adoption of farm forestry at the regional level.
- Rec 27: Develop a cost-effective national index of forest product prices (eg. ANU Forestry Log market report, published on a regular basis).
- Rec 28: Develop regional cost-sharing guidelines that reflect the outcomes of farm forestry development.

Theme 5 - Education, training and extension

- *Rec 29: Undertake an assessment of the training needs of landcare and other field extension officers in farm forestry and define training options to address the key knowledge gaps.
- Rec 30: Develop a broad-based education and public awareness program on the role of farm forestry. Include socio-economic survey to obtain base-line data on the attitude of urban and rural communities.
- Rec 31: Determine and communicate the most effective approach(es) of extension, education and training for different stakeholder groups to achieve specific outcomes (eg. review findings from Edith Cowan University project).

Introduction

1. About this paper

This paper summarises the outcomes of the biennial national meeting of Research Working Group (RWG) 11 (Farm Forestry), held on 28-29 April 1998 in Canberra, and was prepared at the request of the organising committee.

It aims to:

- synthesise and summarise outcomes from the 1998 RWG 11 meeting,
- enhance the national focus of farm forestry R & D and the relevance of RWG 11,
- enhance communication, information sharing and collaboration,
- consider opportunities for public and private R & D agencies to contribute to farm forestry research and extension in Australia, and,
- summarise the status of farm forestry research, policy and funding in Australia.

Volume 1 provides an overview of the key issues facing farm forestry development throughout Australia, and research and development activities, drawing upon summary reports prepared by RWG 11 representatives and other key documents. It also provides recommendations for further action based largely on the meeting and member reports. In doing so, it is hoped that this report will reach a wider audience interested in farm forestry R & D and therefore heighten the awareness of RWG 11's role in providing a national focus in this area.

The summary reports and this paper are framed on five research themes identified by RWG 11, namely:

- farm forestry systems;
- low rainfall systems;
- tree-agriculture interactions;
- social, economic and policy issues; and
- education, training and extension.

Volume 2 provides a list of projects funded under the RIRDC/LWRRDC/FWPRDC Joint Venture Agroforestry Program and the Commonwealth Farm Forestry Program.

This volume has four appendices:

- Appendix 1 - RWG11 meeting agenda
- Appendix 2 – RWG11 members
- Appendix 3 – 2020 Vision actions
- Appendix 4 – update on policy and program frameworks in each State

2. About RWG 11

There are eleven RWGs addressing various aspects of forestry research, including genetics, silviculture and mensuration. RWG 11 was established by the Standing Committee on Forestry (SCF). SCF was established to facilitate the coordination of policy in matters of forest management and forest industry development between State, Territory and Commonwealth Governments. While the first RWGs were formed in 1966, it was not until 1989 that RWG 11 (Farm Forestry) (formerly 'Agroforestry') was established.

The ‘terms of reference’ for RWG 11 (DPIE 1997a) are to:

- review the present state of knowledge;
- define gaps in present knowledge and identify topics on which new work is needed;
- indicate priorities, where necessary;
- consider how to rationalise and coordinate the work of the various organisations concerned;
- ensure that communication exists between workers in the field and devise means for the dissemination of information;
- provide a summary of the proceedings of each meeting to the members of the RWG, the organisation they represent, and the Coordinator;
- submit, via the Coordinator, reports and recommendations to the Research Priorities and Coordination Committee (RPCC) for referral, where appropriate, to SCF; and
- undertake other relevant tasks requested by SCF or RPCC.

The members of RWG 11 and observers at RWG 11 meetings are drawn from State/Territory and Commonwealth agencies, as well as other key farm forestry organisations (eg. universities, Greening Australia, Australian Forest Growers). Together, the delegates represent a wide range of public and some of the private farm forestry interests and experiences. RWG 11 is coordinated by Mr Roger Pfitzner (Primary Industries and Resources South Australia). The 1998 meeting held in Canberra was chaired by Nico Marcar (CSIRO Forestry & Forest Products). The Joint Venture Agroforestry Program (JVAP) funded preparation of this report.

3. Overview of structures, frameworks and programs

3.1 National structures and frameworks

National Forest Policy Statement

The 1992 National Forest Policy Statement (NFPS) is the guiding government policy providing the framework for Australia’s current forest management. The NFPS is endorsed by the Commonwealth and State/Territory Governments. The key plantation and farm forestry goals identified in the NFPS relevant to RWG11 (Commonwealth 1992) are to:

- expand Australia’s commercial plantations of softwoods and hardwoods so as to provide an additional, economically viable, reliable and high quality wood resource for industry;
- increase plantings to rehabilitate cleared agricultural land, to improve water quality, and to meet other environmental, economic or aesthetic objectives; and
- ensure that private native forests are maintained and managed in an ecologically sustainable manner, as part of the permanent native forest estate, as a resource in their own right, and to complement the commercial and nature conservation values of public native forests.

Farm forestry has been given more emphasis in subsequent government policy statements such as the Wood and paper Industry Strategy and the Plantations Vision 2020.

Wood and Paper Industry Strategy

The 1995 Wood and Paper Industry Strategy (WAPIS) sets out a strategy for promoting plantations and farm forestry on cleared agricultural land. The specific objectives for the 'Resource Development - Plantations and Farm Forestry' strategy element are to:

- build on the existing plantation base and processing industries and promote the full utilisation of plantation resources;
- develop regional plantation and commercial farm forestry to provide a reliable, high quality wood resource for industry with associated landcare and environmental benefits; and
- expand job opportunities in the plantation forest industries and regional Australia.

Farm forestry in the context of this strategy is limited to plantings on cleared agricultural land.

WAPIS committed funding to stimulate forestry related research and development, as well as providing support to employ a national farm forestry facilitator (to be appointed by August 1998) and establish a National Farm Forestry Roundtable (NFFR). The first meeting of the NFFR was convened in Benalla in February 1998, chaired by Mr Angus Pollock (Amcor) (Contact: Phil Pritchard, Department of Primary Industries and Energy).

Plantations for Australia: The 2020 Vision

The 1997 Plantations for Australia: The 2020 Vision (2020 Vision) envisages sustainable and profitable long rotation crop plantation forestry in Australia by 2020. The framework was developed by government and industry stakeholders and was endorsed by the Ministerial Council on Forestry, Fisheries and Aquaculture in July 1997. The 2020 Vision aims to treble the effective area of Australia's plantations between 1996 and 2020 (Plantation 2020 Vision Implementation Committee 1997). Small-scale growers are viewed as an important ingredient in achieving the Vision.

Action 5 of the 2020 Vision is to ensure research and development is nationally coordinated and strategic [refer to Appendix 3]. It recommends the development of a national approach to:

- research and development funding;
- research and development planning, prioritising and program selection; and
- sharing and disseminating of research and development results.

A national workshop is scheduled for October to develop an implementation plan. In addition, a national facilitator has been employed to support the implementation of the 2020 Vision, reporting to the Plantation 2020 Vision Implementation Committee (Contact: Richard Stanton, National Plantations Co-ordinator).

Other frameworks

The three policy frameworks mentioned above address the broader forest policy issues and only consider elements of farm forestry. The RIRDC/LWRRDC/FWPRDC Joint Venture Agroforestry Program (JVAP) commissioned AACM International *et al.* (1996) to produce a report *Commercial farm forestry in Australia - Development of a strategy framework: A resource book*. The national Farm Forestry Program (FFP) is now developing a strategic framework in consultation with the NFFR (Contact: Phil Pritchard, Department of Primary Industries and Energy).

References to farm forestry can be found in policies on agriculture, natural resource management and regional development. Policy may also be indirectly stated, such as through national programs. For example, the 1998-99 funding round under the FFP supports private native forest management on farms.

A joint position statement that sets out the broad principles of farm forestry development as agreed by Greening Australia (GA), National Association of Forest Industries (NAFI), Australian Forest Growers (AFG) and National Farmers' Federation (NFF) was published in 1996 (Contact: Annabel Johnston, GA; Miles Prosser, NAFI; Alan Cummine, AFG; Anwen Lovett, NFF).

3.2 Commonwealth programs

Revegetation programs

The earliest schemes were led by industry during the late-1960s and 1970s (Prinsley 1991). The nature of farm forestry under these early industry schemes was one of small plantations established on cleared agricultural land or recently cleared native forest sites.

The Commonwealth's first major revegetation program was the National Tree Program (NTP), developed in response to widespread land degradation in the early-1980s (McDonald 1993). The NTP operated between 1982 and 1987. The subsequent National Afforestation Program (NAP) introduced many regions to the potential of commercial tree growing as a means addressing natural resource degradation. Several of the pioneering regional farm forestry projects commenced with funding through the NAP.

In 1989, the NAP was replaced by the Save the Bush (STB) and One Billion Trees (OBT) programs. STB and OBT were funded by the federal Environment portfolio. STB was managed by the Australia Nature Conservation Agency (ANCA). OBT was managed by Greening Australia, a national non-government organisation with a sustainable vegetation management charter. The emphasis of STB was on remnant vegetation protection. OBT supported revegetation and remnant vegetation protection for conservation, with limited support given to farm forestry development.

Farm Forestry Program

In 1993, the Commonwealth Government launched the national Farm Forestry Program (FFP). The FFP aims were to:

- encourage the incorporation of commercial tree growing and management into farming systems for the purpose of wood and non-wood production, increasing agricultural productivity and sustainable natural resource management.

The early focus of the FFP was on plantation establishment on cleared agricultural land. From 1993-1996, the FFP invested \$3.7 million, funding 27 projects. In 1995, WAPIS committed an additional \$17 million to the FFP and \$2 million to the Community Rainforest Reforestation Program (CRRP) in Queensland. This funding now supports 15 national strategic projects and 40 regional projects [refer to projects listed in Volume 2], including a number of Regional Plantation Committees (RPCs) (DPIE 1997b).

In 1996, the Natural Heritage Trust (NHT) committed a further \$22 million to the FFP. For the 1998-99 funding round, the scope of the FFP was expanded to include the sustainable management of private native forests.

In 1997, the Bushcare program managed by Environment Australia under the NHT contributed an additional \$14.5 million to the FFP to promote new tree crop products, with emphasis on native species. This funding specifically targets activities that combine the management of native vegetation with extensive revegetation to achieve many beneficial outcomes, including:

- conserving wildlife habitat and biodiversity;
- rehabilitation of degraded areas;
- lowering saline watertables, and improving water quality and wetland management;

- absorbing greenhouse gases; and
- creating jobs and commercial opportunities through the production of timber, flowers, foliage, oils, fruits, nuts, honey, and other services (Commonwealth 1997).

A review of State frameworks and programs relevant to farm forestry development is provided in Appendix 4.

3.3 National research and development funding programs

In addition to funding by State governments, national organisations (eg. CSIRO) and industry, research and development for farm forestry is largely provided by the Commonwealth through the Joint Venture Agroforestry Program.

Joint Venture Agroforestry Program

The Joint Venture Agroforestry Program (JVAP) was formed in 1993, combining the resources for farm forestry research and development of two Research and Development Corporations (Rural Industries, and Land and Water Resources), with contributions from the Department of Primary Industries and Energy, Grains Research and Development Corporation and Murray-Darling Basin Commission. In 1995 the Forest and Wood Products Research and Development Corporation joined the JVAP, and in 1996 the FFP and the Cotton Research and Development Corporation began contributing for specific projects. The JVAP funds a wide range of R&D projects to address the research priorities identified within the program.

In 1998, the JVAP was allocated \$4 million under the Natural Heritage Trust from the Farm Forestry Program. The Murray-Darling Basin contributed \$150,000 for 1997-98, and will contribute \$275,000 in each of the subsequent two years.

Of the \$4 million, the Forest and Wood Product Research and Development Corporation will manage \$1.5 million, focusing on timber production elements and private native forest management. RIRDC will manage \$2.5 million, focusing on assessing new tree crop products and industries, quantifying benefits to biodiversity and protection of resources, and developing medium to low rainfall farm forestry options, as outlined below. The strategic plan, which outlines the R&D priorities for the NHT funds, is available from the JVAP. The JVAP priority setting process is ongoing and at present a priority setting document is available for comment (*'Priority Setting for JVAP'*, AACM 1998).

The priority research and development areas for NHT funding are listed below (Contact: Tony Byrne & Sharon Davis, RIRDC).

A: Targeted strategies for implementation of farm forestry:

- market development of niche and commodity products for wood based and non-wood based industries;
- facilitate the provision of market information;

B: More sustainable management of natural resources:

- farm and catchment scale studies for understanding the influences of management on tree water use and feasibility of commercial tree production in irrigated and shallow water tables;
- determine how agroforestry can best increase biodiversity and nature conservation;

C: Optimised productivity of crops and pastures:

- assess the effects of agroforestry on productivity of other agricultural enterprises;

D: Optimised direct returns from tree products:

- identification and development of commercial species and provenances for agroforestry systems and products in medium to low rainfall areas and in northern Australia;

- assessment of high potential species for commercial farm forestry in the higher to medium rainfall areas;
- assessment and development of wood processing technologies and applications for smaller woodlots and timber belts, including different methods and approaches to on-farm processing;

E: Cost effective multi-purpose agroforestry systems to meet commercial and environmental objectives:

- develop farm forestry design options and decision-making tools applicable to emerging industries and the multiple benefits such development;
- investigate the sustainable management and use of private native forest; and

F: Effective communications:

- mechanisms to forge stronger linkages with researchers and the farm forestry community.

RIRDC is currently preparing a compendium of all current and completed research projects, including farm forestry projects, due late-1998 (Contact: Jenny Baxter, RIRDC). A full listing of farm forestry projects funded through the Farm Forestry Program and the JVAP is provided in Volume 2.

Australian Centre for International Agricultural Research

The Australian Centre for International Agricultural Research (ACIAR) has an internationally-focused forestry program, including farm forestry, with an annual program budget of \$4.2 million. The Centre primarily operates in China, south-east and south Asia, and southern Africa. All research must have reciprocal benefits for Australia, with a substantial proportion of the funds allocated to research undertaken in Australia.

The ACIAR forestry research and development priorities include:

- development of Australian tree genetic resources;
- sustainable forest management;
- pests and diseases (plantations); and
- processing and utilisation of forest products.

3.4 A New Zealand perspective

Farm forestry in New Zealand is strongly market-driven (with government having little direct input) and is well-developed as a rural enterprise. The New Zealand Forest Research Institute (NZFRI) is the lead organisation for farm forestry research and development, with close links to the agricultural and forest industries through the NZFRI Research Cooperatives (Contact: Leith Knowles, NZFRI Rotorua).

The main research and development priorities are:

- improving the performance of *Pinus radiata* (radiata pine), the primary species used in farm forestry, and other species for varying farm conditions;
- increasing the knowledge of tree growth functions, with results largely delivered through the Agroforestry Estate Model; and
- developing a methodology for trading 'carbon credits'.

4. RWG 11 research themes

At the 1996 Adelaide meeting of RWG 11, research topics were identified and grouped into five major research themes:

1. Farm forestry systems - focuses on commercial enterprises, targeting land suitable for high productivity; and considers the range of information/tools necessary to evaluate/support such systems, from general silvicultural responses to pricing information.
2. Low rainfall systems - focuses on multiple outcomes, targeting land suitable for profitable farm forestry; and is viewed from the whole farm perspective, where tree profits may be off-set against other values, such as salinity control.
3. Tree-agriculture interactions - focuses on synergistic designs for sustainable, productive land use; with an emphasis on the relationship between the tree and the agricultural component of farm forestry enterprise.
4. Social, economic and policy issues - focuses on the social, economic and broader policy issues associated with farm forestry, including farm, regional and national dimensions; with an emphasis on developing standardised approaches to evaluating social and economic aspects of farm forestry, supported by financial mechanisms and cost-sharing arrangements.
5. Education, training and extension - focuses on the education, training and extension needs of key stakeholders in farm forestry; and considers aspects of availability (eg. tertiary courses, software, publications, field staff), suitability (eg. extension approaches, course content), and access (eg. cost, equipment, remoteness).

5. Current Research Activities

At the Canberra meeting, RWG 11 received the State/Territory/Commonwealth updates on farm forestry R & D. It should be noted that the research issues and activities presented in this section are applicable to several regions and/or States/Territories. No attempt has been made to detail the wide range of research undertaken in all regions, due to the limited scope of this paper. The following synthesis is largely based on RWG 11 State/Territory and Commonwealth member reports and is not presented in priority order.

5.1 Theme 1 - Farm forestry systems

Silviculture

A considerable proportion of current R&D investment aims to better understand the performance of a range of tree species under varying farm forestry operations, highlighting the importance of commercial timber production to farm forestry in Australia.

Farm forestry requires commercial tree crops for farmland, often using unconventional silviculture. For instance, farm forestry operations commonly have lower stocking rates than plantation forestry, requiring clearwood pruning to ensure high quality timber is produced. The impact of pruning operations on wood quality is well known for *Pinus radiata*, *P. elliotii*, *P. caribaea*, *A. cunninghamii*, and *E. nitens* in Tasmania.

A national silviculture project funded by JVAP, '*Silvicultural basis for farm forestry in Australia*' has recently commenced, overseen by a Steering Committee comprising all States, with the exception of the Northern Territory (Contact: Rod Keenan & Rosemary Lott, Queensland Forestry Research Institute). The objectives of the project are to:

- collate and review existing silvicultural information for farm forestry species across Australia;
- determine applicability to other states and regions;
- analyse the sensitivity of farm forestry productivity and economics to silvicultural treatments;
- develop and refine silvicultural prescriptions for resource users;
- identify deficiencies in available data and design experiments to correct these;

- promote a national network of researchers working on farm forestry silviculture; and
- promote increased awareness on good silviculture and the need for it.

Research is also in progress on '*Forecasting tree growth and yield and financial returns of key agroforestry species across southern Australia*'. This project will improve the reliability of forecasting tree growth and yield of key agroforestry species on cleared agricultural land across southern Australia, by developing correlations between tree growth rates and site conditions (Contact: Tom Baker, CFTT, Victoria; Peter Bulman, PIRSA; Don McGuire, PIRSA).

Detailed research has commenced on '*Management of soil fertility on eucalypt plantation sites*' (Contact: Tony O'Connell & Tim Grove, CSIRO Forestry & Forest Products, Western Australia). State Forests NSW is undertaking trials in cultivation, spacing and thinning (Contact: Karen Faunt, State Forests NSW). Queensland has an extensive research program on cultivation, fertilisation, weed control, thinning, and pruning of eucalypt species, funded by the State government (Contact: Rod Keenan, QFRI).

Tree breeding

For commodity species, such as *Pinus radiata* (radiata pine) and *Eucalyptus globulus* (blue gum), developing improved genetic material (eg. clones) to improve yields, quality and adaptability of species to new environments remains an important research issue. Tree breeding is focused upon these two major farm forestry species, undertaken by CSIRO, CRC Sustainable Production Forestry, Southern Tree Breeders Association, Centre for Forest Tree Technology (CFTT), NZFRI, and CaLM WA. QFRI is undertaking considerable tree breeding research on traditional Queensland softwoods, such as *P. elliotii*/*P. caribaea* hybrid, *A. cunninghamii* and other species. Results from comprehensive international trials for *Acacia* spp. funded by ACIAR have recently been published (Contact: Stephen Midgley, CSIRO Forestry & Forest Products). With this exception, tree breeding for a large number of minor species is generally at a rudimentary level.

Research is in progress to improve the genetic material (provenance/progeny trials for conversion to seed orchards) of *Eucalyptus dunnii* (Dunn's white gum), *E. maculata* (spotted gum), *E. grandis* (flooded gum), *E. camaldulensis* (river red gum) and *E. pilularis* (blackbutt) by CSIRO, State Forests NSW and QFRI (Contact: Roger Arnold, CSIRO Forestry & Forest Products). Provenance-progeny trials of *E. occidentalis* (swamp yate) will be established in 1998 in NSW, Victoria and WA (Contact: Nico Marcar, CSIRO Forestry & Forest Products; Elizabeth Barbour, CaLM WA). A JVAP-funded project demonstrating and developing fast growing irrigated eucalypt plantations is underway in northern Victoria. The project will compare the performance of a range of eucalypt species and provenances for a range of soil types and irrigation water qualities (Contact: Tom Baker, CFTT, Victoria).

E. occidentalis and *E. cladocalyx* seed orchards have been established in SA in conjunction with an extensive State-funded provenance trial project focusing on key low rainfall farm tree species (Contact: Peter Bulman/Jeff Fairlamb, PIRSA). A JVAP-funded national workshop to review low rainfall species genetic selection investigations and encourage further collaboration is planned for late 1998.

A book dealing with commercial opportunities using lesser-known native plants has been published '*Economic native trees and shrubs for South Australia: A user-friendly guide to opportunities and establishment of some 300 trees and shrubs*' (Bonney 1997) (Contact: Neville Bonney, Greening Australia SA).

Biodiversity and private native forests

In most regions there is little information as to what 'sustainable' native forest management may be, particularly as farm forestry typically aims to meet a broad range of economic, environmental and

social objectives. In Tasmania, private/farm forestry has historically centred upon the management of native forests, and so there appears to be a wealth of experience on various forest management regimes with local tree species.

JVAP has funded a recent review by CSIRO of research relating to the value of farm forestry for biodiversity benefits; it was concluded that integrated farm forestry with native species could make a positive contribution (Contact: John Ive, CSIRO Wildlife & Ecology). ANU has a major project funded by LWRRDC in the Tumut area investigating the role of corridors and retained vegetation in biodiversity conservation within a pine plantation matrix (Contact: David Lindenmeyer, ANU). State Forests NSW has a small research project investigating the ecological role of isolated paddock trees on plantation establishment sites (Contact: Brad Law, State Forests NSW).

A current LWRRDC project '*Guidelines for the maintenance and improvement of remnant bush in Tasmania*' is investigating the role of fire, pest plants and animals, and grazing on forests (Contact: Jamie Kirkpatrick, University of Tasmania).

Harvesting and processing

The wood and non-wood (eg. oils) properties from various farm forestry operations is being explored, largely by CSIRO with collaborating State agencies (eg. CaLM WA). Much of this research is being funded through government-industry partnerships, such as through FWPRDC (Contact: Gary Waugh, Noel Clarke & David Fife, CSIRO Forestry & Forest Products) and RIRDC (Contact: Mike Slee, ANU Forestry).

Harvesting technology suited to farm forestry situations is being developed with funding by JVAP (Contact: Bill Kerruish, CSIRO Forestry & Forest Products). Much of this research and development is at a preliminary stage, with only broad recommendations available for the main farm forestry operations. A recent JVAP-funded project reviewed the potential for on-farm processing of timber products (Contact: Mark Stewart, Melbourne University).

5.2 Theme 2 - Low rainfall systems

A considerable research and development investment has been committed by CaLM to develop commercial tree crops for low rainfall agricultural regions. Technology for harvesting and processing eucalypt oil, uses for the timber by-product, and genetic material is still being developed under the innovative Western Australia Oil Mallee program (Contact: John Bartle, CaLM WA).

CaLM WA and Forestry SA are adapting *Pinus* species to enable commercial viability of farm forestry in low to medium rainfall regions; from 400-600 mm/year (Contact: Richard Moore, CaLM WA; Mick Underdown, Forestry SA). Forestry SA are establishing a dryland genetics trial as part of a FFP project to evaluate a range of species and provenances (Contact: Mick Underdown, Forestry SA). State Forests NSW and CSIRO are investigating the extent to which supplementary irrigation can support commercial farm forestry, with trials using *E. camaldulensis* and *E. grandis* in the Deniliquin and Millewa areas (Contact: Karen Faunt, State Forests NSW; Phil Polglase, CSIRO Forestry & Forest Products).

An assessment of commercial prospects for planted tree species in low rainfall zones of Australia commenced in April 1997 with funding from JVAP (Contact: Peter Chudleigh, Agrtrans Research Brisbane). This will build on existing work, such as appraisals of commercial opportunities in low rainfall areas of South Australia for broombush (Contact: Peter Bulman, PIRSA), Aleppo pine (Contact: Peter Crammond, RST Technology), and for alley farming designs (Contact: Alex Knight, PIRSA). A 3-year project funded by JVAP is to identify plantation-grown bipinnate acacia species that successfully provide a fuelwood source and tannins for wood adhesive production commenced in late 1997 (Contact: Elizabeth Barbour, WA CALM).

JVAP funded a recently completed study which explored the feasibility of carob as a commercial tree crop for low rainfall areas, with the likelihood of irrigation needed for optimum commercial yields (Contact: Digby Race, ANU Forestry). Preliminary investigations of the value of saltbush and tagasaste in low rainfall areas are being undertaken in WA, NSW, SA and Victoria (Contact: Departments of Agriculture).

5.3 Theme 3 - Tree-agriculture interactions

The National Windbreaks Program, which commenced in 1994, is a major research effort across four States (WA, SA, Vic, Qld), commissioned by the JVAP. It aims to provide an integrated and quantitative assessment of the response of agricultural systems to windbreaks (Contact: Helen Cleugh, CSIRO Land & Water). The research approach includes:

- field measurements over five growing seasons in pasture, cereal and horticultural crops sheltered by mature windbreaks; for damage, phenology, growth rates and final yields, soil water changes, and upwind meteorology;
- field and wind tunnel experiments;
- artificial shelters to measure crop growth, microclimate and water use in field conditions with total shelter; and
- developing and testing predictive models, including airflow and turbulence, microclimate, water use and crop yield.

JVAP has funded recent efforts to explore the value of agroforestry systems and tree water use by integrating trees with agriculture for multiple benefits, particularly to address natural resource management issues (such as salinity) to improve catchment health. The project involves measuring and predicting tree water use under optimal and stressed conditions, and measuring and predicting the competition between trees and crops for water in different farm forestry systems. A guidelines manual to support land managers will be produced (Contact: Rob Vertessy, CSIRO Land & Water). Water use by different tree species under varying conditions are also being measured by other groups (eg contact: Don White, CSIRO Forestry & Forest Products), especially in relation to opportunities for groundwater use.

Another research project, *Wagga Effluent Project* (1991-97), has investigated the environmental implications and commercial opportunities for developing woodlots irrigated with municipal effluent. Guidelines are being written and models developed based on this research (Contact: Brian Myers, CSIRO Forestry & Forest Products). JVAP has also funded a project investigating the effect of salt on wood and fibre formation in eucalypts which is nearing completion (Contact: Steve Read, Melb. Uni.).

Long-term research of the relationship between tree spacing and production from grazing have been undertaken in Victoria (Contact: John Kellas, CFTT; Rod Bird, DNRE) and South Australia (Contact: Roger Pfitzner & Mick Underdown, Forestry SA). Research to identify farm forestry systems with minimal competition between trees and adjacent agriculture commenced in early 1997 (Contact: Tim Grove, CSIRO).

5.4 Theme 4 - Social, economic and policy issues

Social

Socio-economic research conducted in south-west Western Australia revealed the complex social environment in which many farmers make business decisions (Contact: Peter Eckersley, AgWA). Studies of the general socio-economic issues relating to farm forestry at the regional level, and

relationships between small-scale growers and the processing industries have recently been commissioned by the JVAP (Contact: Digby Race, ANU Forestry).

In NSW, Southern Cross University is conducting a socio-economic survey of community attitudes to farm forestry in the North Coast region (Contact: Alison Specht, SCU), and Greening Australia has surveyed timber processors to determine optimum product specifications (Contact: Mark Sandstrom, Greening Australia NSW).

The Cooperative Research Centre for Sustainable Production Forestry has a project to investigate the economic and social outcomes of regional farm forestry. This research will be conducted during 1998-2003, and principally involves ANU Forestry and the University of Tasmania (Contact: Chris Beadle, CSIRO-CRC Hobart).

Economic

Forecasting and modelling

Work is underway to assist yield predictions from forest stands (Contact: Trevor Booth, CSIRO Forestry & Forest Products). The Trees for Profit research group have released several papers outlining the potential of farm forestry in northern Victoria (Contact: Des Stackpole, DNRE), and PIRSA/ForestrySA have a major national project funded by JVAP to coordinate information for *'Forecasting tree growth and yield and financial returns of key agroforestry species across southern Australia'* (Contact: Tom Baker, DNRE; Peter Bulman, PIRSA). The project will:

- improve the reliability of forecasting tree growth and yield of key farm forestry species on cleared agricultural land, by developing correlations between tree growth rates and height of mature remnant native vegetation and selected soil chemical parameters;
- investigate relationships between tree growth rates and species, site, age and spacing, and construct mathematical models of tree growth which can be incorporated into financial models such as FARMTREE; and
- improve landholders knowledge of the relative economic returns and benefits from adapting different farm forestry regimes.

The FARMTREE model has been developed as a farm forestry prediction tool, with funding by JVAP and the FFP, and is increasingly being used around Australia to provide a basis for analysing individual farm forestry operations. Its capacity to accurately predict the multiple benefits of farm forestry systems is greatly compromised where local information is deficient (Contact: Tracey Jarvis, DNRE; Peter Stephen, Melbourne University).

A user-friendly tool for farmers and consultants is being developed in Western Australia to evaluate farm forestry options using regional best-bet information. The model, developed by Campbell-White and Associates with JVAP funding, was released for testing in March 1998 (Contact: Peter Eckersley, AgWA).

A major constraint to farm forestry investment has been the lack of publicly available market information on Australia's forest products. This gap is partly being addressed by the development of a quarterly market report of prices for forest products. The market reports are widely disseminated in the main agricultural and forestry magazines, with JVAP funding (Contact: U.N. Bhati, ANU Forestry).

At a national level, the Bureau of Resource Sciences (BRS) has been commissioned to develop an inventory of Australia's plantation and farm forestry resource, both in terms of extent and quality (Contact: Dan Sun & Claire Howell, BRS). ABARE and the Centre for International Economics have developed models for assessing the regional and national economic outcomes of farm forestry (Contact: Kevin Burns, ABARE; Jenny Gordon, CIE).

BRS and Environment Australia are refining models for predicting carbon sequestration benefits of different farm forestry operations and industries, at the national and international levels (Contact: Jim Donaldson, Environment Australia).

Financing options

Dunchue and Sinclair (1995) reviewed potential mechanisms to link small urban investors and large investment groups (eg. superannuation companies) as a means of providing finance for farm forestry development, funded by the FFP (Contact: Hugh Dunchue, State Forests NSW).

Brokerage teams have been commissioned by urban/corporate investors to establish and manage private forestry investments, purchasing farmland and establishing joint venture arrangements with existing landholders. Two such investment brokerage examples are Integrated Tree Cropping, which focuses on short rotation hardwood for pulpwood (Contact: David Wettenhall, Albany WA), and Radiata Contractors Australia, which focus on high-quality softwood sawlogs (Contact: John Wain, Frankston Vic.).

A project funded by JVAP is nearing completion in the Northern Tablelands of NSW, which aims to provide landholders with information on the economic and market potential for timber products sourced from existing timber resources, and assess the ability of this resource to generate the cash-flows required to establish new plantations (Contact: Roy Powell, CARE Armidale).

Regional appraisals

Regional appraisals, including economic analyses, have been conducted for a many farm forestry regions. Published appraisals include:

- Albany - WA (1993);
- South-west WA (1995);
- South-west slopes NSW (1995);
- Esperance - WA (1996);
- North-east Vic. (1996);
- Northern Territory (1997);
- Adelaide Hills - SA (1998); and
- Green Triangle - south-east SA and south-west Vic. (1998).

Cost sharing

Preliminary analysis of cost sharing arrangements relating to farm forestry has been undertaken by the Murray-Darling Basin Commission. Using the 'beneficiary pays' principle to construct a cost sharing framework, it is theoretically possible to ascribe proportional costs to individuals, state governments, and the Commonwealth (MDBC 1996). It has been argued that cost sharing of some design is warranted as '... there are public good aspects and management issues in both the incidence, prevention and treatment of land degradation' (Gretton & Salma 1996, p.37).

Guijt and Race (1998) have reviewed 18 leading examples of farm forestry across Australia to illustrate the multiple benefits that can be derived from various farm forestry systems, as a step towards identifying likely approaches for cost sharing at the local level (Contact: Annabel Johnston, Greening Australia).

Monitoring and evaluation

There is interest in developing a systematic approach to monitoring and evaluating the outcomes of the numerous farm forestry programs at the regional and national levels. An evaluation of the initial phase of the Farm Forestry Program (1993-95) was undertaken (Curtis & Race 1995), with a second review currently in progress (Contact: Hassall Consulting, Canberra). Environment Australia and

JVAP have commissioned a study to develop indicators for assessing the effectiveness of revegetation and farm forestry programs (Contact: Denis Saunders, CSIRO Wildlife & Ecology; Jenny Gordon, CIE).

Evaluations have been conducted for farm forestry courses delivered by Melbourne University and the Australian National University (Contact: Rowan Reid, Melbourne University; Peter Kanowski, ANU Forestry).

Policy

A recent assessment of the policy and institutional context in which farm forestry is developing was commissioned by JVAP (Alexandra & Hall 1998). A review has been conducted of planning legislation and regulations controlling planning for timber production in each State, with particular emphasis on the role of local government in farm forestry development (FORTECH 1997).

5.5 Theme 5 - Education, training and extension

Extension

State/Territory and regional farm forestry development projects include a considerable education, training and extension component. Most of the 40 regional projects currently funded through the FFP have a strong emphasis upon extension and education. State and Commonwealth agencies, industry groups (eg. Australian Forest Growers, National Association of Forest Industries), non-government organisations (eg. Greening Australia, universities), and Regional Plantation Committees adopt varied communication approaches. An analysis of the current extension and training approaches used for farm forestry is currently being conducted with JVAP funding, with findings due in August 1998 (Contact: Alan Black & Kären Forge, Edith Cowan University).

Greening Australia also delivers a significant national project *Forestry for Farms*, funded through the FFP. The program focuses on three primary areas:

- developing interest, knowledge and networks;
- responding to enquiries and participating in activities at a regional level; and
- developing an institutional environment that is conducive to the development of farm forestry, particularly through networks with local government and state agencies.

Importantly, the project sets out to build the capacity for activity in the lower rainfall zones and linkages with the broad landcare activities.

Several regional Greening Australia offices, including Dorrig, Deniliquin and Eden, manage large scale farm forestry projects (Contact: Annabel Johnston, Greening Australia). CSIRO's Seed and Advisory Service includes the provision of advice to prospective growers on species and site selection (Contact: Tim Vercoe, Australian Tree Seed Centre, CSIRO Forestry & Forest Products).

There is a wide range of written information on farm forestry generated at the national and regional levels. The *Australian Forest Grower*, *Agroforestry News*, and *Shaping the future with farm forestry* report on farm forestry developments and are published quarterly (Contact: Lyn Day, AFG; Tracey Jarvis, DNRE, Sharon Davis, RIRDC, respectively). A comprehensive collection of extension materials is likely to be held by regional farm forestry development officers (Contact: regional networks, State agencies, industry, Greening Australia).

An interactive computer database, *REX '96* (available on CD), has been developed with JVAP funding to support plant selection. A new version, *REX Encyclopedia: Trees and other plants for Australia*, is expected to be released by December 1998 (Contact: David Bicknell, AgWA).

Formal education and training

Melbourne University offers a Graduate Certificate in Farm Forestry to experienced agency and industry staff, and landholders. To date, about 200 people have completed the course. The Master Tree Growers course, with funding from the Myer Foundation, FFP and JVAP, targets neighbouring landholders with an interest in farm forestry, and is delivered locally. There are currently about 200 people enrolled in this course (Contact: Rowan Reid & Peter Stephen, Melbourne University). The Australian National University - Forestry delivered a 5-day technical course in farm forestry to Greening Australia and Landcare facilitators in 1997.

Undergraduate students are offered farm forestry as a subject of study at Melbourne University and Australian National University (Contact: Rowan Reid, Melbourne Uni.; John Field, ANU Forestry), with about 50-60 students per year completing this subject at both institutions. There is an increasing number of university courses that relate to farm forestry development (eg. agriculture, environmental management).

Conferences

Regional workshops, seminars and conferences, as well as the national level biennial conferences of the Australian Forest Growers (Contact: Lyn Day, AFG) and Institute of Foresters - Australia and provide opportunities for information dissemination. National conferences are growing in popularity as a means of information sharing and facilitating networks among farm forestry stakeholders across States/Territories.

6. General recommendations

Recommendations in Sections 6 and 7 are categorised as MR (Meeting Recommendations) or OR (Other Recommendations). MRs are mostly those recommendations made during the Canberra RWG 11 meeting but there are also some formulated on the basis of recommendations made in State/Territory/Commonwealth member reports and in subsequent submissions by members. ORs are recommendations made by the authors based on issues raised by farm forestry researchers and discussions with the organising committee outside the RWG 11 meeting.

The meeting expressed concern about the long period of time between meetings and the need to develop mechanisms by which issues are progressed during the intervening two years. RWG 11 will aim to work with other member organisations and RPCC to develop a work program to implement the recommendations made during this RWG 11 meeting process.

The recommendations made in section 6 apply generally, while the recommendations in Section 7 apply to a specific theme area.

The process for developing consistent national research priorities needs reviewing. JVAP is the major research and development funding agency, and currently undertakes a priority setting exercise separately from the activities of RWG 11 since the latter only meets every two years. For example, JVAP has published a paper '*Priority setting for JVAP*' which is currently available for public comment. Presently, priority setting undertaken by RWG 11 does not relate directly to any substantive decision-making processes for farm forestry research. The research-related functions of the National Farm Forestry Roundtable (NFFR) should be determined. The relationships of NFFR to SCF, RWG 11 and JVAP should be defined and linked more closely.

MR 1: R&D priority setting should be coordinated and stream-lined across organisations, in particular between JVAP with RWG 11.

It was suggested that RWG 11 meetings should be restructured so that specific research projects can be formulated in addition to research priorities. Although State/Territory representatives can describe

their own research well, and provide a useful outline of relevant State/Territory-wide research, State/Territory summary reports prepared may be incomplete. Most members also do not have detailed knowledge of the scope of research nationally. In an attempt to inform members of the scope of research nationally there is little meeting time for priority setting, and many members remain unconfident about making such judgements. However, members of RWG 11 are involved in innovative projects and have creative ideas about specific research projects. The RWG 11 meeting can provide valuable opportunity for co-ordination and collaboration at the project design and planning stage, particularly for national projects. The meeting could also focus on particular issues, such as projects for low rainfall zones or biodiversity, and invite guests with particular expertise in specified areas.

MR 2: Future RWG 11 meetings should focus on (a) sharing information on innovative farm forestry research and (b) developing specific research projects with national significance. Membership of RWG 11 should be reviewed to ensure representation of FF R & D and extension stakeholders.

There is a need to more clearly define lead agencies for farm forestry R & D in each State/Territory. Communication is hampered by the lack of clear communication pathways and definition of roles and responsibilities. Farm forestry appears to fall between the gap of forestry and agriculture, and the responsible agencies are not clear in most States.

MR 3: State/Territory governments should identify the roles and responsibilities of agencies for farm forestry (notably, policy, planning, regulation, extension, and research and development), and improve communication pathways between these agencies.

Forestry and agricultural organisations have a long history of research that may have some application to farm forestry development. The extent to which research undertaken in forestry or agricultural organisations has some value to farm forestry has also not been comprehensively interpreted. The membership of RWG 11 could better bridge the knowledge of national research in farm forestry, forestry and agriculture.

MR 4: Priority should be given to assessing the applicability of research undertaken in both forestry and agriculture to the development of farm forestry, implications to research priorities and opportunities for collaboration.

Three research areas spanning all five themes that require particular attention were identified by both the meeting and the development of this report:

- sustainable management of private native forests;
- contribution of farm forestry to farm and regional biodiversity values and environmental benefits more generally; and
- the role of and potential for carbon credits and carbon trading in farm forestry development.

MR 5: That research and development programs give particular consideration to private native forest management, biodiversity values (and environmental benefits more generally), and carbon credits.

Improved communication between dispersed R & D organisations has the considerable benefit of allowing effective nationally-coordinated projects to emerge (eg. National Windbreaks Project). However, the meeting noted that development of and access to national databases remained an priority. For example, the database on trials developed under the National Silviculture Project.

MR 6: Priority should be given to the development of and access to national databases, particularly for results from national research projects.

The meeting defined the key characteristics of an effective national project as:

- application of world-class science;
- national importance established using a range of indicators including adequate socio-economic input;
- access to information stored on national databases and the capacity to modify these (eg. as in the National Silviculture Project);
- peer review at project inception and implementation;
- ownership by stakeholders and clients;
- involvement of a range of disciplines and skills;
- good leadership and coordination (especially a project champion) and a clear focus;
- adequate resourcing to meet objectives
- assessment of project performance against a range of criteria;
- ongoing communication with project (eg. workshops, site visits) and effective communication of project to a wider audience

MR 7: Develop protocols to assist project proponents to develop effective national projects.

The importance of maintaining communication among farm forestry researchers in RWG 11 and between RWG 11 and related RWGs between the biennial meetings was identified. Various communication pathways, including the internet, were suggested. A standard reporting system may be a valuable investment. The meeting also noted that the outcomes of RWG 11 meetings should be reported to a wider audience.

MR 8: Develop mechanisms for better communication between RWG 11 members and between RWG 11, other related RWGs and the farm forestry sector between biennial meetings, and publish outcomes of RWG 11 meetings as a report for wider circulation.

7. Research gaps and recommendations

The meeting reviewed the five research themes, and the key research and development issues that needed to be addressed within each theme. The major R & D gaps are reported below.

It was agreed that the RWG 11 research theme ‘Tree-agriculture interactions’ would be renamed ‘Capturing multiple benefits’. It was also agreed that the five major research themes would continue to provide an appropriate focus.

Theme 1 - Farm forestry systems

Silviculture

The National Silviculture Project aims to identify deficiencies in available data on silviculture and to design experiments to correct these. Interim work indicates there is little information on thinning, pruning and spacing, and for lower rainfall areas. There is an emphasis on data from high rainfall areas and old-age stands. The Steering Committee for this project may be in a position to provide early recommendations to guide further research in this area.

OR 1: Seek advice from the National Silviculture Project Steering Committee on priority research and development gaps in silviculture.

Tree breeding

Tree improvement of a large number of minor species is generally at a relatively rudimentary level, and is a major impediment to improving the viability of farm forestry systems not based on dominant commercial species. There is a need to develop cost-effective approaches to screening and breeding

for such species. The performance of native species for non-commodity product remains an important issue if farm forestry is to emerge as a viable land use in the medium and low rainfall regions in temperate Australia, and the wet tropics of Queensland and Northern Territory.

MR 9: Develop tree improvement programs for a range of prospective species.

Private native forests

The paucity of information on sustainable native forest management as a farm forestry option, particularly in non-traditional forestry areas, is an issue in most States (not in SA and NT). The full impact (positive and negative) of private native forest management on regional biodiversity is complex and largely unknown (Ive & Lambeck 1997).

MR 10: Undertake research and development on management options for private native forest that protects biodiversity values and assess the value of ecological research to determine its usefulness to farm forestry.

Other issues

Exploring the use of herbicides and non-chemical weed control methods for varying farm forestry systems was identified as an important issue in New South Wales, Tasmania and Victoria. Improving efficacy of the *Btt.* insecticide in eucalypt plantations was viewed as important in Tasmania, as was minimising the impacts of pests and diseases in Queensland.

MR 11: Explore the sustainable use of herbicides, non-chemical weed control methods, and insecticides for different farm forestry systems.

The following recommendations were developed in discussion groups and presented for consideration to the meeting.

MR 12: Develop and provide ready access to databases, and standardise experimental and demonstration design protocols for silvicultural trials, including: genetic material, silvicultural practice, replication, recording, data collection, and index systems that reflect wood quality parameters.

MR 13: Develop and assess common or generic response models (perhaps based on the New Zealand format) which allow data integration and model validation using existing simple parameters, such as total crown length and leaf-area index.

MR 14: Develop growth models and yield prediction tools for a range of major and minor species, for varying site and silvicultural options, and appropriate methods for incorporating such models into widely available decision-support systems.

MR 15: Develop a national feasibility study of eucalypts for sawlogs as a commercial tree cropping option (eg. Young eucalypt project no. 2).

Theme 2 - Low rainfall

Identifying the suitability of commodity and non-commodity species for farm forestry outside traditional forestry regions is an important task for most regions.

OR 2: Develop a compendium of projects undertaken in low rainfall zones.

OR 3: Develop a comprehensive research and development program or plan to more clearly define needs and priorities.

The following recommendations were developed by individual discussion groups and presented for consideration to the meeting.

MR 16: Evaluate the costs and benefits (environmental & otherwise) of a range of farm forestry opportunities for low rainfall areas on a national basis.

MR 17: Implement a national project to select and develop improved genetic material of commercial farm forestry species suitable for low rainfall areas (eg. National Farm Tree Improvement Project).

MR 18: Undertake product and industry development for private native woodlands in low rainfall areas.

Theme 3 - Capturing multiple benefits

As land degradation is an important driver of farm forestry initiatives, further R & D is required to better define appropriate farm forestry locations, designs, densities and planting patterns to manage water, salts and nutrients in agricultural catchments.

OR 4: Assess existing agricultural research to determine its usefulness to the development of farm forestry systems.

OR 5: Assess how remnant vegetation contributes to the ecological value of and ecosystem functioning in plantations.

OR 6: Assess the levels of biodiversity supported in plantations and how this varies with tree species, age and isolation from remnants/forest.

The following recommendations were developed by individual discussion groups and presented for consideration to the meeting.

MR 19: Review and research attributes (eg. rooting patterns & canopy dimensions) of species (& provenances) with potential for capturing multiple benefits

MR 20: Investigate the effects of species and planting arrangements to quantify the site-level outcomes on microclimate, soil chemistry and structure, hydrology and water balance, wind and water movement, competition and interaction with crops/pastures.

MR 21: Undertake cost-benefit analyses of the effects of farm forestry options against agricultural and environmental criteria at local and regional levels.

Theme 4 - Social, economic and institutional issues

Social

Community concern that forestry is displacing prime agricultural land, and contributing to rural decline, has been raised. There appears an opportunity for recently formed RPCs to play a facilitation role in resolving such concerns at the regional level.

OR 7: Assess the validity of concerns that farm forestry displaces agriculture, and explore the potential for farm forestry to resolve such concerns.

Economic

The long-term commercial prospects of farm forestry for individuals and regions remains based on non-commodity species is an issue of importance in most States. Investment in farm forestry will continue to be constrained until prospective investors (growers, industry, government) can be given greater assurance of the likely economic (and other) returns. Uncertainty about the financial prospects of farm forestry undermines capital investment in forestry, particularly outside traditional forestry regions (eg. wet tropics of Queensland). Regional appraisals of market prospects therefore remain a research priority.

MR 22: Undertake regional appraisals of market prospects in prospective farm forestry regions.

Despite considerable biophysical and economic information for commodity species (eg. *Pinus radiata*, *Eucalyptus globulus*) within traditional forestry regions, sophisticated modelling and market appraisal is not broadly available. For example, in Western Australia about 15,000 ha/year of blue gum for pulpwood is established on farmland, and in the Green Triangle, planting of blue gum for pulpwood has reached about 2,000 ha/year and radiata pine for sawlogs about 500 ha/year on farmland. These figures do not include the additional areas that are established as large scale industrial plantations.

Analytical tools, like FARMTREE, need further refinement if accurate analysis of individual farm forestry operations are to be made. Local biological and economic values of farm forestry systems are needed for accurate predictions. Access to program operators may also be a limiting factor. A related issue is how best to incorporate scientifically valid information from the numerous trials and demonstration sites to support models.

OR 8: Refine analysis tools to include local biophysical and socio-economic data and make access to tools more widely available.

Clear cost sharing arrangements, or approaches for calculating fair cost sharing, are yet to be developed.

MR 23: Develop cost sharing frameworks, building on the work of the MDBC.

Policy

An analysis of policy approaches to farm forestry at the State/Territory could identify the most effective policy instruments in supporting farm forestry development.

MR 24: Analyse State/Territory and overseas policy approaches to farm forestry and identify best bet options.

The following recommendations were developed by individual discussion groups and presented for consideration to the meeting.

MR 25: Develop a standard approach to social, economic and environmental monitoring and evaluation of farm forestry development at the farm, regional and national levels.

MR 26: Identify and develop socio-economic mechanisms (eg. planning) to assist the adoption of farm forestry at the regional level.

MR 27: Develop a cost-effective national index of forest product prices (eg. ANU Forestry Log market report, published on a regular basis).

MR 28: Develop regional cost-sharing guidelines that reflect the outcomes of farm forestry development.

Theme 5 - Education, training and extension

Enhancing the exchange between researchers and extension agents is an issue in all States, particularly the dissemination of research findings. Information exchange must be coordinated between regions and States/Territories. For example, in Tasmania, Private Forests Tasmania (PFT) has gained wide recognition as the lead agency for facilitating information exchange (but does not undertake research) and has developed close links with grower cooperatives, Tasmanian Farmers' and Graziers' Association, and industry groups. However, the position of PFT appears to benefit greatly from there being few other agencies with a major interest in private/farm forestry.

OR 9: Publish a research and development compendium on farm forestry in Australia.

MR 29: Undertake an assessment of the training needs of landcare and other field extension officers in farm forestry and define training options to address the key knowledge gaps.

MR 30: Develop a broad-based education and public awareness program on the role of farm forestry. Include socio-economic survey to obtain base-line data on the attitude of urban and rural communities.

The following recommendation was developed by individual discussion groups and presented for consideration to the meeting.

MR 31: Determine and communicate the most effective approach(es) of extension, education and training for different stakeholder groups to achieve specific outcomes (eg. review findings from Edith Cowan University project).

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Appendix 1: RWG 11 meeting format – Canberra, 28-29 April 1998

Tuesday 28 April

MORNING ‘Current R & D: summaries, synthesis and progress under research themes’

Session chair: Peter Bulman (PISA)

0845-0850	Welcome	Glen Kile (Chief, CSIRO FFP)
0850-0900	Introduction to RWG 11	Roger Pfitzner (RPCC)
0900-0910	Process for the meeting	Nico Marcar (Chair)
0910-1000	Summary of state/territory/national reports and progress made with projects since RWG 11 (1996). Order of presentations: NSW/ACT (Karen Faunt), Vic (John Kellas), Qld (Rod Keenan), SA (Mick Underdown), WA (Richard Moore), Tas (Mike Castley), NZ (Leith Knowles) and CSIRO (Nico Marcar)	Individual 5 min presentations
1000-1015	National overview of issues and major program areas	Lisa Robins
1015-1045	Morning tea	
1045-1055	Low rainfall agroforestry: progress to date & prospects for the future	Richard Moore (WA)
1055-1105	Farm forestry systems: National Silviculture Project	Rod Keenan (Qld)
1105-1115	Tree-agriculture interface	John Kellas (Vic)
1115-1125	Social, economic & policy issues/Education, training & extension	Lisa Robins
1125-1130	National market report	U.N. Bhati (ANU)
1130-1230	Discussion. What revisions are needed to bring the 5 major program areas up to date?	
1230-1330	Lunch	

AFTERNOON ‘Current R & D: nationally co-ordinated projects and future opportunities’

Session chair: Jim Donaldson (DPIE)

The aim of this session is to improve our understanding of current nationally co-ordinated projects and recent developments, identify critical information gaps and future opportunities.

1330-1350	CSIRO Forestry & Forest Products research for farm forestry	Tim Vercoe (CSIRO)
1350-1405	National Farm Forestry Inventory	Dan Sun (BRS)
1405-1420	National Windbreak Program	Helen Cleugh (CSIRO)
1420-1435	Farm forestry research supported by ACIAR	John Fryer (ACIAR)
1435-1450	Management of regrowth on farms: issues and R & D opportunities	Alan Cummine (AFG)
1450-1515	Discussion	
1515-1530	Afternoon tea	
1530-1630	Assessment of nationally co-ordinated projects. Are we doing enough? Future needs.	Discussion in groups
1630-1800	Free time.	
1800-1900	Dinner at Forestry House	
1930-2030	Summary of outcomes from day 1. Planning for day 2.	Discussion

Wednesday 29 April

MORNING ‘The way forward: gaps and priorities’

Chair: Peter Kanowski (ANU Department of Forestry)

0830-0845	Vision 2020	Vanessa El-Gavins (DPIE)
0845-0900	NHT	Phil Pritchard (DPIE)
0900-0915	JVAP	Tony Byrne (RIRDC)
0915-1000	Discussion	
1000-1015	Morning tea	
1015-1030	Agroforestry options: NZ experiences	Leith Knowles
1030-1215	Group discussion on identification of major gaps in knowledge that are not being addressed by current R & D activities, opportunities for new projects and further collaboration	
1215-1300	Lunch	

AFTERNOON- The way forward: action plans and proposals for new projects

Chair: David Bicknell (WA Agriculture)

1300-1445	Development of action plans for development of new project proposals and closer links between R & D providers, funders and policy makers. Draft report ready for RPCC	Group and main discussion
1445-1500	Selection of Chair and Secretary for 1998–1999 and close of meeting. Next meeting may be either 1999 or 2000	Nico Marcar
1500-1515	Afternoon tea	
1515-1815	Field trip to Uriarra (species trials)	Aidan Flanagan (ACT Forests)/ Tim Vercoe (CSIRO)

Appendix 2: RWG 11 Members

RWG11 Commonwealth ACT Co-Ordinator	Marcar, Dr Nico	CSIRO Forestry and Forest Products	PO Box E4008 Kingston ACT 2604
RWG11 Commonwealth	Pritchard, Mr Phil	Agricultural Production and Natural Resources Branch Bureau of Resource Sciences	PO Box E11 Kingston ACT 2604
RWG11 Commonwealth	Prinsley, Dr Roslyn	Rural Industries Research & Development Corp.	PO Box 4776 Kingston, ACT 2604
RWG 11 Commonwealth	Hansard, Mr Allan	Forestry Branch Minerals, Energy and Resources Branch Australian Bureau of Agricultural and Resource Economics	GPO Box 1563 Canberra ACT 2601
RWG11 Commonwealth	Sun, Dr Dan	Agricultural Production and Natural Resources Branch Bureau of Resource Sciences	PO Box E11 Kingston ACT 2604
RWG 11 New South Wales	Blore, Ms Dhyan	NSW Agriculture	Locked Bag 21 Orange NSW 2800
RWG11 New South Wales	Faunt, Ms Karen	Northern Research Centre State Forests of NSW	PO Box J19 Coffs Harbour Jetty NSW 2450
RWG 11 Victoria	Jarvis, Ms Tracey	Department of Natural Resources and Environment	Locked Bag 3000 PO Box Hill Vic 3128
RWG11 Victoria	Kellas, Dr John	Centre for Forest Tree Technology Dept Conservation & Natural Resources c/- School of Forestry and Resource Conservation	Creswick Vic 3363
RWG11 Queensland	Grodecki, Mr Andy	Department of Natural Resources	Block A, Resource Sciences Centre, 80 Meirs Road Indooroopilly Qld 4068
RWG11 Queensland	Keenan, Dr Rod	Officer-in-charge Tropical Forestry Queensland Forestry Research Institute	PO Box 210 Atherton QLD 4883
RWG11 South Australia	Underdown, Mr Mick	Department of Primary Industries Co-ordinator, Private Forestry Primary Industries SA (Forestry)	PO Box 162 Mount Gambier SA 5290
RWG11 South Australia	Bulman, Mr Peter	Sustainable Resources Revegetation Program Primary Industries SA	Box 752 Murray Bridge SA 5253
RWG11 Western Australia	Moore, Mr Richard	Department of Conservation and Land Management	14 Queen Street Busselton WA 6280
RWG11 Western Australia	Bicknell, Mr David	Agroforestry Group Pastures and Revegetation Branch, Plant Industries Division Department of Agriculture	Narrogin District Office 10 Doney Street Narrogin WA 6312

RWG11 Tasmania	Castley, Mr Mike	Private Forests Tasmania	PO Box 180 Kings Meadows Tas 7249
RWG11 Australian Capital Territory	Flanagan, Mr Aidan	ACT Forests Department of Environment Land and Planning	PO Box 3252 Weston ACT 2611
RWG11 Northern Territory	Reily, Mr Don	Agriculture Division Department of Primary Industries and Fisheries	GPO Box 990 Darwin NT 0801
RWG11 New Zealand	Knowles, Mr Leith	NZ Forest Research Institute	Private Bag 3020 Rotorua New Zealand
RWG11 Non government Greening Australia	Elwell-Gavins, Ms Vanessa	Greening Australia	PO Box 74 Yarralumla ACT 2600
RWG11 Non government	Race, Dr Digby	Department of Forestry, ANU	Canberra ACT 0200
RWG11 Co-ordinator	Pfitzner, Mr Roger	Manager, Private Forestry Primary Industries SA Forestry	PO Box 162 Mount Gambier SA 5290

Appendix 3: 2020 Vision Actions

Strategic imperative 1: Boost the availability of suitable land for plantations

Goal 1 Government recognition of plantations as an agricultural crop

Action 1 Promulgate guidelines and codes of practice consistent with other land uses

Action 2 Ensure State native vegetation legislation is appropriate for plantations

Goal 2 Local government support for regional plantation development

Action 3 Develop a communications strategy about the benefits of plantations

Goal 3 Knowledge of regional potential for commercial tree production

Action 4 Identify suitable available land and the existing resource base

Action 5 Ensure R&D is nationally coordinated and strategic

Goal 4 Adequate planning to underpin plantation expansion

Action 6 Encourage local governments to plan for the required infrastructure

Action 7 Ensure local planning and rating systems do not discriminate against plantations

Strategic imperative 2: Get the commercial incentives right

Goal 5 Greater global focus

Action 8 Provide information to improve foreign and local investor confidence

Action 9 Identify how to enhance both local competition and global competitiveness

Goal 6 A supportive commercial and regulatory environment

Action 10 Regularly review State government ownership of plantations

Action 11 Review State plantation operations in terms of National Competition Policy

Action 12 Pursue a comprehensive policy approach to plantation development

Action 13 Provide secure rights to plant, harvest and trade plantations

Strategic imperative 3: Establish a commercial plantations culture

Goal 7 A strong plantations and farm forestry culture that attracts investors

Action 14 Develop information packs to facilitate regional plantation development

Action 15 Extend the life and functions of Regional Plantation Committees

Action 16 Improve commercial tree growing skills through extension and education

Action 17 Target onshore and offshore investors to build a solid investment base

Action 18 Encourage Regional Plantation Committees to consider marketing issues, especially for small growers

Action 19 Review the desirability of extra incentives for plantation development

Strategic imperative 4: Improve information flows

Goal 8 Readily available information on tree growing, markets and profitability

Action 20 Provide growers with log specifications and anticipated prices

Action 21 Publish comparative data on domestic and international markets

Action 22 Inform farmers of the comparative profitability of plantations

Action 23 Promote the natural resource management benefits of commercial trees

Action 24 Fund R&D on the natural resource management benefits of commercial trees

Existing initiatives

Goal 9 A non-discriminatory taxation environment

Action 25 Remove tax impediments and publicise tax arrangements

Goal 10 Greater global market access

Action 26 Remove export controls on unprocessed plantation wood

Action 27 Remove quotas on exports from private native forests

Goal 11 Better economic information

Action 28 Report on industry trends and on economic assessments of plantation regions

Note: More detailed information on the Goals and Actions can be found in the Vision 2020 publication, or on the Internet at: <http://www.dpic.gov.au/agfor/forests/2020/framework.html>

Appendix 4: State frameworks & programs relevant to farm forestry development

State/Territory Governments are joint signatories of the National Forest Policy Statement and have endorsed the Wood and Paper Industry Strategy and Plantations 2020 Vision. These framework documents, to some extent, guide farm forestry-related policy, strategy and legislation development at the State level.

A brief synopsis of structures and frameworks influencing farm forestry development at the State level follows. The key government agencies and regional players are identified, as well as significant legislative and strategy frameworks. FORTECH (1997) provides a comprehensive assessment of state planning frameworks and issues.

Australian Capital Territory

Environment ACT and ACT Forests are the key government agencies influencing farm forestry development in the ACT. Environment ACT is the lead agency for landcare and management of conservation areas, while ACT Forests manages commercial softwood plantations.

All land in the ACT is leasehold. Rural lessees renewing or purchasing a lease are required to develop a Property Management Agreement, which may include vegetation clearance and management provisions. ACT Forests is the major timber supplier based in the region, with extensive *Pinus radiata* plantations. The community-based Southern Tablelands Farm Forestry Network operates in the ACT region.

New South Wales

The key government agencies in farm forestry are State Forests of NSW, Department of Land and Water Conservation, and Agriculture NSW. State Forests is a statutory corporation, primarily responsible for state forest management for timber production. The corporation also enters into contracts for plantation establishment on private land. Department of Land and Water Conservation have soil, water and forestry functions, both policy and regulatory, and are the lead agency for landcare. Agriculture NSW has input into farm forestry development, such as through the development of Land and Water Management Plans.

NSW has a number of regional structures playing a role in farm forestry development. NSW is divided into Total Catchment Management regions, each with a Catchment Management Committee which considers a wide range of catchment issues. A number of Regional Economic Development Organisations (REDO) have policies and strategies applying to farm forestry, with some REDOs employing farm forestry development officers. Regional Plantation Committees have been established with funding from the national Farm Forestry Program, principally in the east of the State in the traditional forestry regions.

Despite a long history of farm forestry activity, NSW has little in the way of comprehensive State policy development. A paper was produced in 1993 by the NSW Vegetation Forum, leading to the establishment of a Farm Forestry Working Group. In 1996, this group was overseeing the development of a farm forestry strategy.

The Vegetation Forum was replaced by the Native Vegetation Advisory Council with the advent of the Native Vegetation Act 1997. This Act stemmed from the introduction of State Environment Planning Policy No 46 (SEPP 46) in 1995 to halt native vegetation clearance. SEPP 46 and the provisions of all existing Acts relating to native vegetation management are now superseded by the new legislation. The Native Vegetation Act defines exemptions, requirements for regional vegetation management plans, and establishes the Native Vegetation Advisory Council and Native Vegetation Management Fund linked to property management agreements. The development of regional vegetation management plans under the Act has particular implications for farm forestry, particularly private native forest management.

The major timber processors with operations in NSW are Australian Newsprint Mills (softwood pulpwood), CSR Softwoods (softwood sawmilling) and Boral Forest Resources (hardwood sawmilling).

Northern Territory

Department of Primary Industries and Fisheries is playing a leading role in the development of farm forestry in the Northern Territory. There is no guiding policy or framework for farm forestry development; however, the Northern Territory Forestry and Timber Industry Network, with agency representation, has developed a preliminary farm forestry strategy. Further, there is no specific native vegetation clearance legislation, rather the Pastoral Lands Act 1992 requires that lessees must apply to clear land. Some Aboriginal lands are covered by Joint Management Agreements, which may prescribe aspects of vegetation management.

Queensland

The four key government agencies for farm forestry in Queensland are the Departments of Primary Industries, Natural Resources, Lands, and Environment. Department of Primary Industries is the principal agency for forestry, supported by the Queensland Forestry Research Institute. Department of Natural Resources employs a small extension network, with some farm forestry service delivery. Department of Lands manages vegetation clearance permit processes.

There are a number of regional structures in place in Queensland that have bearing on farm forestry development, such as the Tropical Queensland Vegetation Management Advisory Committee. Regional Plantation Committees operate in parts of the state, as well as the North Queensland Joint Board, coordination body of the Community Rainforest Reforestation Program funded in unison with the Farm Forestry Program.

Vegetation clearance controls exist for the 77% of Queensland that is leasehold land. There are no clearance controls for the remaining land, apart from Vegetation Protection Orders under the Local Government Act 1936 (FORTECH 1997). The Land Act 1962 requires leaseholders to have a permit to clear. This Act was amended in 1994 to introduce stricter provisions, as permits were rarely withheld. The amendment established a process for developing local vegetation clearance guidelines, including approval criteria.

In 1995, the Queensland Government tabled a Forest Directions Statement, announcing its commitment to increasing plantations on private land. The Statement considers opportunities for operating a share farming scheme, removing institutional impediments to private forestry, and hardwood plantation expansion (Robins *et al* 1996).

The Integrated Planning Act, passed in November 1997, is under assessment by a government-initiated Vegetation Forum to consider the incorporation of state and local vegetation clearance guidelines in the Act. The 1997 Kyoto meeting on 'greenhouse' gases and its emphasis on vegetation retention has signalled the need for more comprehensive vegetation policies in Queensland, while also causing some landholders to clear native vegetation in anticipation of the introduction of restrictions.

South Australia

Primary Industries and Resources South Australia and Forestry SA are the lead farm forestry agencies. South Australia has suffered extensive native vegetation clearance, leading to the broad-scale banning of clearing in 1985. The Native Vegetation Act 1991 puts in place comprehensive controls and is administered by the Native Vegetation Council.

With extensive erosion, salinisation and wildlife conservation problems, South Australia recognised farm forestry as a mechanism for getting trees back into the landscape on a large scale. Farm forestry is therefore an integral element of several state policies and frameworks, such as *The Revegetation Strategy for South Australia* (State Revegetation Committee 1996).

There are many regional structures in South Australia that impact on farm forestry development. The state is divided into regional Soil Conservation Boards, each with a Soil Conservation District Plan which may consider aspects of farm forestry. Regional Development Organisations have an interest in farm forestry. There are also Regional Plantation Committees in the Greater Green Triangle and Mt Lofty Ranges regions.

South Australia has a major timber industry centred around Millicent and Mount Gambier in the State's south-east, with Kimberly-Clarke (softwood and hardwood pulping and paper making) and major softwood processors, such as CSR Softwoods, Carter Holt Harvey and Auspine. There is also a large softwood woodchip

export trade out of Portland. Increasingly, the Green Triangle region is attracting local and overseas investment for joint ventures with landholders to establish eucalypt plantations for pulpwood.

Tasmania

There are three State government agencies influencing farm forestry development in Tasmania. Forestry Tasmania and Private Forests Tasmania are statutory corporations formed in 1993. Forestry Tasmania manages state forests and plantations, while Private Forests Tasmania advises and supports private forestry enterprises. Both entities are subject to the Code of Forest Practice, regulated by the Forest Practices Board (Ferguson 1996). Department of Primary Industries and Fisheries is the lead agency for landcare.

There is no state legislation directly regulating vegetation clearance in Tasmania, although local government sometimes place restrictions on clearing under planning regulations. The Forest Practices Act 1995 applies to land cleared as part of commercial timber harvesting operations. However, the Act does not apply once the timber harvesting operation is complete, often leading to land use conversion to agriculture. The Regional Forest Agreement process has recently facilitated the identification of forest set aside for conservation and that potentially available to farm forestry.

There are several large-scale processors in Tasmania, notably North Forest Products (hardwood pulpwood), Boral Forest Resource (hardwood sawmilling), Australian Newsprint Mills (softwood pulpwood). Additionally, three grower cooperatives have formed as a mechanism for aggregating supplies from small scale growers and accessing alternate markets.

Victoria

Department of Natural Resources and Environment is the lead agency in Victoria for farm forestry and landcare, while the Victorian Plantation Corporation manages the State's plantation estate.

The Victorian Government and Victorian Farmers' Federation formally launched 'Landcare' in 1986, which was later adopted as a national program in 1989. Early landcare groups and landcare policy focused on the integration of agricultural production, conservation and land repair. For example, the *Salt Action: Joint Action* strategy steered the development of salinity management plans for most major catchments. At this time, Victoria adopted an Integrated Catchment Management (ICM) framework, similar to NSW's Total Catchment Management model, with most catchments having a Catchment Coordinating Committee, Salinity Working Group or equivalent.

Native Vegetation Clearance controls were introduced without warning in 1989. The Planning and Environment Act 1987 was amended, requiring approval for native vegetation clearance of more than 0.4 ha. Regulations were introduced into the State section of local government planning schemes. Local government is the referral authority for applications between 0.4 and 10 hectares. Department of Natural Resources and Environment is the referral authority for applications of more than 10 hectares.

Victoria's ICM framework was formalised in 1994 with the advent of the Catchment and Land Protection Act, establishing a State Catchment and Land Protection Council and ten regional Boards. Each region is primarily based on catchment boundaries and has produced strategies addressing, to some extent, land, water and vegetation management. Each region also forms part of the Victorian Agroforestry Network. In October 1996, the Forestry Rights Act was passed, separating rights to trees from the land. Victoria has a Code of Forest Practices for Timber Production ratified in 1996 and applying from February 1997; however, it does not apply to farm forestry (FORTECH 1997).

Catchment and Land Protection Boards became Catchment Management Authorities (CMA) in 1997, with expanded responsibilities, including rating capacity. CMAs now have responsibility for aspects of catchment planning and water resources management, sustainable agriculture and land management, sustainable regional development and pest plant and animal management, as described in *Managing Victoria's Catchments - Partnerships in Action* (DNRE 1997).

In terms of farm forestry, this document states an objective 'to develop private forestry as an ecologically sustainable and commercially viable option in the primary industry sector of the state and regional economies.' Its performance measure is to 'implement actions arising out of the private industry strategy for Victoria, including trebling of the Victorian private forestry estate by 2020' (DNRE 1997). The State's private forestry strategy was released in early-1998.

In 1997, each CMA developed phase one of their Regional Vegetation Management Plans (RVMPs), focusing on vegetation clearance. Mallee region was first to submit its plan for broader community consultation. The Victorian Government is also currently considering the devolution of powers for vegetation clearance to CMAs.

The major timber processors in Victoria include Amcor (softwood and hardwood pulpwood), Midway Forest Products (softwood and hardwood pulpwood), Carter Holt Harvey (softwood sawmilling and hardwood pulpwood), and CSR Softwoods (softwood sawmilling).

Western Australia

Department of Conservation and Land Management (CaLM) and Agriculture WA (AgWA) are the lead agencies for farm forestry in Western Australia. CaLM manages national parks and reserves, state forests and Crown lands, and state plantations (Ferguson 1996). CaLM has a research group which undertakes farm forestry and an extension group (the Farm Forestry Unit) which is concentrating on passing on current knowledge and stimulating adoption.

During 1995, the WA Farm Forestry Task Force, comprising government, landholder and industry representatives, developed a strategy to guide farm forestry development in the State. The WA Salinity Action Plan is also a guiding document in farm forestry development.

WA has vegetation clearance controls under the Soil and Land Conservation Act 1945-88, administered by AgWA. The Act requires approval to clear areas greater than one hectare. Prior to 1994, approval was rarely withheld. The Act was amended in 1994 to restrict clearing. Generally, if a property has less than 20% of its area under vegetation, approval will be denied. In circumstances where the shire has less than 20% of its area under vegetation, approval will generally be denied to all landholders. Where a landholder has greater than 20% property cover, in a shire with less than 20% cover, the landholder must demonstrate that there is no adverse impact of further vegetation clearance.

WA has a structure of Land Conservation District Committees (LCDCs), arising at the same time as the Victorian Landcare program. Some of these committees have advanced strategic plans and undertake substantial programs of works. Regional Plantation Committees formed more recently, operating within the framework of LCDCs. The integration of farm forestry with agriculture and conservation has developed over this period, as indicated by the extensive plantings of *Eucalyptus globulus* and oil mallees.

CaLM is the State's major forest supplier of softwood and hardwood timber for processing by a number of operators. CaLM and Bunnings Treefarms have established large joint venture programs (ie. 5-10,000 ha/year) with landholders to establish eucalypt plantations for pulpwood. The south-west WA region continues to attract considerable overseas investment also for joint ventures to establish eucalypt plantations for pulpwood.

State programs

During the 1980s, several State government programs were initiated, aimed at developing a commercial farm forestry resource. These initiatives were partly inspired by existing industry schemes and government revegetation programs, such as the Plantation Sharefarming Scheme in Victoria and Private Forestry Encouragement Scheme in South Australia (Prinsley 1991).

During the 1990s, most State governments have developed farm forestry programs which link the resources of landholders (labour, land, equipment) with government wood production using joint venture arrangements. An example of a program from each State/Territory is outlined below, most of which are joint venture schemes.

ACT Forests have an established softwood plantation program, which has recently been supplemented by plantings through joint ventures with landholders.

State Forests NSW began a joint venture scheme with landholders in 1994 to establish a range of eucalypts to support the hardwood sawlog industry. The scheme aims to establish about 5,000 ha/year with landholders and plantings on State Forests' land. This joint venture scheme shares the revenue at the time of harvest among the parties according to proportional contributions. In 1997, State Forests launched another joint venture scheme offering landholders an annual payment ('lease' arrangement) for growing *Pinus radiata* (radiata pine) for sawlogs, with the aim to establish about 500 ha/year.

Northern Territory's Department of Primary Industries and Fisheries recently established species trials with Greening Australia. The Department is a member of the Northern Territory Forestry and Timber Industry Network, which has commissioned a preliminary feasibility study of farm forestry opportunities, funded by the Farm Forestry Program. A small farm forestry development program has subsequently commenced with these organisations.

Queensland has a unique farm forestry program in the tropics, the Community Rainforest Reforestation Program, which is jointly funded by the Commonwealth, State and local governments. It has 'a major emphasis on planting native species as well as a range of eucalypt and other natives' (Commonwealth 1995). There is increasing interest among small-scale landholders in growing native rainforest species for specialty timber, especially in the tropics. A Government joint venture program which began in 1996-97 has so far established about 200 ha/year.

Forestry SA links industrial processors of eucalypts for pulpwood with landholders in traditional forestry regions. Over recent years, PIRSA and Forestry SA have been developing commercial farm forestry options in the non-traditional forestry regions (eg. low rainfall areas, Adelaide Hills) using commodity species and selected alternate species.

Tasmania has a considerable forest industry based on government, industry and private plantings and native forests. The State has an estimated plantation estate of 70,000 ha, with about 70% (50,000 ha) grown for hardwood pulpwood. A considerable proportion of the plantation estate, about 85% (60,000 ha) has been established by industry alone or with industry-landholder joint venture schemes (King 1996).

Department of Natural Resources and Environment in Victoria began a joint venture farm forestry program in 1995, in the north east (dryland) and north central (irrigation) regions of that State, covering about 60% of the establishment costs. The focus of the program is on developing shared arrangements with landholders to establish up to 800 ha/year of eucalypts on agricultural land, principally for sawlogs.

Department of Conservation and Land Management (CaLM) in Western Australia has joint venture programs that work with landholders to establish *Pinus pinaster* (maritime pine), *Pinus radiata* (radiata pine) for particle board, sawlogs and veneer logs; *Eucalyptus globulus* (southern blue gum) for pulpwood; and *Eucalyptus* species for eucalypt oil to be used for the industrial solvent market. By mid-1995, these CaLM farm forestry programs had established 27,500 ha with rural landholders (Inions 1995). An industry joint venture scheme operated by Bunnings Treefarms also offers landholders an annual payment of \$100-150/ha for growing *Eucalyptus globulus* for pulpwood (Eckersley *et al.* 1993). Anecdotal reports indicate that annual payments under the CaLM and Bunnings' schemes can range between \$160-200/ha for landholders to grow *Eucalyptus globulus* on properties with good economies of scale, fertile sites and located close to processing facilities.

CaLM initiated the Western Australian Oil Mallee program in the early-1990s, with Farm Forestry Program support, to develop commercial quantities of eucalypt oil, from trees grown in an alley-cropping design and managed as hedgerows. This approach integrates large scale tree planting with cereal cropping. Early signs are promising, with about 6,000 ha of oil mallee trees established by mid-1997.