



# Development of a FloraSearch project for Southern Australia

## Workshop Proceedings

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**A report for the  
RIRDC/Land & Water Australia/FWPRDC  
Joint Venture Agroforestry Program**

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## Foreword

The National Action Plan for Salinity and Water Quality in Australia identifies high priority, immediate actions to address salinity, particularly dryland salinity, and deteriorating water quality in key catchments and regions across Australia. One specific action is to establish multiple-purpose perennial vegetation in targeted areas.

The Joint Venture Agroforestry Program (JVAP) initiated a workshop to address the urgent need to find economic revegetation options to assist in controlling dryland salinity in the low rainfall zones of Southern Australia. The workshop was held in March 2001 with participants from academic, government and private fields relating to salinity management and associated industries.

Currently there are only limited opportunities to extend more traditional forestry and existing plant-based industries into lower rainfall zones (eg round wood, fodder shrubs, firewood, sandalwood and broombush). The workshop aimed to focus on developing a project to search for species suitable for *new* integrated tree crop industries, and assess the feasibility of those industries and their related products.

The workshop was funded by the JVAP, which is supported by three R&D Corporations — Rural Industries, Land & Water Australia and Forest and Wood Products. These Corporations are funded principally by the Federal Government.

This report, a new addition to RIRDC's diverse range of over 800 research publications, forms part of our Agroforestry and Farm Forestry R&D program, which aims to integrate sustainable and productive agroforestry within Australian farming systems.

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**Simon Hearn**

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## Table of Acronyms

| Acronym | Expansion                                                  |
|---------|------------------------------------------------------------|
| ABARE   | Australian Bureau of Agricultural and Resource Economics   |
| AFFA    | Department of Agriculture, Forests & Fisheries, Australia  |
| AGO     | Australian Greenhouse Office                               |
| ALRTIG  | Australian Low Rainfall Tree Improvement Group             |
| CALM    | Dept of Conservation & Land Management (WA)                |
| CRC     | Co-operative Research Centre                               |
| CSIRO   | Commonwealth Scientific & Industrial Research Organisation |
| DNRE    | Department of Natural Resources & Environment (VIC)        |
| FWPRDC  | Forest & Wood Products Research & Development Corporation  |
| GRDC    | Grains Research & Development Corporation                  |
| IBRA    | Interim Biogeographic Region in Australia                  |
| JVAP    | Joint Venture Agroforestry Program                         |
| LWRRDC  | Land & Water Resources Research & Development Corporation  |
| NAP     | National Action Plan for Salinity and Water Quality        |
| NHT     | Natural Heritage Trust                                     |
| NRM     | Natural Resource Management                                |
| PIRSA   | Primary Industries and Resources South Australia           |
| RIRDC   | Rural Industries Research & Development Corporation        |
| SARDI   | South Australian Research and Development Institute        |

## Executive Summary

The potential losses of rural and urban resources and biodiversity due to dryland salinity in Australia are daunting. Many of the current revegetation solutions however are not economically viable and hence cannot be implemented at a scale large enough to have significant impact.

The Joint Venture Agroforestry Program (JVAP) initiated a workshop in March 2001 to address the urgent need to find economic revegetation options to assist in controlling dryland salinity in the low rainfall zones of Southern Australia. The objective for the workshop was to develop a project proposal to

- identify species suitable for *new* large-scale integrated tree crop industries, and
- assess the feasibility of those industries and their related products.

### Review of related projects

The Joint Venture Agroforestry Program was established in 1993 and has had a primary role in initiating, co-ordinating and funding R&D into commercial options to address the salinity crisis and related environmental and social issues. Australian agroforestry is most developed in regions of relatively high rainfall that are close to timber markets or wood processing facilities. It is less well advanced and less easily driven by wood fibre production in the sheep-wheat belts and pastoral zones, which generally are further from markets and processing facilities and have lower rainfall. Some of the tree crops necessarily require long rotations but JVAP is funding research into shorter-rotation tree crops and ‘phase farming’ with deep-rooted perennials including mallees and fodder shrubs. The research covers the biophysical and design aspects of these alternative woody crops.

There are many other JVAP research projects relevant to the workshop. They span a range of issues and scales – from the paddock-scale interaction of tree and crops, hillslope and catchment scale hydrology, to farm and regional scales of socio-economics. There are also national scale initiatives - for example the National Bioenergy Atlas which will assist development and planning at regional and national levels.

It is equally important to find potential products from the new range of woody species. JVAP is currently funding research into ‘best bet’ products from agroforestry biomass - for example medium density fibreboard, electricity production, methanol/ethanol production, wood-fibre plastic composites, high value timbers, thermochemical pulping and kraft pulping technologies from non-traditional species. Novel products such as pharmaceuticals, nutraceuticals and wattleseed (for human consumption) are also being researched.

Agroforestry and commercialisation of vegetation management are key elements of the National Action Plan for Salinity and Water Quality. The task of finding new species for new industries in rural Australia fits in with the overarching research and development goals of the Plan.

A new Co-operative Research Centre (CRC) – the CRC for Plant-Based Management of Dryland Salinity - has been set up specifically to provide new plant-based land use systems that lessen the economic, environmental and social impacts of dryland salinity. One of the 5 CRC Programs is entitled “New and better varieties of woody and herbaceous perennial plants”, and Project 4 within this Program aims to increase

the availability of woody germplasm and examine its market potential. Funding for five programs over seven years is expected to amount to \$4 million per year from the Commonwealth with \$10 million from in-kind contributions from CRC partners.

An important NHT project called “WA Search” directly addresses the need to identify commercial options for tree species, products and industries in low-medium rainfall areas. The project has developed some simple selection criteria and indices by which species can be selected for developing new industries. The following steps have been used in WA Search to guide new industry development:

- search for new species
- pre-feasibility study to narrow down selections
- industry exploration
- commercial feasibility studies
- implementation
- promotion and adoption.

The WA Search project is focused on finding Western Australian native species with characteristics to suit systems based on short-rotation cropping of woody perennials. The criteria and methodology used to search for new species may be applicable to such systems across Southern Australia.

The emerging oil mallee industry in WA also provides some useful insights. The bioenergy market is not currently competitive with fossil fuels but can potentially develop on a national scale to help meet federal greenhouse obligations. Simultaneous production of several different products, including energy, from one combined woody feedstock source through 'Integrated Tree Processing' (ITP) may improve the economic feasibility of growing trees in low rainfall areas. The market for ITP plants is not large enough solve the salinity problem, but it can be a major driver for concentrated tree planting on a regional basis. In addition, the principle of improving economic viability of tree-cropping enterprises by integrating the process and products has been established, and the approach can be adapted for different products and situations. A demonstration ITP plant is scheduled to be built at Narrogin, WA, in 2002.

CSIRO Forestry and Forest Products is currently researching new and existing products that uses woody biomass produced on a large scale in low rainfall areas. The wood material that grows in these areas may have vastly different characteristics to the timber grown in traditional forestry areas, and therefore requires development of different processing technologies and products. These include wood-plastic composites, wood-based panels, oriented strandboard, laminated veneer lumber, structural timber, appearance grade timber, pulp and paper. Finding new native species to use as woody biomass involves extensive testing of wood and extractive characteristics, which is an expensive process and requires a major financial commitment to achieve.

## **State initiatives**

Each of the State representatives expressed positive views regarding the development of a national FloraSearch project.

In most states, private forestry strategies and Regional Forestry Agreements (RFAs) are now investigating new low-rainfall commercial opportunities. The focus is shifting from industrial plantations to true integration of forestry with farming systems. Some new product development is taking place in each state, but not yet at a level needed for effective wide-scale salinity control across landscapes.

## **Development of a research proposal**

An outline of a collaborative research project proposal involving agencies from SA, NSW, VIC and WA was developed the day after the workshop. The proposal outlined a 5 year project with a budget of approximately \$13 million, encompassing aspects of searching for new species, trial site establishment, market opportunity analyses, economic analyses, determining plant and wood characteristics, product testing and national project co-ordination/networking.

The FloraSearch proposal was refined after broader group input and submitted to the JVAP, where it has since undergone further revision.

## Introduction

### ***Chair: Dr Roslyn Prinsley (RIRDC)***

There is a critical need for new large-scale perennial vegetation systems to aid in salinity control. It is now generally recognised that there is a lack of commercial options for farmers. We therefore need to focus on both identifying and selecting appropriate tree species as well as investigating and developing new processing systems, products and markets.

The Joint Venture Agroforestry Program has had a primary role in initiating, co-ordinating and funding R&D into commercial options to address the salinity crisis and related environmental and social issues. Australian agroforestry is most developed in regions of relatively high rainfall that are close to timber markets or wood processing facilities. It is less well advanced and less easily driven by wood fibre production in the sheep-wheat belts and pastoral zones, which generally are further from markets and processing facilities and have lower rainfall. Some of the tree crops necessarily require long rotations but JVAP is funding research into shorter-rotation tree crops and ‘phase farming’ with deep-rooted perennials including mallees and fodder shrubs. The research covers the biophysical and design aspects of these alternative woody crops.

It is equally important to find potential products from the new range of woody species. JVAP is currently funding research into ‘best bet’ products from agroforestry biomass - for example medium density fibreboard, electricity production, methanol/ethanol production, wood-fibre plastic composites, high value timbers, thermochemical pulping and kraft pulping technologies from non-traditional species. Novel products such as pharmaceuticals, nutraceuticals and wattleseed (for human consumption) are also being researched.

The objectives of the workshop are

- to learn from Western Australian experiences
- to gain an overview of the current JVAP projects already addressing some of the issues
- identify the opportunities available through each State’s activities and the new CRC for Plant Based Management of Dryland Salinity
- then, if appropriate, set the direction for a new national project that will help to find new commercial species and systems for the low rainfall regions in Southern Australia.

# **AFFA Natural Resource Management and Commonwealth Perspective on National Salinity Action Plan**

**Bill Handke, AFFA**

We have now in Australia recognised the significance of vegetation and vegetation management and also the opportunities that lie ahead of us for commercialising vegetation in our landscape. This underpins the National Action Plan for Salinity and Water Quality.

The National Action Plan sets out a broad policy framework for how the Commonwealth, States and Territories with State Government agencies and regional bodies will look at managing our landscape, direct policies, focus on research, and support communities to address salinity and water quality. The Prime Minister states that this is the first step along the way. There is a longer term focus - we don't see any quick fixes.

Key elements of the plan are regional delivery and involving regional communities, capacity building, information dissemination, market-based incentives, education, and supporting land-use change through Research & Development.

R&D under the National Action Plan will be driven by identifying the instruments to include in our landscape to halt further decline, eg how we use vegetation to reduce further risk, and the new commercial opportunities for agricultural production in both salt-affected and non-salt affected land. This is where agroforestry and the focus of this workshop is important, because we all now recognise that if benefits are to occur at the farm-level, farmers need to see an economic return from planting trees, managing remnant vegetation, for changing cropping systems etc.

'Research and Development' is a major theme of the Action Plan. Together with R&D corporations, the CRC's and State agencies, the NRM Ministerial Council will, in an iterative process over the next few months, be working out themes of research that we should be focusing on in the future. Industry and independent researchers may also be involved at this level and at the implementation phase.

It is anticipated that the Commonwealth and the States will be moving into finalised bilateral agreements on the Action Plan over the next few months. Partnership agreements will then be made with regional communities on the range of activities and regional strategies that they will implement. This implementation will be over a 7 year period and will be supported by further activities under the NHT and other programs.

There will therefore be an integrated and co-ordinated approach by governments to managing our landscapes. Agroforestry and commercialisation of vegetation management will be key elements of this strategy.

*In question time the following points were made or clarified:*

- Opportunities for the private sector to be involved are as venture partners in research and development and to help develop and carry out implementation strategies in the regions.
- It is envisaged that research and development work would be carried out on three land types - land not salt affected but at risk where a variety of vegetation options can be used to help minimise salt risk; land already somewhat affected but where some commercial

options exist; and land already saline where a total rethink is needed in terms of commercial options.

- The NRM Ministerial Council will inevitably decide on broad research themes but this will be an iterative process with input from State and Commonwealth agencies, research and development corporations, CRCs and related R&D brokers.
- The total cost of remedial revegetation is well beyond the means of government alone to provide - the private sector must be involved.

## **The Need for Large-Scale Revegetation**

***John Bartle, CALM Farm Forestry Unit, WA.***

Salinity is a very large problem. We are facing land loss of 32% in 40 years for WA, but it is not the only problem that we are facing due to imbalance in the water table. Associated flooding may increase three or four-fold in major catchments and cause catastrophic damage to infrastructure.

It is estimated that 450 vascular plant species may be lost due to salinity. Litigation and the risk of environmental sanctions from international trading partners is real if we let these kind of losses occur.

Salinity treatments are complex and costly. The scale of revegetation required to control discharge may be up to 80% of recharge areas. In any system it is imperative that the water that is too saline for plant use must be dissipated by other means. We need both perennial vegetation establishment and engineering treatments to achieve salinity control.

This leaves us in a salinity dilemma because the cost of the problem appears unbearable but the cost of the solution is daunting and it is such a big challenge we have to confront. We will however, be compelled by both international and domestic reasons to act. We have no choice, we must do something substantial.

There are several misconceptions about solving salinity problems that need to be addressed. David Pannell has summarised these in several papers but the key point is that farmers don't plant trees because if they did so on the scale needed they would go bankrupt as most of the options are not currently economical.

This means that a lot of the policy settings of the past and present won't work until we get the fundamentals right - making species involved in the bulk of 'revegetation' and the systems of agriculture in which they will operate, profitable. We also need the right industries there to drive the process but the industries of the right scale needed don't currently exist for the dryland/wheatbelt areas. We have opportunities suitable for the fringes between mid and high-rainfall areas but we need a lot more R&D for new species/systems for low rainfall areas.

There is cause for optimism however. The oil mallee industry is a case in point where we took deliberate action with moderate resources and some public money to try to create something that would work better. The public investment spent was less than half of the total

development cost of \$20 million. Farmers have ventured a lot of the capital and the process has been relatively straightforward and successful.

Similar principles as those involved in developing the oil mallee industry can be applied for other industries, but the constraint is the scale needed of the markets for the materials that might be produced.

The oil mallee example has shown us in WA that there are simple logical selection criteria by which you can select species and indices for developing new industries. Characteristics should include:

- Large market size and stability
- Management systems and species compatible with farming
- Produce matter that is economical to transport
- Short-rotation harvest
- Whole-of-plant usage with multiple product options
- Species compatible with grazing
- Species or methods that minimise competition with crops and use
- Species with minimal weed risk and/or systems that minimise weed risk and/or contribute to biodiversity where possible.

An industry development framework has six main steps:

1. *Search.*  
Rational selection for species that may be able to be commercially developed. The WA Search process makes use of existing data on native species to broadly choose species that may be suitable.
2. *Pre-feasibility study.*  
Investigations gathering new information to narrow down the range of selections.
3. *Industry exploration.*  
Involves aspects of technical, environmental and commercial exploration. Technical exploration includes looking at breeding, silvicultural and agronomic systems, harvesting, processing, product development etc. This is being done for a group of *Melaleuca* species in WA through the current WA Search project. Commercial exploration involves getting a constituency with a commercial interest prepared to invest money.
4. *Feasibility investigation.*  
Commercial feasibility is explored at this stage.
5. *Implementation.*  
Demonstration-scale plants may be involved in this phase.
6. *Promotion and adoption.*  
Viable species and industries are actively promoted - may involve policy changes to achieve adoption on an adequate scale.

Mallee biomass productivity from WA indicates that if 30-40% of wheatbelt lands in southern Australia were established with trees, then enough chip would be produced in one year to exceed the total amount of chip ever exported from Australia to date. This illustrates the huge scale of biomass production involved and the large scale of industries needed to use it in profitable systems.

Bold scenarios for market shares for products for such large scale industries were 50% of domestic and 10% of export wood market; and for domestic energy, 30% of the market that is projected to be occupied by coal by 2020 and 20% of the transport fuels market (ethanol). Even if these exceedingly bold targets were achieved by 2020 we would still only have a revegetation percentage of 16%. To get up to 40% biomass energy would need to displace coal from electricity generation and a large share of transport fuels market by ethanol.

*In question time the following points were made or clarified:*

- The sustainability of short-rotation cropping of perennial vegetation relies on the system being integrated with agriculture such that the excess water and nutrients not used by crops or pasture can be used by the vegetation. Eventually fertilisers and other inputs may be required. R&D is warranted to consider the ecological sustainability of these systems and this is occurring.
- Chip has the potential to be produced out of wheatbelt tree crops at less cost than existing forestry systems due to the nature of the bulk handling, the possible very short rotations and economies of scale.
- We can prospectively be a completely renewable fuels economy based on fixing up salinity and therefore hit two targets at once. Doing it that way we can offset the carbon emissions obligations for fossil fuel exports.
- We must consider all the environmental impacts when reconstructing agricultural systems, that is why, for example, the Search project is focussing on species native to the region.
- There is an issue of negative impact of tree planting on surface flows in some areas – the Murray-Darling Basin issue is clouded by that complication. It must be decided on a local scale where tree planting negativity on surface flow outweighs positive recharge impact.
- Impact on catchment yield strongly correlates with rainfall - in medium-low rainfall catchments the problem is not significant, but it is in high rainfall areas.

## **Emerging Products and Services from Trees in Lower Rainfall Areas**

***Sharon Davis and Roslyn Prinsley, JVAP***

The Joint Venture Agroforestry Program was established in 1993. It is a collaborative undertaking by three R&D corporations: Rural Industries (RIRDC), Land & Water Australia (L&WA; formerly Land and Water Resources Research and Development Corporation), and Forest and Wood Products (FWPRDC). Additional funding has been provided for some activities by the Murray Darling Basin Commission, the Grains R&D Corporation, the Department of Agriculture, Fisheries and Forestry, Australia (formerly the Department of Primary Industries and Energy), the Natural Heritage Trust, the Australian Greenhouse Office (AGO), and private investors. The JVAP and the AGO also lead Bioenergy Australia, a consortium of 40 private and government investors formed to promote the development of biomass energy in Australia.

The role of the JVAP is to coordinate and communicate research on a national level about the development of new tree-based systems and industries. A current focus is in lower rainfall areas.

The Joint Venture Agroforestry Program has six objectives:

1. Targeted strategies for implementation of farm forestry (social and marketing issues)
2. More sustainable management of natural resources (biophysical processes of integrating trees from taking into account hydrology, soils and biodiversity)
3. Optimise productivity of agricultural systems
4. Optimise direct returns from tree products on a regional and farm scale
5. Cost-effective multi-purpose agroforestry systems to meet commercial and environmental objectives, and
6. Effective communication.

A key impediment to large-scale change is the lack of commercial opportunities. In 1998, JVAP commissioned a consultancy to look at commercial prospects for low rainfall agroforestry. JVAP's current research direction stems from the findings of that consultancy.

### **Current Projects**

Current projects include:

Scoping potential new forestry products. CSIRO Forestry and Forest Products is developing a rational method to select 'best bet' target products for agroforestry systems in medium to low rainfall areas. Six target products have been identified, including: appearance grade sawn timber, medium density fibreboard, electricity generation from biomass, methanol and ethanol production and two new innovative bio-products.

Investigations into pharmaceutical, nutraceutical and industrial products. 'Best-bet' species for further investigation and commercialisation have been identified by Wondu Holdings Pty Ltd. These include thirteen species of eucalypts with bio-active metabolites which have a range of potential applications.

Investigating economics and new agroforestry systems. This project is being undertaken by a team led by Dr Ted Lefroy of the University of WA. It will compare the relative profitability of emerging and existing agroforestry systems with conventional crop and pasture production, with a focus on medium to low rainfall areas. It is linked to the WA Search Project.

### **Biomass for energy and other industrial products**

A Biomass Taskforce was formed in 1997 to facilitate the development of a biomass industry in Australia. Named "Bioenergy Australia" it is managed for the JVAP by Dr Stephen Schuck and chaired by Dr Roslyn Prinsley.

In February 2000, RIRDC and Bioenergy Australia convened a workshop to help develop a framework to promote the development of an environmentally sustainable

resource for bioenergy production. The workshop brought together a range of industry representatives and researchers to try and find what the key areas for R&D would be and to develop a well-designed and environmentally sustainable system for bioenergy production that has the potential to give benefits such as salinity control as well as developing the best technologies for bioenergy production.

Funding has been provided for several projects to address information gaps:

- An assessment of the technical feasibility, commercial viability and environmental performance of current and emerging bioenergy technologies. This new project will cover biomass combustion, gasification and pyrolysis, 'co-firing' of biomass with other fuels and production of ethanol and methanol
- Development of a National Bioenergy Atlas of existing and potential biomass resources (jointly with the Australian Greenhouse Office). The Atlas will be a internet-based resource for mapping biomass source and demand locations
- Development of a new processing technology for eucalyptus oil, cellulose pulp and valuable chemicals (low temperature pyrolysis).

### **Mallee systems and products**

A scoping study has looked at the integrated mallee processing for energy, activated carbon and eucalyptus oil. A pilot plant is to be established at Narrogin in 2002 based on the feasibility study. Other JVAP projects are also investigating the silviculture and water use of mallee systems, with the next phase to investigate nutrient issues.

Other projects focus on evaluating the economic viability of Australian eucalyptus oil production and developing technology for on-site eucalyptus oil extraction.

### **Timber and wood products**

Projects focusing on traditional wood products and agroforestry are also funded through JVAP. These include performance trials for species selection and improvement through the Australian Low Rainfall Tree Improvement Group; exploring the potential of conifers; assessing wood quality and recovery rates; evaluating portable sawmills and development of laminated plywood for flooring. Properties of medium to low rainfall species to produce pulp and paper, Oriented Strand Board (OSB), and cement board have also been targeted for investigation.

### **Novel products**

A number of novel products are being investigated, including tannins, firewood, wattle seed for human consumption, fodder trees, pharmaceuticals and nutraceuticals.

### **Commercialising environmental services**

JVAP supported a scoping study to review the use of incentives and market based instruments for promoting agroforestry in Australia. The study also aimed to identify opportunities for development of markets for the environmental services derived from agroforestry.

## **Tools to estimate carbon credits**

The development of a tool to help farmers make decisions about carbon credits, including potential returns, called "The Carbon Farmer" has also been produced.

## **Past projects**

Reports and research updates covering design issues are available for the following past collaborative projects:

- Australian Low Rainfall Tree Improvement Group (ALRTIG) - a multi-state, multi-agency initiative for southern Australia;
- National Windbreaks Program;
- Trees Water and Salt (guidelines for tree planting for salinity control from a hydrological perspective) and
- Biodiversity values of farm forestry.

## **Summary**

The Joint Venture Agroforestry Program focuses on a range of research into new farm forestry systems and products in medium to low rainfall areas. Much of the early work was informed by a scoping study carried out by Agtrans Research and Consulting but it is recognised there are constantly opportunities coming up to identify new products or systems. The FloraSearch project may help with these.

A more detailed report of JVAP programs and activities in this area can be found in the report entitled "*Emerging Products and Services From Lower Rainfall Areas.*" *The JVAP Research Update Series No. 2.* A summary of the report as given at the workshop is outlined below.

*In question time the following point was made:*

- The Best Bets project aims to address issues regarding the relative feasibility of low rainfall industries compared to high rainfall - it is thought that for long-rotation traditional crops, high rainfall areas will out-compete low rainfall areas, but that a shift to a new system such as short-rotation tree crops would be more successful in low rainfall areas. Short-rotation tree crops can be handled very efficiently and cheaply and can be competitive. The cost of producing woody feedstock for industry will be much cheaper in low rainfall zones than high rainfall because land is cheaper and the cost of continual harvest and bulk handling is expected to be lower. ABARE and CSIRO are undertaking relevant commercial and economic analyses for this project.

## **WA Search Project Overview**

***Graeme Olsen, Olsen and Vickery.***

The WA Search project is funded by the NHT for 3 years and employs 3 - 4 people.

### **Aim**

To find Australian perennial plants with the potential to be grown as new agricultural crops to produce raw materials for a range products.

### **Past Screening of Australian Flora**

People in the past have looked at chemical extracts, particularly tannins and essential oils on a small scale and there has been a lot found out about solid timber products from some of the larger species, eg construction uses, firewood, charcoal etc.

### **New Approach**

A new approach is to look at potential new industries based on short-rotation cropping systems.

Plant characteristics needed for these new industries are different from how we have looked at our flora in the past:

- must produce large amounts of biomass
- be mainly small-dimension material
- have low feedstock costs, and
- potential for more than one product which can be produced in an integrated process from a single species.

There are two models of integrating products and processing: the "fruit salad" approach and the "cake and icing" approach.

The fruit salad approach is where several products which have more or less similar revenue streams come from the same source of biomass. The cake and icing approach is where a crop has a dominant single product but there is a chance to extract out a small stream of material for a higher value use - the 'icing' that makes the crop profitable.

### **Main drivers for the WA Search Project**

A primary driver is the need to find products that require cheap feedstock, that use proven or developing technology and have large accessible markets. Therefore we need species which will grow well and that will make high quality or low cost products, and that have the feedstock characteristics to suit those products.

## **The 'WA Search' Process**

We are attempting to design new industries, and this requires suitable products and species. There are many ways of identifying suitable species. We start with products that have large markets, then look for species that are suitable for those products. There will also be some species which stand out as growing particularly well in low rainfall areas. It will be incumbent on us to look closely at those species and find out what potential products we can make out of them - so some product development will be driven by the species.

Promising products that can be made from small-dimension materials include wood composites; solid and liquid fuel looks very promising in the longer term and chemicals by transformation is exciting but only a small market in Australia. Chemicals by extraction may have specialty high value markets also. There is also a range of specialty markets for food and fodder.

Chemical products may only be viable as exports as the domestic market is too small.

## **Species Search**

The WA Search project is focusing on Australian native species for a number of reasons: they are well-adapted to our environment, the genetic material resides here so it is easy to do research and development on them and there are some significant direct biodiversity gains in using Australian species for revegetation.

We will pre-select the most suitable species because we do not have enough money to thoroughly test all the ones we have. Once we have some short-listed species we need to do some tests on them to find out if they have suitable characteristics to make the products we have in mind.

## **Regions for the WA Search Project**

There are four Interim Biogeographic Regions of Australia (IBRA) which cover most of the medium to low rainfall regions (<500 mm) of WA:

- Geraldton Sandplain
- Avon Wheatbelt
- Mallee
- Esperance Sandplain.

## **Progress so far**

We have created the 'SIFT' database (Microsoft Access database) which can take queries to show which characteristics different species have. We have collected basic data on every WA taxon. Data include:

- current/old name
- IBRA region of occurrence
- type of plant
- height from herbarium records

- habitat, soil type etc.

We are also assembling a 'wish list' of other data that we need to proceed further. The wish list includes information such as:

- regenerative behaviour (that would determine the way the plant gets used in a farming system)
- weed risk
- toxicity and palatability
- environmental tolerances
- biological threats, and
- biodiversity value.

We also need to know some product attributes, particularly wood properties and the uses and what sort of things we can get out of the bark, foliage and seeds and what extractive compounds and exudates they may have. We can't afford to go out and collect most of the data on the wish list, however. So what do we do? We need to somehow narrow down the choices for testing and this is the aim of the SIFT process.

### **Example with Acacias:**

In Western Australia we have 16 945 plant taxa of which 949 are Acacias. Of these, 813 are currently named Acacias (some are redundant), 709 are naturally occurring in WA, 592 are not priority (threatened) species.

If we restrict the search to species in the four IBRA regions of the target agricultural areas, we get down to 377 Acacias. Then if we use a level of 4 m maximum height as a surrogate measure of adequate biomass production we get down to 88 species. This is still a lot of species to go and test so we need other ways to get that number down lower.

We would probably want to invest only in widespread species so that the results in developing an industry based on that species are applicable over a large area of our wheatbelt. So if we restrict the search to only those Acacias that occur in at least three of the four IBRA regions we get down to 23 and if we limit it to only those found in all four IBRA regions we get down to only 7.

So this process is a very powerful discriminator using basic data. It is not surprising that the seven Acacias found by this search were already identified intuitively as being ones we should have a closer look at and they have been included in initial trials.

### **Genera found by WA Search**

Overall, 620 taxa were found by the WA Search process as having suitable basic features and these are scattered over a large number of genera (eucalypts, acacias, melaleucas and a smattering of others). This is very encouraging as it tells us we have a wide suite of genera that we can go and look at for potential commercial exploitation.

## Where to next?

We aim to use a mixture of factual and intuitive information. Using a semi-intuitive approach we will select species on the general characteristics which we are able to get relatively cheaply and easily and then take those lists to specialists for each of those genera. They can help trim the species lists because they will know a lot of things about those species which we don't have in our database and will help us exclude some of those species which don't have very good commercial potential and maybe drag some other species back onto the list which we might have overlooked.

## Relevance to a National FloraSearch Project?

Firstly the WA Search so far only contains data on Western Australian species but we believe the methodology is transferable. The feedstock characteristics for products which we generate will be very useful as they are obviously the same nationally and quite a lot of the product testing which we do will be very helpful.

So in terms of individual species, we can't help much, but most of what happens in the rest of the project will be very relevant to this Florasearch-type concept.

## Scale of Industry Development

There are three different scales which we can look at for development (Table 1):

- Agro-ecological zones (eg IBRA)
- Regional (eg Southern WA or Murray-Darling Basin)
- National

|                                            | Agro-ecological zones<br>(IBRA) | Regional<br>(eg WA, MDB or south<br>east Australia) | National<br>(Southern Australia) |
|--------------------------------------------|---------------------------------|-----------------------------------------------------|----------------------------------|
| Administration                             |                                 | ✓                                                   |                                  |
| Development of search<br>process           |                                 | (✓)                                                 | ✓                                |
| Search of species                          | ✓                               |                                                     |                                  |
| Small industries                           | ✓                               | ✗                                                   | ✗                                |
| Medium industries (eg<br>activated carbon) |                                 | ✓ (collaboration)                                   |                                  |
| Large industries<br>(eg energy)            |                                 |                                                     | ✓ (share)                        |

Table 1 Different scales of development for different industries

Setting up new industries requires different scales: small industries are best done in one agro-ecological zone only so that the value of the product remains high, otherwise the industry will collapse due to too much competition.

Medium industries may be best done on a regional scale but large industries such as bio-energy applications like liquid fuels wouldn't be able to operate unless done on a national scale.

*In question time the following points were made or clarified:*

- The SIFT process can be run using a variety of data so that if the preliminary searches don't find adequate species, other searches can be run using different criteria to try and pick up other species that may first have been 'thrown out'.
- Some literature has been reviewed to help target species for products but so far the Project has concentrated on products for large industries only rather than doing a comprehensive chemical search.
- It has been a conscious decision to limit the search to natives first as there are a wide range of plants we know nothing about and using them makes sense from a biodiversity point of view, but it is acknowledged that if suitable species can't be found after having that look, the search could be widened to include non-native plants. The team is excited by the diversity and potential of our native plants. For short-rotation cropping we don't think there would be any introduced plants that could perform better as some of our natives are fire adapted and therefore regeneration capacity is excellent.
- The Project has not looked at opportunities for native pastures as there is more than enough to do just to focus on woody perennials and widen the scope and types of markets farmers have access to through that field.
- An upcoming meeting will look at selection criteria for species and scoring biodiversity values will be discussed.
- Advice from geneticists is needed to see if introducing other provenance gene pools is a risk to indigenous populations eg for *Acacia saligna* as it is inevitable that to develop a consistent product from a wild population, some genetic selection would take place. (JVAP is funding a consultancy to develop a risk management strategy to minimise the potential of genetic pollution, especially in eucalypts).

# Integrated Tree Processing Developments

**Colin Stucley, Enecon**

## New energy markets

Energy from biomass ('bioenergy') has a large market potential but it can not currently compete with coal - electricity can be produced for less than 5 cents per kilowatt hour from coal whereas biomass feed itself before processing costs more than 2 cents per kilowatt hour - the cheapest trees might cost 4 cents per kilowatt hour when considered in terms of the electricity to be made from it.

Bioenergy is therefore not currently competitive with fossil fuels - but bioenergy fits into the federally mandated renewable energy target. To help meet our Kyoto Greenhouse obligations we as a country need 9 500 Gigawatt hours per year to come from new renewable energy sources by the year 2010. We need to create a market-driven industry within the federal mandate to reach that target.

If the entire target of 9 500 Gigawatt hours was met by bioenergy this would translate into a demand of approximately 15 million tonnes of green biomass per year. Even a part of this target is a very large opportunity, some of which may be able to come from the low rainfall areas. Energy from wood must compete however with other forms of renewable energy such as wind, hydro and photovoltaics.

## Energy efficiencies

How well does energy compete when it comes from wood? When green wood is put through a conventional power plant, much of the energy is lost in the following ways:

- evaporating the water out;
- hot air that goes up the stack;
- converting most to steam to run a turbine;
- condensing steam back to water to put back into the cycle loses much of the energy that is there;
- and transferring the energy to the site where it is used.

So normally only about 18-25% of original energy in wood ends up as electricity for industry. (While this sounds inefficient, it must also be remembered that other renewable energies such as photovoltaics and wind also suffer from significant inefficiencies.)

Electricity price breakdown for different sized plants

Large coal-fired power plant in the Hunter Valley or Latrobe Valley can produce electricity at less than 5 cents per kilowatt hour whereas electricity generated from green biomass bought at \$30 per green tonne could typically cost about 12 - 25 cents per kilowatt hour depending on the size of the production plant - running costs are much higher. So biomass energy does not compete with large coal-fired plants. (Compare these figures to first para – which are correct?)

Even with low feedstock prices and a plant producing 10 megawatts, biomass energy may still only just be competitive with wind technology. If the feedstock price exceeds \$20/green tonne it is far more difficult to compete.

### **Optimising energy recovery**

Bioenergy is a lot more competitive if you can find other products to provide the "icing" on the cake - the cake being energy.

The sugar industry already uses 'co-generation'. Steam is generated in boilers fired by the waste cane fibre (bagasse) and this steam is used for both electricity generation and process heat around the sugar mill. A large sawmill that needs heat to dry wood could also make electricity at the same time. There may be many niche opportunities where the need for heat creates an opportunity for creating electricity.

Co-firing is a great way of starting out. It involves taking wood to an existing coal-fired power station, so there is less capital or operating cost in using the existing station to combust the wood and recover its energy. There is still the greenhouse gas benefit of using a sustainable feedstock and the benefit is recovered at a lower cost to the community. The amount of wood you can put into a power station is limited however as typically they will only run 5-10% from wood because it changes the way the plant operates. A huge piece of capital and infrastructure is put at risk with this 'small but strange' feed! Location of the station relative to the wood supply is also important to minimise wood transport costs.

### **Biomass integrated gasification combined cycle (BIGCC)**

Instead of getting about 20% of the energy from the green wood converted to electricity, BIGCC enables about 40% energy recovery through the use of clever engineering (two cycles, both gas and steam turbines are used). This means that farmers could be paid more reasonable amounts for their feedstocks and it is more likely to be an economic system.

BIGCC plants have been built in Scandinavia and Yorkshire but the technology is still yet to be proven economically. It is at least five years away in Australia. The technology works but capital cost of the more sophisticated power plants needs to be better understood. Enecon is currently assessing new technologies and costs with other energy companies.

### **Co-values**

Bioenergy provides opportunities that other renewable energy industries don't. Promoting tree planting provides salinity control benefits and carbon sequestration, plus permanent jobs into country towns etc. But what do these benefits do to the electricity price? Until we quantify the benefits of salinity control they won't help a market driven solution. Salinity benefits need to be reflected in the price of feedstocks (eg through salinity credits?).

### **Complementary products**

Complementary products potentially make energy from biomass more financially viable. Complementary products include oils and tannins, charcoal, activated carbon and those from pyrolysis.

### **Integrated processing of mallee eucalypts**

The main development focus for Enecon over the past couple of years has been CSIRO technology for the co-production of charcoal and activated carbon while recovering energy from wood. CSIRO realised that you could recover the energy produced when wood was

burned to make charcoal - that is the energy that drives much of the electricity side of integrated tree processing. Charcoal is a good product but by activating it with steam, a high value mallee carbon product worth about \$3000/tonne as opposed to only \$300-\$400/tonne for plain charcoal can be made.

Carbon and energy are not the only uses for mallees. CALM and the Oil Mallee Company have put considerable work into understanding the properties of eucalyptus oil from the leaves in a range of new, large scale applications such as industrial solvents and cleaning additives. The key to this work is scale - planting, harvesting and processing on a scale that drives down unit costs and opens up major markets. In the future when feed is readily available there is opportunity for MDF (medium density fibreboard) plants and a whole other range of large-scale uses for the mallee wood, if they are shown to be commercial .

The current salinity bill to WA is \$650 million per year and research has indicated that that it may reach \$2 billion per year before it reaches a new equilibrium. John Bartle and his colleagues saw tree planting as a part of the solution a long time ago. Mallee eucalypts were seen to be the best bet for low rainfall areas. There are already 18 million trees already in the ground and around 800 farmers involved. We need to work now on harvesting developments that will bring the costs down.

Initial discussions between Enecon and CALM about mallees in 1998 came up with the integrated tree processing idea - take the whole tree in and make multiple products. The main steps involved are:

- harvest (chip) whole trees as feed
- winnow to separate of leaves and stems
- take leaf for oil distillation
- take spent leaves, gasify them, recover heat to put into a turbine
- recover ash for nutrients to take back to farmers
- take wood and put into CSIRO plant to make charcoal
- capture waste heat in a boiler
- convert charcoal to activated carbon with steam, and
- all steam/waste energy goes to turbine to make electricity.

### **Background to ITP feasibility work**

In 1999 JVAP and Western Power jointly supported a feasibility study which better defined the positive economics of the proposed process. Enecon looked at a theoretical full scale plant using 100 000 tonnes per year green feed:

- Average cost for the trees is assumed to be \$30/tonne (\$15 to the farmer and \$15 for harvesting and transport);
- Plant capital cost is \$25 million;
- Direct employment of approx. 40 people;
- Would provide about 3 500 tonnes of activated carbon worth about \$10.5 million annually;
- Eucalyptus oil and electricity also provide significant annual revenue;
- Results in an attractive positive internal rate of return.

Sensitivity analyses found that the viability is most sensitive to the price of activated carbon.

A demonstration ITP plant is scheduled to be built at Narrogin in 2002. A budget of \$6 million is required at this stage, provided by Western Power, the AGO and Ausindustry. Enecon is assisting with provision of the CSIRO carbon technology, engineering, carbon marketing and plant operation. Products to come out of the facility include:

700 tonnes of activated carbon per year - that allows development within the Australian market for water treatment carbons and use the Australian market to show the product's worth when going into the much larger carbon markets overseas;  
250 tonnes of eucalyptus oil - could also allow similar marketing in Australia and overseas;  
approximately 1 MW continuous production (8,000 MWh per year) of renewable electricity.

*In question time the following points were made or clarified:*

Public policy is extremely important in making the operation work. We as a country are supporting our renewable energy industry - we have had to legislate to achieve it - and the greenhouse benefits it represents. Salinity and other drivers are incidental to the bioenergy industry but may well be critical to making it happen. There is a great potential synergy between the greenhouse benefits of bioenergy and the environmental benefits of large scale tree planting in the dryland regions, however the environmental benefits need to be quantified so that they can "fit" into a market driven bioenergy industry and help it grow.

The financial aspects of the ITP plants are quite robust with respect to transport costs.

The world activated carbon market is about 750 000 tonnes and ranges from less than \$1000/tonne up to \$100 000/tonne. The target for ITP-produced activated carbon would be about \$2500-8000/tonne for products used in water treatment, solvent recovery, gas cleaning, and gold recovery. The market for ITP plants is not big enough by itself to solve the salinity problem, but it can be a major driver for concentrated tree planting on a regional basis.

# Raw Material Characterisation and Product Evaluation

## *Jamie Hague, CSIRO Forestry and Forestry Products*

### **Forest Products**

The kinds of products CSIRO Forestry and Forestry Products is testing and developing include:

- Structural timber;
- Appearance grade timber;
- Wood-based panels;
- Pulp and paper (a large consumer of wood and biomass).

New products include:

- Wood-plastic composites (a very large growing area in the US, this will potentially consume a lot of biomass);
- Wood-based panels - 30 years ago we just had particleboard, plywood and some hardboard. Now we have Medium Density Fibreboard (invented by the Americans to use up all the bits that the paper industry couldn't use, but now "MDF" consists of 7 different types of fibreboard of different densities and moisture tolerance).
- Other new 'growth' products include Oriented Strandboard and Laminated Veneer Lumber.

Why is the industry going in this direction with reconstituted panels? It is the most efficient way of utilising wood and biomass in the construction and furniture industries and it is possible to achieve consistency of product (strength, quality etc) as opposed to solid lumber which is variable in its quality and properties.

The reconstituted panels area will continue to grow and dominate in the industry. This is very good for the types of fibre-producing industries we are considering because those that use short-rotation, small particulate biomass are going to fit in very well - all the signals are right.

### **Raw materials**

Wood-based product properties are determined by those of the raw materials. Accordingly biomass needs to be suited to product. The sort of raw material characteristics that are important are:

- Density (particularly for composites)
- Fibre (cell) length
- Extractives content (this can be beneficial if we can extract them and make them into something else, but can be problematic when making reconstituted timber products, particularly where adhesion is involved), and
- Chemical composition in general.

### **Composites (as an example)**

Ideally a relatively low density raw material is preferred - this is because in making the product the particles are squashed together and densified in order to get good particle contact so that the product will hold together. Typically particles may be densified by a factor of two.

So starting with a high density particle results in an extremely dense, heavy product. It also introduces stresses and the product has a tendency to 'explode' (delaminate) in high moisture environments.

Longer fibres in general improve the strength of the product and reduce the amount of dust, which means less adhesive is needed to hold the product together and potential health hazards are reduced.

Low extractives levels are also desirable - unless extracting a chemical to use as a co-product. Extractives typically cause problems in resin cure and they can also promote absorption of moisture into the product.

### **Raw material selection**

A three stage process can be used to select raw materials:

- elimination of the non-starters
- pre-screening of potential candidates as cost effectively as possible, and
- detailed evaluation of most promising candidates - very expensive.

### **Pre-screening**

There are a whole host of ways but some of the better ones and the most cost effective are non-destructive; core samples can be taken of standing trees with no need to chop down the resource.

### **Silviscan**

CSIRO FFP has developed an instrument called 'Silviscan' which allows fast, non destructive wood testing. It is used mainly to determine wood density and fibre microfibril angle and the results can be used to predict a range of other properties including wood stiffness and many pulp properties. The approach is generally only applicable to analysis of larger tree stems. The Australian researcher involved in developing this, Dr Rob Evans, was recently awarded the Marcus Wallenberg prize, awarded annually in Sweden; it is in effect the Nobel Prize for Foresters and Wood Scientists.

### **Product testing**

Pre-screening is designed to identify a handful of the most promising candidates. Pilot-scale evaluation in the laboratory is then needed in order to mimic industrial reality as closely as possible.

New products need to be cost-competitive against existing benchmarks. This means that new products need to be assessed from both a technical and economic standpoint to determine whether they might have a commercial future.

*In question time the following points were made or clarified:*

- The use of Silviscan technology to characterise fibres is applicable to other industries apart from the pulp and paper industry for which it was originally developed.
- Pre-screening is needed to determine the approximate cost to be spent on development and testing of new species but it could be anywhere between \$1 million and \$10 million depending on how different the raw material is from existing raw materials / products.

# CRC for Plant-Based Management of Dryland Salinity Projects

***Mike Ewing, Department of Agriculture, Western Australia***

## **Focus**

The CRC will focus R&D efforts towards the development of innovative plant systems that will combat the impact of salinity. This is an area of under-investment in R&D. The plant cultivars and farming systems developed will complement the effectiveness of other strategies (such as engineering structures) for salinity mitigation.

The CRC will address recharge and discharge zone issues.

In designing novel plant-based solutions we will use an understanding of the functional nature of stable natural ecosystems and attempt to design farming systems with similar functional characteristics.

The CRC will develop systems that will be implemented on a large scale because they have little or no profit disadvantage compared to current systems in use. There will be a focus on systems that might require substantial external subsidy for implementation will limit the degree of uptake and slow its rate.

## **CRC Partners**

The Salinity CRC has wide geographic spread, taking in both south-west of Western Australia and the Murray Darling Basin. It also has a mixture of organisations involved with respect to the current type of research being tackled. It involves 4 state Departments of Agriculture, 3 Universities (UWA, Adelaide and Charles Sturt) and Conservation and Land Management in WA. CSIRO is represented mainly by Plant Industries and Forestry and Forestry Products as well as smaller elements of some other groups.

Approximately \$10 million/year of in-kind contributions have been promised for the proposal and once it is up and running it will have a Commonwealth budget of around \$4 million/year.

## **Five Program Headings**

1. *'Education, information exchange and technology adoption'*. One of the pre-requisites of a CRC is that it have a strong education component and that will be delivered through the university sites. This is an important aspect of training the next generation of scientists to tackle salinity issues. The CRC path offers very good opportunities to link in universities with more pragmatic organisations that are dealing with these issues. The mix of participants provides great scope for dynamic supervision of postgraduate programs.
2. *'Function of natural and agricultural ecosystems'*. This program provides the theoretical and philosophical framework of the CRC; that new land use systems need to mimic the processes of natural ecosystems.
3. *'New and better varieties of woody and herbaceous perennial plants'*. John Bartle and Mike Ewing are closely linked to this program which is about developing the new perennial land-based systems that are needed to tackle the salinity issue.

4. *'Land use systems with balance water use'*. This program will integrate plants into innovate systems that combine the productivity/profitability objective with the sustainability objective, while maintaining an awareness of the social implication of change on the scale needed to have an impact on salinity.
5. *'Economic and social assessment'*. This program will include activities that focus on positive policy development as well as production economics and community adoption issues.

### **Program 3 - Manager Mike Ewing**

Program 3 is comprised of two projects:

1. Woody Perennials. John Bartle is project leader. This project will increase the availability of woody germplasm and examine its market potential.
2. Perennial and annual legumes, grasses and crop plants. Philip Beale from SARDI is project leader. The project will focus on herbaceous perennials, with a component directed towards annual crops and pastures specifically for waterlogged and saline in discharge zones.

### **Woody Perennials Project- Leader John Bartle**

This project will provide co-ordination and resourcing of the methodological approaches to the issue of identifying new products and possibilities. Through the linkages that are going to be made across the southern agro-ecological zones, the project will establish a credible framework for co-ordination of funding of the key regional initiatives over a 7-year period.

The CRC is going to provide resources to fund critical R&D that might otherwise constrain the national operational effort. It will also provide an interface for integrating new products into systems involving complementary and competing products.

*In question time the following point was made:*

- The proportion of funding from the CRC for woody vs non-woody perennials (program 3 and 4) will be roughly even between the two areas although there is some tied investment from groups like GRDC which is in the order of \$0.75 million per year which will almost inevitably push the focus towards crop rotational systems.

## **Southern Australian State Programs**

### ***Victoria***

**John Taylor (North Central Region) and Charles Hajek (Wimmera Region), Natural Resources and Environment Vic.**

#### **Private Forestry Strategy Review**

The private forestry strategy review looks at Victoria's forestry industry expanding into lower rainfall areas with a more integrated approach and multiple benefits (social, environmental, economic). It has small research and personnel component and will involve policy change.

#### **Salinity Program**

Of 23 priority catchments identified in the National Action Plan for Salinity and Water Quality, four have been nominated in low rainfall areas of Victoria:

- Wimmera;
- Mallee;
- North-Central and
- Goulbourn-Broken.

The Wimmera and Mallee plans will both involve accelerated implementation. The North-Central plan involves an innovative targeting of specific parts of the catchment. These catchments all have the right landscape, rainfall, environments and needs to be involved in a wider Search-type project.

Victoria has been allocated \$43 million under the NAP which will form a sound basis to be involved in future Search-type projects.

#### **Regional Forestry Agreement**

An outcome of the RFA for western Victoria was an adjustment package of \$1.5 million to help the industry and its employees. A large proportion of that money has been deliberately steered into encouraging farm forestry in both the low and high rainfall areas. As part of the offset package, there is a focus that any plantation development that happens occurs in areas that are directly linked to contribute to salinity control.

#### **Greenhouse Gas Abatement Program**

Goulbourn-Broken have already got a significant project running. North-Central regions are currently developing collaborative projects with several components, one of which is for low-rainfall commercial opportunities.

#### **Catchment Management Authorities**

Victoria has a framework where Catchment Management Authorities over ten regions deliver projects. This framework does not provide for regional R&D however so there is a need for a Search-type project to be co-ordinated more broadly.

Commodities such as grain, wool, lambs and beef look good for the next 2-3 years so there will be opportunities to get landholders on board to diversify.

*In question time the following point was made:*

- A firewood strategy is not yet developed but is a growing issue and would complement these strategies.

## **New South Wales**

### **Len Banks, NSW Agriculture.**

#### **Farm forestry**

NSW Agriculture is particularly interested in how low-rainfall revegetation activities can enhance diversity on farms to spread income streams and how they can integrate with existing enterprises and management systems.

In NSW at the moment, forestry is managed as plantations and there is a lack of integration with the rest of the farm. A more integrated approach to farm management to get all the benefits of diversity of income streams as well as the natural resource benefits is needed.

NSW Agriculture has a Farm Forestry Advisory Unit which has been in place for 18 months and consists of an economist and a forester. Their charter is to look at silviculture and economics of farm forestry in low-rainfall areas and provide information to farmers as to how to better integrate farm forestry with agricultural activity.

Information about how to improve the use and management of trees on farms is also given by a Trees on Farms Advisory Officer.

#### **Native pastures**

There is a lot of knowledge in NSW now about management of native grass pasture species. There are several programs currently running to build on that knowledge with other species as well investigating the benefits for salinity control in the farming system.

We are very interested in the environmental benefits that might come out of these kinds of programs and how we might share the costs – government, farmers, industry and so on – a market-based approach to investment in plant species.

#### **Other woody species**

Peter Milthorpe has done work on woody species for dryland environments. There is also a wealth of descriptions for plants, particularly in western NSW, which include details of botany, geographical location and biophysical features for many species.

We have expertise in oilseed chemistry. Current projects involve chemists working on blue mallee, ethanol and olive oil.

## **Salinity**

NSW Agriculture provides the Program Leader for Program 4 (Land Use Systems with Balanced Water Use) of the CRC for Plant-Based Management of Dryland Salinity, based at Wagga. We also support a range of people who will be carrying out research projects under that CRC.

NSW Agriculture drives the R&D component of the NSW Salinity Strategy and the Land and Water Department drives the extension component. There are also other components of economics and market-based solutions being looked at under the strategy.

Salinity R&D is largely about the hydrological impact of farming systems – where is the water going, what sort of farming systems can we put in place to capitalise on rain where and when it falls? Under the NSW strategy, there is the capacity to have a Salinity R&D Co-ordinating Committee which is just getting going now. Its role is to look right across the State and see where the priorities are for salinity R&D. The activity of finding new plants and new enterprises can feed into that process of prioritising R&D.

Developing plans of action for catchments with focus on salinity priorities and management targets is the key role of the Catchment Management Boards.

### **Future directions**

There is a need to get the information we have on plants in drier areas into an electronic and interactive database so that we can make better use of it. Adding some other features of the species that are likely to be most useful would be the next step.

Socio-economic analyses of the benefits that might come out of new industries are also needed so that we can see how they fit into farming systems in NSW.

*In question time the following point was made:*

- We don't know enough about hydrology in some catchments to truly understand the impact of tree planting on water balance.

## **South Australia**

### **Phil Cole, Primary Industries and Resources SA.**

The SA State Government is investing \$100 million in the National Action Plan for Salinity and Water Quality which is to be matched equally by the Commonwealth to make a total of \$200 million. There are three focus catchments under the plan in South Australia.

### **Lower Murray Darling Basin**

The issue for the Lower Murray Darling Basin is not so much about salinity in the Western Australian sense of land becoming salinised, but the long-term impact of very low recharge rates from the Mallee on the River Murray.

The rainfall is only 250-300 mm/year for much of the region involved. There is interest in the types of perennial vegetation that might go back in and fit into farm forestry type thinking for the Mallee. There is also interest in what you might do with the floodplain of the river. In SA

the floodplain is broad and once consisted of river red gum woodlands but is now rapidly degrading. Thought is just starting to be given to working out management actions for long term sustainability.

### **Upper South East**

The second major catchment is the Upper South East. It is similar to the Esperance sandplains with light textured soils, low-lying country becoming salinised and higher sand ridges recharging the groundwater.

There is a major drainage project underway in the Upper South East but the economics of that project will rely on getting salt-tolerant pastures back onto the flats and lucerne or other perennials plants onto the sand dune systems. A regional biodiversity/revegetation model requires that an additional 6% of the region should go under perennial vegetation such as alley farming, reforestation and 'bushcare' type activities.

### **Greenhouse Gas Abatement Program**

Initiatives are waiting on Commonwealth announcements.

### **CRC for Plant-Based Management of Salinity**

Philip Beale, based with SARDI in Adelaide will help run the program on pastures and cropping and there are also people involved in landscape mapping. There is an interest in developing a Natural Resource Centre of Excellence at the Waite Institute which will look at sustainable landscapes.

### **Sustainable Agriculture Program**

The Sustainable Agriculture Program run by CSIRO in three states for the mallee is providing a good basis for the community to understand integration of new farming systems into the landscape. The program is not just tree-based, lucerne also features. There is the potential to build on this program with Search-type projects, especially for the areas of land that are not providing good returns compared to the inputs.

For areas not suitable for traditional agriculture, we feel it would be of benefit to learn from WA to find new solutions but do it in conjunction with NSW and Victoria rather than go it alone as we all have a lot of common issues.

## **Other Issues**

The following issues were raised in general discussion after completion of the speakers program:

- Need to look at the full value and costs of all land uses as this will change the economics, particularly when land use changes due to measures to control salinity or for biodiversity conservation.

## **Where to from here?**

Day 2 of the workshop aimed to look at developing a funding proposal for a expanded Search-type project for Southern Australia. Day 1 participants were asked what they saw as important issues or directions for the project to take account of. The following points were raised in general discussion:

### **Links with current/prior research**

- Important to incorporate all aspects of the WA Search process in a new project which involves looking for new species, new products, new markets and the associated trials and product testing.
- Build on the WA Search project to look at some common assessment framework especially for product characteristics.
- The Australian Low Rainfall Tree Improvement Group has an interest in the domestication and breeding of ‘wild’ species and so is a step ahead in this process which could be built upon.

### **Aspects of consultation, communication and co-ordination**

- Need to learn as much as we can from WA, to organise a joint arrangement between WA and the other States and have that nationally co-ordinated so that we maximise efficiency.
- Further consultation with other organisations, particularly Murray Darling Basin Commission is needed once a more concrete proposal is finalised.
- There is a strong co-interest between the aims of JVAP and the new CRC. Must make sure that they are not seen as competing but complementary and that good communication is set up between the two. The CRC connection may provide opportunities to attract and link in with new investors.
- A strong framework of interstate co-operation will be crucial to the success of a new project for Southern Australia – the appropriate avenue could be via the new CRC.
- The next ‘big thing’ will be the National Action Plan for Salinity and Water Quality so need to work through that system.
- Vital to win ‘Green’ group participation to make sure direction is right from the start.

### **Policy**

- Government policy needs to be clear on what the support is for the promotion and use of new native plants to minimise risk to landholders. The community can be involved in the “D” part of R&D.
- The government may need to offer incentives to promote uptake on a large scale and therefore strengthen the security of biomass available to industry.

## **State positions**

- Each State and region within each State may be at different levels of knowledge and readiness for the kinds of activities we want to see happen in a wider Search type project so need to review what the positions are. May be helpful to identify priority regions and designate as pilot regions.

## **Other opportunities/research**

- Need to be able to identify the constraints across the landscapes to new developments.
- Could look at using JVAP project trial sites that are currently growing to use for plant characteristic testing.
- Grazing opportunities with native plants for fodder could be looked at more.

## **Conclusions**

The methodology used in WA to search for species that might be suitable for new short-rotation cropping systems and for new products/industries relies on data obtained from literature, herbarium records and experts' local knowledge. Even using simple data, the WA Search process can narrow down suitable taxa to investigate further from a list of hundreds to a handful. The methodology used is transferable to other regions but data would need to be collected from those regions to be applicable.

Several speakers identified potentially good opportunities for the use of large-scale biomass in the fields of bioenergy, panel boards, fuels, oils/chemicals and other associated by-products, particularly if government support is given during the developmental stages.

The conclusion from Day 1 was that participants favoured the development of a project proposal that would look at developing species and products for new industries based on large-scale revegetation for low-medium rainfall areas in Southern Australia.

Given that the development of new large-scale perennial vegetation systems would help to realise the complementary targets for salinity control, greenhouse gas abatement and renewable energy, it is seen as potentially a priority project for various funding bodies and co-ordinating agencies including the CRC for Plant-Based Management of Dryland Salinity, the National Action Plan for Salinity and Water Quality, the Murray Darling Basin Commission, RIRDC through the Joint Venture Agroforestry Program and each of the leading State agricultural/natural resource management agencies.

It was stressed that each of these programs/agencies still needed to confirm any commitment to such a project and that a high level of consultation and communication was needed with them after an initial project proposal was formulated.

## **Day 2 (Project Development)**

A smaller working group of participants (see Appendix 1) discussed the elements needed in a project proposal. The rough outline of a 5 year project with a budget of approximately \$13 million was devised to submit to RIRDC.

The proposal encompassed aspects of searching for new species, trial site establishment, market opportunity analyses, economic analyses, determining plant and wood characteristics, product testing and national project co-ordination/networking.

Refinement and development of this proposal was to be undertaken by Peter Bulman and Zita Stokes of Primary Industries and Resources SA in consultation with the working group.

## Appendix 1. List of attendees.

Participants marked \* formed the working group on Day 2 to formulate a project proposal.

|                   |                                                             |
|-------------------|-------------------------------------------------------------|
| Madeleine Baldwin | Agriculture, Fisheries & Forestry Australia                 |
| Len Banks         | NSW Department of Agriculture                               |
| John Bartle*      | CALM                                                        |
| Annie Boutland    | Environment Australia                                       |
| Peter Bulman*     | Primary Industries & Resources SA                           |
| David Bush*       | Australian Low Rainfall Tree Improvement Group              |
| Phil Cole         | Primary Industries & Resources SA                           |
| Bob Crouch        | Murray Darling Basin Commission                             |
| Sharon Davis*     | Rural Industries RDC                                        |
| Rhondha Dickson   | Environment Australia                                       |
| Jim Donaldson     | Environment Australia                                       |
| Mike Ewing*       | Agwest & CRC for Plant-Based Management of Dryland Salinity |
| James Florent     | Australian Greenhouse Office                                |
| Jamie Hague*      | CSIRO Forestry & Forest Products                            |
| Charles Hajek*    | Natural Resources & Environment                             |
| Bill Handke       | Agriculture, Fisheries & Forestry Australia                 |
| Peter Milthorpe*  | NSW Department of Agriculture                               |
| Graeme Olsen*     | Olsen & Vickery                                             |
| Roslyn Prinsley   | Rural Industries RDC                                        |
| Phil Pritchard    | Agriculture, Fisheries & Forestry Australia                 |
| Rob Rawson        | Agriculture, Fisheries & Forestry Australia                 |
| Louise Rose       | Australian Greenhouse Office                                |
| Wes Stein         | CSIRO Division of Energy Technology                         |
| Zita Stokes*      | Primary Industries & Resources SA                           |
| Colin Stucley     | Enecon Pty Ltd                                              |
| John Taylor       | Natural Resources & Environment                             |
| Tim Vercoe*       | CSIRO Forestry & Forest Products                            |
| Andrew Walker     | Agriculture, Fisheries & Forestry Australia                 |
| Rob Waterworth    | Australian Greenhouse Office                                |
| Annemarie Watt    | Environment Australia                                       |
| Jeremy Whitham    | Environment Australia                                       |



# Australian *Florasearch*

## Agenda

**10 August 2001**

**9am-3pm**

**Venue: Seminar Room, University House, ANU Canberra**

**1. Introduction      5 mins (9:00 -9:05)**

*Dr Roslyn Prinsley*

**2. Brief review of 'Search project' principles by    10 mins (9:05 – 9:15)**

*John Bartle*

- Information
  - Review all prospects systematically and allocate priorities
  - Focus on large-scale prospects to maximise impact on salinity
  - Take first steps towards development of best prospects

**3. Update on Search project      30 mins (9:15 – 9:45)**

*Graeme Olsen*

- Information
  - work to date
  - plans for remainder of 2001
- Discussion
  - adjustment of plans to maximise benefit and coordination with the RIRDC's 'FloraSearch' component of CRC.

**4. FloraSearch RIRDC funding application 75 mins (9:45 – 11:00)**

*Mark Ellis*

- Information
  - size of budget secured by RIRDC.
  - draft funding application, revised by PIRSA
- Discussion
  - need for matching funds from proponents?
  - integrate Search with FloraSearch to boost resources and increase collateral to attract other funding sources?
- Action
  - review and revise project application, to match year 1 request to the likely budget (will require agreement on priorities)
  - decide how to handle years 2-5. How to ensure funding continuity and increase? From where?

- finalise funding application
- (Morning tea included in this session)

## **5. Proposed RIRDC project – Acacia assessment 60 mins (11:00 – 12:00)**

*Bruce Maslin*

- Information
  - purpose (preliminary assessment of the commercial potential of Acacia species across southern Australia)
  - presentation of WA assessment
- Discussion
  - use WA format for a similar assessment across southern Australia?
- Action
  - Refine project application to fit requirements and budget

## **6. Edible wattle seed 45 mins (12:00 – 12:45)**

*Graeme Olsen*

- Information
  - background, ANPI initiative
  - presentation of Search report on wattle seed, with emphasis on priority issues for R&D (esp. plant breeding)
- Discussion
  - funding and coordination pathway within CRC – what are the options?

## **Lunch (provided) 45 mins (12:45 - 13:30)**

## **7. CRC for plant based management of salinity: update 60 mins (13:30 – 14:30)**

*Mike Ewing/ John Bartle*

- Information
  - brief description of structure and function
  - resources available for relevant program and sub-program (3.4)
  - potential for GRDC funding of projects within woody perennials sub-program 3.4 (perhaps directed through JVAP?)
- Discussion
  - how RIRDC component will mesh with the CRC
  - how to attract and manage GRDC projects within CRC 3.4 (as stand alone projects, or within the FloraSearch framework where possible?)
- Action
  - recommendation to relevant CRC management group?

## **8. Conclusions 30 mins (14:30 – 15:00)**

*John Bartle*

- Action
  - firm undertakings by when and whom?

**Close meeting by 3:00 pm**

Room is available till 4:30pm