

focus

ON SALT

ISSUE 31
NOVEMBER 2004
ISSN:144-7703



Special conference report:
Salinity Solutions - Working with Science and Society.

Full coverage of this major event starts on page 6.

in this issue

Future directions for the CRC – a view from the top.....2

How the CRC works – old projects and new2

Agreement with Uruguay a first for lucerne alternative3

What will FloraSearch find?4

NDSP goes out with a bang5

Salinity Conference reports.....6

Creative solutions begin at the farm scale13

Salinity mapping and hazard assessment.....14

Making the switch to profitable pasture phases16

State roundup.....17

Alison Southwell picks up A.W. Howard fellowship.....18

The answer might have been here all the time.....19



CRC FOR PLANT-BASED MANAGEMENT OF DRYLAND SALINITY



Focus – more of the same, but much that is new

By Kevin Goss,
Chief Executive Officer, CRC for Plant-based Management of Dryland Salinity

The CRC Salinity is proud to bring you this 31st edition of *Focus on Salt*. *Focus on Salt* has become something of an institution since it commenced as the newsletter of the National Dryland Salinity Program (NDSP) back in 1994. Since then it has continued to keep readers up to date with salinity R&D, announcing important project outcomes, reporting on work in progress, and signaling new ventures.

Over that period *Focus* has been the only regular national publication bringing to readers the most up-to-date knowledge of dryland salinity. The CRC has recognised the importance of this role and welcomed the opportunity to continue it.

A survey in 2000 showed that *Focus* was highly valued by a readership covering the spectrum from policy advisers to farmers, and through local government, farm advisers, community groups, agribusiness, researchers and catchment management organisations. Over the years it has undergone several make-overs, now finally bursting into full colour, but its substance and its intent remain unchanged.

Whilst some things have changed, this CRC is determined to see *Focus* continue its important role. Like the NDSP we are also ensuring that all aspects of dryland salinity research are covered, not just those plant-based issues in which we specialise.

A major initiative is our partnership with the CRC for Landscape Environments and Mineral Exploration (LEME), and I invite you to read the introduction on page 3 from Paul Wilkes.

As with the NDSP, we will continue to feature research highlights emerging from other sources such as the Murray-Darling Basin Commission, industry R&D corporations and government agencies.

All this will ensure our readers of a comprehensive and up to date coverage of what is new in dryland salinity knowledge generation.

Finally I would like to make a few general com-

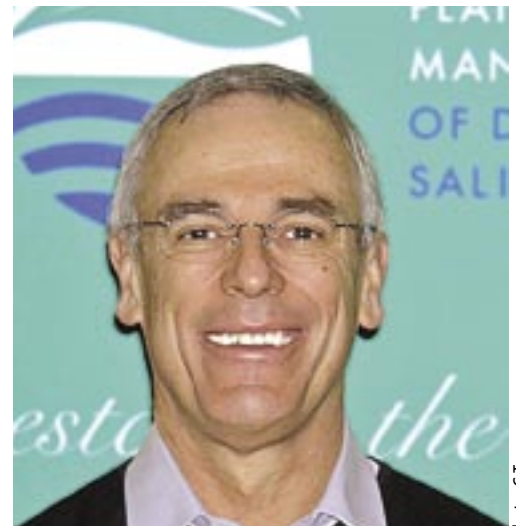


Photo: C Twomey

Chief Executive Officer of the CRC for Plant-based Management of Dryland Salinity, Kevin Goss.

ments about the CRC that I now manage.

This is one of the largest CRCs in the nation, with 350 scientists from 11 institutions undertaking research in four States. Over the past three years the CRC has established a comprehensive but carefully targeted research portfolio that is now beginning to deliver some very significant research results. Aside from the researchers themselves, much of the credit for the CRC's achievements must go to my predecessor, Professor Phil Cocks.

I am sure you will get a strong feel for some of these research achievements in this edition of *Focus*.

As we approach our fourth year we are now embarking on a series of new projects that add value to existing work or fill gaps that we have identified.

As a nation we face great challenges protecting our natural resources and the industries and communities that depend on them. Those individuals and organisations charged with planning for salinity management and with making relevant investment decisions will do so on the basis of good scientific advice. This CRC, along with CRC LEME and other research organisations, will play a vital role in providing much of this advice.

Future directions for the CRC – a view from the top

It is now four months since Kevin Goss joined the CRC for Plant-based Management of Dryland Salinity as its new Chief Executive Officer. In this interview with Focus on Salt, he shares some of his thoughts and hopes for the future with Jo Curkpatrick, CRC Communication Coordinator (Victoria).

FoS: Kevin, what attracted you to the CRC role?

KG: I had decided in my own mind that further R&D was essential to the future management of salinity and to the sustainability of agricultural land use and that's where I wanted to be. I knew from my experience with other CRCs that this was a CRC in excellent shape. My predecessor Phil Cocks put a lot of time into building the collaborative culture of the CRC, assisted by a very effective Board led by Alex Campbell. They laid down some strong directions and rules about how the CRC could make a difference.

FoS: What are your plans for your first year in the job?

KG: The CRC is now three years into a seven year program. Taking up the opportunity of rounding out its research program to make full use of our resources is a priority. That's an exciting prospect because we've learnt as we've gone along where the new opportunities lie.

FoS: Will communication be a focus as research begins to deliver?

KG: Yes it will. For the next six months we need to lead from the front on a larger communications program, developing our own CRC approach to delivering knowledge and extension.

We have to deal with the research questions and then the options for adoption as they are developed. How we demonstrate that they could improve profit at the same time they deal with recharge is very important to me.

FoS: Kevin, what is your personal philosophy on dryland salinity?

KG: I have reached a point where I don't want to die wondering about plant-based solutions to salinity. One of the things about the CRC that gives me a buzz is that if some of the speculative long-term opportunities we are involved with come off it will be tremendous. What really appeals to me is taking a team of really talented people on this journey and sharing the risks and the excitement.

FoS: Where do you see the CRC in four years time?

KG: If I do my job well, we could see a CRC that's quite different in the suite of problems it speaks to, but one that has held onto its core strengths.

This CRC is making some real gains in development of perennial plants, but the prospect of perennialising agriculture will deliver other benefits. A new CRC will build on these and bring in the new technologies needed to complete the job.

■ **More information:** www.crcsalinity.com

How the CRC works – old projects and new

At mid-term, the CRC Salinity faces the task of consolidating its past research effort, building on the opportunities created by current work and identifying gaps and developing new initiatives to fill them.

Deputy CEO, Associate Professor Mike Ewing, comments: "The CRC went through a rigorous process to develop a prospectus of new project opportunities and has now had these approved by the Board as priority areas for project development. The extent to which these projects can be funded will depend partly on the extent to which current projects are continued, subject to review.

"The CRC's current research activity is delivered through 32 projects (see www1.crcsalinity.com).

"We are now reviewing all these projects (other than some late starters) to determine which will continue, refocus or terminate for the final phase of this CRC."

Title	Interim Project Leader
Profitable animal production from perennials	Dr A Avery
FloraSearch	M Bennell
Evaluating CRC outputs	Dr A Abadi
Designing land use systems to support native biodiversity.	Dr V Turner et al
Catchment scale evaluation of farming system impacts	Dr C Beverley
Market prospects for new products from woody perennials	J Bartle
Breeding herbaceous perennials for low and medium rainfall zones	
EverGraze (livestock production for the wheatbelt)	Dr D Revell
Field evaluation of perennial pasture plants	Dr B Dear
Agronomic practices for new perennials	
Precision nutrition (testing plant nutritive value and safety)	Dr D Masters
Integrating forestry into farming systems in salt-source catchments	Dr N Marcar
Fodder shrubs for integrated production systems	M Bennell
Enrich (exploiting secondary plant compounds)	P Vercoe
Molecular breeding for plant traits relevant to salinity	

The complete list of current research projects can be found at www.crcsalinity.com

■ **CONTACT:** Dr Mike Ewing,
Tel. (08) 6488 1876,
E-mail: mewing@cyllene.uwa.edu.au

Agreement with Uruguay a first for lucerne alternative

A perennial pasture legume that can survive summer droughts, acid soils and waterlogging is a tall order, but might soon be available to Australian farmers as an important alternative to lucerne.

The CRC for Plant-based Management of Dryland Salinity has signed an agreement with the National Institute of Agricultural Research (INIA) in Uruguay to establish the exchange of breeding material for Birdsfoot Trefoil (*Lotus corniculatus*).

"This represents a major win for Australian farmers," said Associate Professor Mike Ewing, Program Leader of the plant breeding group with the CRC.

"The international exchange of germplasm provides an opportunity to really kick start



The real deal...celebrating the exchange of legume plant breeding material between the CRC and Uruguay's National Institute of Agricultural Research (INIA) were (from left) Pedro Bonino Garmendia (INIA), CRC senior plant breeder Daniel Real and the CRC's Kevin Goss.

the Australian program targeting a greatly expanded array of environments and it can cut up to 10 years off the normally extended breeding cycle required to produce new cul-

tivars suited to our harsh conditions."

According to Dr Daniel Real, Senior Plant Breeder for the CRC, new Lotus cultivars developed here offer an alternative to lucerne on acid soils, and low fertility and waterlogged soils in southern, western and eastern parts of Australia.

Australian Wool Innovation Ltd is a major funding partner in the Lotus breeding project in a five year investment which is expected to deliver new cultivars adapted to Australian conditions.

The drought tolerance needed for successful Australian cultivars will be made available to Uruguayan breeders, providing reciprocal benefits to the INIA program.

■ **CONTACT:** Daniel Real,
Tel. (08) 9287 1734,
E-mail: dreal@cyllene.uwa.edu.au

CRC LEME joins Focus on Salt

By Paul Wilkes,
Deputy Chief Executive Officer, CRC LEME

The CRC for Landscape Environments and Mineral Exploration (CRC LEME) is delighted to be collaborating with the CRC for Plant-based Management of Dryland Salinity as the new publishing partner of *Focus on Salt*.

Both CRCs believe that it is important to continue this publication after the conclusion of the National Dryland Salinity Program (NDSP). We will work together to bring you useful information on the work we are doing to combat salinity. Our two CRCs are very complementary and we are increasingly building stronger links and projects between us. You will read more of this in future issues of *Focus on Salt*.

CRC LEME concentrates on 'regolith' - all the material between fresh (hard) rock and

fresh air. It thus includes soil, water and all the material (such as salt) beneath the soil until we reach hard rock. Plants grow in the regolith and derive nutrients from it.

CRC LEME has four Research Programs - two of which are focused on research in natural resource management:

- Program 3 - Environmental Applications of Regolith Geoscience; and
- Program 4 - Salinity Mapping and Hazard Assessment.

Program 3 is led by Dr Steve Rogers (CSIRO Land and Water, Adelaide) and Program 4 by Dr Ken Lawrie (Geoscience Australia, Canberra). A further, related initiative, Program



Paul Wilkes

5 - Education and Training, is led by Dr Steve Hill from University of Adelaide. We support a large number of Honours and Postgraduate students on projects integrated with our overall research programs.

For more information on the partners and work programs of CRC LEME please visit our newly upgraded website: <http://crclme.org.au/>

We hope you continue to find *Focus on Salt* useful and enjoyable to read.

■ **CONTACT:** Paul Wilkes, Deputy CEO,
CRC LEME, Tel. (08) 6436 8699;
E-mail Paul.Wilkes@csiro.au

What will FloraSearch find?

By Bruce Munday

Most of Australia's agricultural industries are based on plant or animal species originally imported from another country. For some time there has been debate about the sustainability of agriculture based on these species in the Australian environment.

The CRC's FloraSearch project (a joint project between the CRC and the Joint Venture Agroforestry Program) is screening Australian native flora for candidates that might be developed as large-scale woody crops, supplying commercially viable and ecologically sustainable industries.

FloraSearch is a first step in a long-term and complex process of adjustment towards more diverse land uses for the wheat-sheep zone of southern Australia. It provides a coordinated effort across southern Australia to develop new woody crops for wide scale adoption in areas subject to salinisation.

FloraSearch Stage 1 was designed to confirm this premise and develop a method to systematically identify prospective species from within the south-eastern Australian flora. FloraSearch 1 was able to use and



Paper from native woody species for performance testing by CSIRO Forestry and Forest Products.

improve the method originally developed by the Natural Heritage Trust-funded 'Search' project in Western Australia. Between them, these two projects have screened over 20,000 native plant species across southern Australia using progressively higher resolution selection criteria to systematically reduce the species of interest to a couple of hundred.

The 'Search' Project, which preceded FloraSearch, undertook the manufacture of sample products to provide actual product performance data. This enabled the project to narrow down its selection of WA species to a shortlist of about a dozen. These species

combine the best indications of performance as a crop with product attributes that appear competitive with current commercial species. The selected species are nearly all from different genera and include some from the major genera *Eucalyptus* and *Acacia*.

FloraSearch Stages 2 and 3 will narrow down the selections from the two preceding projects and will then subject the short-listed species for each region to more intensive evaluation to select the most prospective species. This final stage in species selection will focus on field testing work to evaluate agronomic attributes, examination of within-species diversity to reveal the best sources of germplasm and the potential for co-products.

So what will FloraSearch find? It is well on the way sifting through the considerable diversity of the native flora to systematically pick out the best prospects. But more importantly, the indications are that these prospects will confirm the premise, that the native flora contains germplasm capable of providing some important woody crop plants for the future.

■ **CONTACT:** Mike Bennell,
Tel. (08) 8372 0188,
E-mail: bennell.mike@saugov.sa.gov.au

Passing of salinity leader

Issue 29 (December 2003) of *Focus on Salt* carried an interview with Tony McGrane, MP, Independent Member for Dubbo in Western NSW. At that time *Focus on Salt* asked Tony why he attended all four days of that year's Productive Uses and Rehabilitation of Saline Lands (PUR\$) conference, including the field trip.

He replied: "The exchange between landholders who have the questions and scientists who have the 'answers' is important, and this is a dialogue I need to hear."

Unfortunately Tony passed away in September this year. A former mayor of the City of Dubbo, he had been a leader in the establishment of the Salinity Action Alliance, through which 14 local government councils collaborated on landscape-scale projects without the hindrance of local government boundaries.

Approximately 1800 people attended Tony's funeral – he will be a great loss to the region.

Abraham's Holy Grail

Grain breeding's 'Holy Grail', a drought tolerant, high yielding crop, could be achievable if researchers understand, design and act upon crop plant improvement programs for drought conditions, according to plant stress expert, Abraham Blum of the Volcani Centre, Tel Aviv, Israel.

Addressing the Grains Research and Development Corporation-funded *Adaptation of Plants to Water-Limited Mediterranean-type Environments* international symposium at CSIRO Perth recently, Dr Blum said the association between drought resistance, water use efficiency (WUE) and yield potential was often misunderstood.

"This can lead to conceptual oversight and wrong decisions in implementing breeding programs for drought-prone environments. Most breeding programs target high yield potential, which might not be compatible with superior drought resistance.

"On the other hand, high yield potential

should therefore be reviewed in the context of its effect on and interaction with drought resistance and WUE on the background of the prevalent drought profile in the target environment," Dr Blum said.

According to Dr Blum, drought resistance is a function of dehydration avoidance, rather than desiccation tolerance.

"Under most dryland situations, where crops depend on unpredictable seasonal rainfall, the maximisation of soil moisture use is a crucial component of drought resistance, or avoidance, which is then often expressed in lower WUE.

"The effect of a single drought adaptive gene on crop performance in water-limited environments can be assessed only when the whole system is considered in terms of drought resistance, WUE and yield potential," Dr Blum said.

■ **CONTACT:** Dr Abraham Blum,
E-mail: ablum@plantstress.com

NDSP goes out with a bang

By Bruce Munday

The story of Australia's National Dryland Salinity Program (NDSP) has been played out in this newsletter over the past decade, culminating in the Enhanced Communications Year just completed. It was great way to wind it up – bringing together all that has been learned in that time, not just through the NDSP but through all the complementary R&D conducted over that period.

The NDSP communications products, collectively the 'Managing Dryland Salinity in Australia' resource kit, were finally launched in July by Senator Judith Troeth, Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry.

That was the ceremony, but the practical 'launch' was a series of workshops held in five States illustrating the extent of these materials and demonstrating how to make the most of them. That every State took a distinctly different approach to these workshops itself says something about the diversity of contexts within which each approaches the issue of salinity.

The 'roadshow' featured two of the Managing Dryland Salinity in Australia authors, Lisa Robins and John Powell and NDSP Networks Coordinator Bruce Munday.

The gifts they bore were the major resource directories:

- *Breaking Ground: Key Findings from 10 years of Australia's NDSP;*
- *Dryland Salinity and Catchment Management;*
- *Dryland Salinity: On-farm Decisions and Catchment Outcomes;* and
- A CD-ROM that captured all these and more.

Aside from making these products available, the main role was to take the

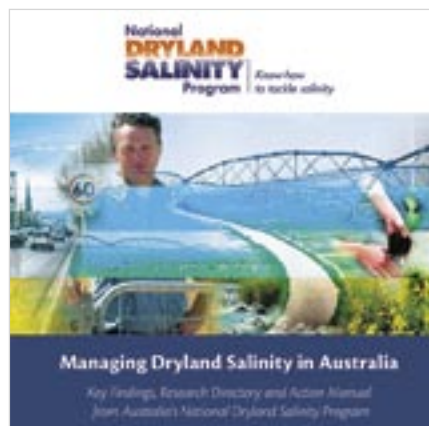


Photo: L Munday

At the Adelaide workshop (from left) Rob Freeman, Chief Executive DWLBC, Lisa Robins and Di Coady, Urrbrae Agricultural High School.

audience for a test drive – and show just how much information is now at their fingertips, stress the context in which it should be used, and demonstrate how to get the best value from the vast library available on the CD-ROM.

In Launceston the team was but one act in a full-day event that also featured



'Managing Dryland Salinity in Australia' - the ultimate salinity survival kit is now available from Australia's National Dryland Salinity Program.

a presentation on Tasmanian groundwater flow systems, along with several farmer case studies. The 120-strong audience was ample evidence that salinity is indeed an emerging issue in Tassie.

It is much tougher call to expect Queenslanders to travel from the vastly distant regions, so from Brisbane we used a Webcast. This was a new territory for the three of us and no doubt we would be better next time, but nonetheless it worked well and got us out to areas (including Canberra!) we would otherwise never have reached.

In Adelaide the NDSP had a slot in the SA Dryland Salinity Committee's annual salinity forum. Dubbo in NSW was another full-day event, hosted by the CRC and providing an opportunity to show how the CRC's research agenda builds on much of what the NDSP commenced.

Finally to WA. They might have the most salt but Perth, again hosted by the CRC, was the smallest event – perhaps they heard that Lisa and John would not be there or perhaps they have heard it all before. Nonetheless, a comprehensive State round-up by Richard George and an erudite summary by Mike Ewing of the CRC's research platform made this morning seminar a very worthwhile event.

The events in Tasmania, Queensland and NSW were all greatly assisted by Greening Australia as part of the Exchange program that aims to bridge the gap between scientific research and the knowledge and information needs of users.

Copies of the various components of the NDSP's *Managing Dryland Salinity in Australia* resource kit are available free from CanPrint on Freecall 1800 776 616.

■ CONTACT: www.ndsp.gov.au

A National Salinity Conference!

What were we thinking?

When asked to organise a national conference in Victoria, my first response was: “We’ve already had national salinity conferences in Victoria – why would people come to another?”

However, after talking to a few ‘learned’ and ‘experienced’ people around the traps, a vision started to emerge of a conference that could hopefully capture the interest and stimulate the minds of those involved in salinity around Australia.

Elements of that vision included a conference that would:

- Present sound, peer reviewed science, not just speculation and anecdotes;
- Enable all the relevant disciplines to interact, not just agronomists talking to agronomists or hydrologists talking to hydrologists;
- Integrate thinking at a range of scales, from the plant to the paddock to the farm to the catchment to the nation;

- Provide a forum for meaningful interaction between biophysical, social and economic scientists, advisers, policy makers and catchment decision-makers;
- Highlight the work of the CRC for Plant-based Management of Dryland Salinity, now three years old and starting to produce some results; and

- Push people outside of their comfort zone, but let them have good time doing so.

In addition, we were keen to highlight the issues that Victoria faces in dryland salinity and the efforts being made by the farmers, CMAs and Departments of Primary Industries and Sustainability and Environment to address them.

The rest, of course, is history. Bendigo turned on its charm and over 330 delegates, from all the sectors that we were targeting, were rewarded with some stellar performances by invited speakers and an



Michael Crawford
Chair, Conference Organising Committee

outstanding array of oral and poster papers.

The major theme of the conference was *Salinity Solutions – Working with Science and Society*. The key messages for me from the conference reinforced that theme – there are potential solutions, and not just one, and that if they are to work, the continuing interaction of science

and society, at all levels, is critical.

Thankyou to everyone involved for your contributions and please enjoy our report in this edition of *Focus on Salt*.

Michael Crawford
Chair, Conference Organising Committee

Epilogue: from propaganda to practicalities –

An edited version by Jo Curkpatrick of John Passioura’s (CSIRO Plant Industries) summary of the Salinity Solutions conference.

The *Salinity Solutions* conference confirmed just how much progress we have made in coming to grips with the problem of dryland salinity and in exploring practical ways of dealing with it. The conference showcased the remarkable explosion of increasingly solid data, reliable information, and usable knowledge that we have seen during that time, and most importantly the emergence of much wisdom.

Ten years ago trees were the answer and many agricultural scientists, in nascent discussion with hydrologists, learnt the great hydrologic truth that any particular part of the landscape was either recharging or discharging, and further, that the lateral distance between recharging and discharging areas varied from ‘local’ systems, over distances of kilometres or even less, to ‘regional’ ones, with distances of hundreds

of kilometres or even more, and with time scales ranging from years to centuries.

It did not take long for trees not to be the answer. The use of trees to capture water that had drained beyond the reach of crops and annual pastures, *en route* to becoming excessive recharge, was seriously questioned by both scientists and economists.

Further, the simple hydrologic picture, simple at least in the minds of most agronomists and farmers, was rapidly becoming more complicated.

This increased hydrologic variety was reinforced during the conference by a pair of complementary and riveting papers by Richard George and Ed Barrett-Lennard, arguing that the simple hydrologic picture of areas of recharge separated laterally from areas of discharge, was incomplete. They point out that flat landscapes with aquifers of low transmissivity have the potential for both recharge and discharge, with the action being essentially one-dimensional. The consequences of their insights for sensible land management are great, with many more options becoming available.

The conference made it clear that the general outlook in relation to dryland salinity has changed to become one of adaptive management, to exploring, with adequate reflective appraisal and reappraisal, a range of possible measures for simultaneously controlling deep drainage and making a living.

It may turn out in the long run that the pessimistic lobbyists of the past have done Australia a service in raising the political profile of dryland salinity to the point where the National Action Plan could come about. On the other hand, the promotion of illusory urgency has meant that the NAP has not been as well thought-out as it should have been. Anna Ridley and David Pannell convincingly argued this point, and made a strong case for policy makers to support more plant-based R&D in recognition of the very inadequate range of effective and profitable management options yet available to people trying to deal with dryland salinity.

The conference was remarkable in spanning a very wide range of scales,

Current salinity solutions just not good enough

By Bruce Munday

New trees and pastures – when, where and their likely role in farming systems was the title of a keynote paper by Dr Mike Ewing, Deputy CEO of the CRC Salinity, highlighting the importance of research to develop new plants and farming systems based on perennials.

“Australian farmers in the low rainfall wheat-sheep zones are reluctant to adopt perennial plants for salinity management for a very good reason – it is generally unprofitable,” said Dr Ewing.

“Salinity, in many instances a result of farming systems based on annual plants, demands that we challenge the status quo, but if we are to see the essential widespread adoption of perennial pastures and trees we will have to greatly expand the range of options we can offer to farmers.

“At the same time, we need to develop the practical and profitable farming systems that will accommodate these new pastures

and trees. In this we should be encouraged by examples of systems such as the use of lucerne grown as a phase – between sequences of crops.

“The challenges facing researchers in the CRC vary according to how radically we are departing from our traditional options.

“Existing options are clearly inadequate, but the most rapid and lowest risk results will come from innovation and development within commercially known species that already fit established farming systems.”

Dr Ewing indicated there would be many situations where such plants could not be sufficiently pushed to be both practical and profitable.

“It is here that we need to explore new plants and new farming systems,” he said. Summarising the steps in plant development, Dr Ewing reminded the conference that this is essentially long-term research. Even



Mike Ewing

Photo: C. Twomey

within the structure of the CRC, with all of its opportunities for collaboration and sharing of resources, it would be unusual for a new plant variety to be brought to commercialisation within 10 years. “In many instances we already have promising species that we are targeting to fit both current and yet-to-be-proven systems,” he said.

“However, low fertility soils and low rainfall impose more challenging constraints that will inevitably demand longer term research. For many such areas we are yet to even identify those species that might be suitable for intensive plant improvement.”

The CRC Salinity is undertaking research in four States and across the full spectrum of farm environments in an endeavour to provide a comprehensive suite of perennial plant options for salinity management.

■ **CONTACT:** Dr Mike Ewing,
Tel. (08) 6488 1876,
E-mail: mewing@cyllene.uwa.edu.au

the progressive evolution of the salinity debate

covering not only the biological sciences, from molecular genetics to ecology, but also the social. What the conference has beautifully demonstrated is that, when trying to deal with such multi-faceted problems as dryland salinity, it is important that all scales be explored. Moreover, they need to be explored in parallel, stitched together by strong threads of dialogue, primarily between adjacent scales. Such dialogues are not as common in agriculture as they should be.

These dialogues are so important because the essence of a bigger picture is that it includes constraints and interactions, otherwise invisible to those working on the smaller picture, that could easily make the smaller picture irrelevant.

These issues of scale are embedded in the spirit of this meeting as in no other I have ever attended. This spirit is evidenced by the many contributions that talked not of providing solutions but of providing options – options that can be used for practitioners



John Passioura

at a larger scale to assess and integrate into a workable system. We have transcended the earlier naïve view that there can be universal solutions.

As ever though, the most difficult problem of scaling up is from farm to catchment. The problem remains that it is not easily amenable to adaptive management, to trial and error.

The results of any interventions are hard to assess, especially the many that involve multiple goals. Most of the participants at the conference would not sympathise with the assumption embedded in NHT that we know what is needed to be done on the ground, and that all we need to do is devise the right blend of carrots and sticks to make sure it is done. Yet, we can also have sympathy for the view that policy makers cannot wait for scientists to be sure of their recommendations.

In trying to bridge the gap, we frequently resort to the art of the plausible, simulation modelling, which is a very beguiling art,

especially in these days of superb computer graphics. Converting modelling from art to science requires incessant fierce internal criticism, especially involving comparison between the predictions of a model and what actually happens. Of this we rarely have enough.

Finally, I'd like to take us back to 20 or 25 years ago, and to recall contrasting attitudes between Western Australia and Victoria. There was a widespread view in WA that solutions to salinity were in hand and that it was reasonable for the government to release further large areas for clearing for agriculture. By contrast, there was the Victorian Salinity Committee, which was deeply concerned about salinity, travelling around the country seeking advice from many people. It was considering, amongst several scenarios, the possibility of deliberately using the Murray as a drain for carrying salt exported from troublesome catchments to the sea.

We have come a long way, on both sides of the continent, since then.

CRC Salinity looks to the future

By Alex Campbell,
Chair, Governing Board of the CRC
Salinity

Our CRC is well into its first term and the research we are undertaking is starting to produce results and outcomes. However, whilst we still have a year or so to go before we need to submit a second bid, it is now time to start thinking about what a second bid should achieve, time to start thinking about new directions.

The CRC Board is keen to submit for a second bid because we believe there is still much research to do in finding more and better ways to lessen the economic, environmental and social impacts of dryland salinity.

We want to capitalise on this research and go forward, building on the strengths of the work of the CRC in our first period of operation.

A re-bid by definition is about retaining the strength of the first round whilst demonstrating that the CRC is pursuing new opportunities, not just 'more of the same'.

We can afford to keep our options open for a little while yet, while we consult with existing and potential partners and gauge where the opportunities are. Some have already said that we could set wider parameters for research on perennials than just salinity management. This research might look towards other plant-based solutions such as carbon sequestration and biomass energy production, and other land care or multi-benefit issues including water and wind erosion, and livestock protection.

With end of the National Dryland Salinity Program after 10 years, there is an opportunity to consolidate salinity research and broaden our agenda to address engineering, infrastructure management, soil responses and rehabilitation.

We still have to retain the best of what we are doing in plant-based management, but what we add to that, and what our emphasis is in the future will be worked through over the next 12 months.

In August 2005 we will have to commence work on preparing a business plan for our



Photo: E. Madden

CRC Salinity Chair Alex Campbell believes the time is right to begin planning the future direction of the CRC.

second bid. Over the next year the CRC Board and program and subprogram managers and other CRC participants will be involved in workshopping the best opportunities for a re-bid. After that comes the hard work of putting the business plan together and negotiating with potential partners who may be interested in the re-bid.

The recent *Salinity Solutions* Conference in Bendigo sowed some of the seeds for our discussions and provided a starting point to the process.

The hard work is ahead of us - the Board will decide on the shape of the new CRC in August 2005.

■ CONTACT: www.crcsalinity.com

Students – a glimpse of the future

The next generation of scientists, the CRC Salinity's research students, played a major role in the Bendigo conference.

CRC PhD researchers represented nearly 13 per cent of the total delegate population, contributed 15 of the 45 posters on display and participated in the development and presentation of six of the concurrent papers. One of the highlights of the conference was an *Emerging Science* session, allowing six of our rising stars to present their work to conference delegates during the first day of proceedings.

The student involvement during the week was coordinated and funded by the CRC's post-graduate professional development program that provides opportunities and activities for our emerging scientists.

■ CONTACT: Daryll Richardson,
Tel. (07) 5446 6094,
E-mail: drichardson@csu.edu.au



PhD researcher Juan de Dios Guererro Rodriguez from the University of Adelaide.

Conference proceedings now available

Proceedings of the *Salinity Solutions* Conference on CD-ROM are available from the CRC office in Perth at a cost of \$30.

The CD includes both full papers and in most cases the PowerPoint presentation.

■ CONTACT: Natalie Lennon:
Tel (08) 6488 1952;
E-mail: nlennon@fnas.uwa.edu.au

Smart policies can lick salt

By Elizabeth Madden

The *Salinity Solutions Conference* opened with a challenging keynote address, delivered jointly by Dr Anna Ridley and Professor David Pannell.

Their provocative and well argued paper set the tone for a conference that never flinched from serious debate.

Dr Ridley and Professor Pannell, along with co-authors Professor Mike Ewing and Dr Ted Lefroy, conducted a detailed analysis of the most appropriate policy responses for dryland salinity based on the type of asset affected and the particular circumstances for that asset.

"We concluded that the best approach to policy is quite different depending on whether the salinity is affecting land, water resources or infrastructure," said Dr Ridley. "It also depends on factors like the local hydrogeology, farm economics, the value of the threatened asset, local social changes in some regions, and the availability of suitable land-use options for farmers to adopt.

"We have come up with specific policy recommendations for about 60 different scenarios. Across these scenarios, recommendations include extension, engineering works, R&D, regulation, incentives, and the 'do nothing' option," Dr Ridley said.

Professor Pannell noted that people were surprised by some of the results.

"A striking example was that extension and incentives, the two key planks of the National Action Plan (NAP) for Salinity and Water Quality, did not feature at all prominently in our recommendations," he



David Pannell and Anna Ridley, joint authors of the *Salinity Solutions Conference* first keynote paper.

Photo: E. Madden

said. "We concluded from our study that they are appropriate responses in only a minority of cases."

On the other hand, the analysis emphasised several policy approaches that are not well catered for under the NAP. One of these is R&D to develop plant-based systems for salinity management, a theme particularly relevant to the conference.

"For protection of land and water, one of the keys to managing salinity will be the development of profitable and practical farming systems based on perennial plants," said Dr Ridley. "The existing perennial plant options are only appropriate for some locations and are often not sufficiently economically attractive to be very widely adopted. The only realistic response to this problem is R&D to develop new improved options," she said.

"Unfortunately the NAP is based on expectations that solutions already exist and so has given no emphasis to creating

improved plant systems for salinity management. Without the correct tools we will have little chance of heading off salinity in the future and we will miss opportunities to make productive use of saline land," said Dr Ridley.

Professor Pannell agreed. "Government policy must recognise that farmers need good economic reasons to make major farming system changes," he said. "Financial incentives for planting perennials, although popular, will not be affordable on the scale or for the time needed to address the salinity problem, except in relatively unusual circumstances."

The authors have applied their 'best-practice' policy to some preliminary case study catchments across Australia and will be working further on the analysis to develop it as a practical decision tool.

They hope that their analysis will be used to re-cast the approach taken to salinity policy nationally and in the States. "We believe it provides a real step forward towards effective and efficient salinity policy," Professor Pannell said.

"We have laid out the evidence and the logic and we believe that people will find it convincing."

As an opening address, the paper energised the conference from the start and stimulated a great deal of discussion and debate, particularly amongst policy advisers and catchment managers.

The paper is available at <http://www.general.uwa.edu.au/u/dpannell/dp0408.htm>

■ **CONTACT:** Dr Anna Ridley, DPI, Rutherglen Tel: (02) 6030 4581; E-mail: anna.ridley@dpi.vic.gov.au

Conference papers go public

Following the successful CRC Salinity conference - '*Salinity Solutions: Working with Science and Society*', 17 papers have now been submitted for publication in a special issue in the *Australian Journal of Experimental Agriculture* (www.publish.csiro.au/journals/ajea). These papers represent most of the

invited and keynote addresses as well as some selected contributed papers.

The papers cover the five theme areas addressed in the conference, ranging from new plant options, potential of current options, extension, modelling, economics and policy for salinity management. The

special issue journal will be published in 2005, with the papers representing the latest thinking and development in the practical options for salinity management.

■ **CONTACT:** Dr Anna Ridley, Tel. (02) 6030 4581; E-mail Anna.Ridley@dpi.vic.gov.au

Cropping tour an eye-opener for many

By Jo Curkpatrick

The Pental Hills between Charlton and Wedderburn was the targeted area for the cropping country salinity tour on a cold and sometimes wet day. Despite the sun shining at the first stop, one of the buses sank into the paddock and gave many of the conference delegates an opportunity to a) give the bus driver advice on how to get out of the bog; or, b) get rid of some pent up energy pushing the bus.

Some 10,000 of the 58,000 hectares that make up the Pental Hills are at risk from salinity and the area is a significant salt exporter. It is one of 10 priority areas in the North Central Dryland Targeted Salinity Program, selected because they are threatened by salinity, but have groundwater systems considered capable of responding to change in land use.

At Stephen and Lisa Poole's property the group saw an excellent demonstration of lucerne in pastures and intercropping. Stephen told the group he had boosted his

sheep returns by up to 240 per cent using lucerne as a tool in his lamb and wool production business. Stephen has sown 660 ha of lucerne and other perennial pastures over the last few years. He has also fenced out and protected 110 ha of remnant vegetation and fenced and rehabilitated 15 ha of gullies.

He has been intercropping with lucerne for more than five years and believes the sustainability and grazing advantages far outweigh the loss in grain production.

"It means better use of the rainfall, and the moisture and nutrients held in the subsoil", Stephen told visitors. "We get 30 per cent of our rainfall between November and April so we are able to use it, the stock is turned over faster and we can



Photo: M McCaskill

Conference Chairman Michael Crawford - no problem is too big.

match our feed needs with pasture growth.

"Despite what people say, the crops are better because we use less chemicals and don't need as much urea," he said.

The next stop on the cropping tour was Dennis and Glenda Watts property. The Watts are the 5th generation of the family to farm the property. They have a major revegetation effort underway with the establishment of 7000 farm forestry trees, 6000 tree and shrub species and 4000 salt-tolerant species on the farm.

A comprehensive paddock plan for the salt-affected areas addresses the cause of salinity in the paddock and reduces run-off by using the water where it falls.

To the top of the catchment

By Bruce Munday

Being a hills person, I took the tour to the upper part of the Loddon River Catchment, where Bet Bet Creek starts its journey.

Aside from a natural leaning towards hilly landscapes, I had visited this region about a decade ago and looked forward to assessing progress. I also figured that a bus would be far less likely to get bogged up on a ridge than down on the plain.

The upper catchment of the Bet Bet is certainly challenging. The hills of the Benmore Range have been extensively cleared and pastures are generally poor quality, based on annual grasses. There is plenty of waterlogging along drainage lines

(at least in August) and all the indicators of dryland salinity. The incised landscape will probably preclude salinity taking over much more of the land, but the real issue is the impact on water quality.

The landholders who hosted our trip, Rob and Lyn Bright, have done a lot of repair work in the short time they have owned the property. Fencing the creek from stock, planting tall wheat grass and stabilising creek banks and beds, and some repasturing – all with the support of the North Central CMA through its incentive scheme and with technical backup from Vic DPI staff at Maryborough.

The CMA also provides incentives for perennial pastures, but here too they face a major challenge typical of many. The

soils we saw were acidic to depth, poorly structured (and judging from the bogged bus, probably sodic) and apparently very low in phosphorus. I found it difficult to think of an available exotic pasture that would perform profitably in this situation. And then, as for so many catchments like this, you need a whole grazing management system for an environment where the economics (including externalities) just don't appear to support intensive activity.

Perhaps a realistic proposition might be a management program that restores the density and vigour of remnant native grasses.

■ **CONTACT:** Jarrod Coote; DPI Victoria, Tel. (03) 5461 0823; E-mail: jarrod.coote@dpi.vic.gov.au

Property boom makes sound urban planning an imperative

By Elizabeth Madden

Fifty participants of the conference toured Bendigo to see and hear how salinity is dealt with in urban landscapes.

“Under threat from salinity is Bendigo’s urban infrastructure such as roads, buildings, playing fields plus the water quality of Bendigo Creek and two artificial lakes,” said Anthony Sheehan from The Greater City of Bendigo.

“Due to salty groundwater draining into the Bendigo Creek, it carries 4500 tonnes of salt per annum from the Bendigo urban area. Since urban salinity was first identified in the mid-1980s, more than thirty saline discharge areas have been mapped across the urban and peri-urban areas of Bendigo.”

Jenny Pendlebury, North Central Salinity Education Officer explained that recent rapid urban expansion and a predicted population growth of 40,000 residents over the next 26 years had placed demands on the city to develop and implement salinity planning guidelines. This is particularly



Photo: E. Madden

Phil Dyson and Jenny Pendlebury warming the crowd to urban salinity.

important where urban development is taking place on ‘high risk’ areas.

“Salinity management is a major planning issue for both our existing and future urban areas with urban salinity management options often being quite different from those recommended for dryland salinity

in rural landscapes due to the differences between agricultural and urban land use,” Ms Pendlebury said.

To demonstrate the issues faced, the group visited a recent subdivision on the urban fringes of Bendigo where some sections of land were salt affected and some areas were at risk of becoming saline. Phil Dyson, a private consultant, then explained the investigations he had undertaken on behalf of the City of Greater Bendigo and the nature of the advice he provided for development of this land.

While the area was designated a salinity discharge site in the City’s Planning Scheme, Mr Dyson advised that no guidelines had been developed by the State Government, and he could not locate any appropriate guidelines elsewhere for developing saline land.

Initially, the developer was unaware the area was at risk. On the advice provided by Mr Dyson, the developer and the Greater City of Bendigo agreed that the lower lying parts of the site should not be built on, but might be developed as parkland with roads being used as buffers.

■ **CONTACT:** Jenny Pendlebury, North Central Salinity Education Officer, Tel. (03) 5430 4444, E-mail: jenny.pendlebury.dpi.vic.gov.au



Photo: M. McCaskill

David Clark (Lexton Landcare Group) joining the dots at Bet Bet Creek.

National award to researcher who dares

By Bruce Munday

Australia's most prestigious award for salinity research, the National Dryland Salinity Program's 5th W.E. Wood Award, was presented to Professor David Pannell (University of WA and CRC Salinity) at a special dinner held in conjunction with the national *Salinity Solutions* Conference in Bendigo.

The annual award commemorates the foresight and achievements of railway engineer Walter Ernest Wood who, in 1924, recognised and reported on the salinity risks associated with land clearing in Western Australia.

Presenting the award, Chair of the Selection Panel, Kevin Goss, drew attention to the great significance of Professor Pannell's work and in particular drew a parallel with Wood's prescience and preparedness to challenge conventional thought.

"David Pannell has been a national research leader, demonstrating that potential solutions to dryland salinity are not yet available for much of our agricultural land," said Mr Goss. "He has shown that what appeal as simple solutions today, applied broadly, will be a waste of resources and lead to dashed expectations. This of course presents a challenge to policy makers who so often work within the confines of short political time frames and are often under pressure to deliver on-ground action.

"David Pannell's work has greatly influenced policy makers who are now heeding his message. We are seeing much greater attention paid to cost-effectiveness and a more realistic appreciation of the importance of socio-economic issues in developing salinity solutions.

"Our understanding of salinity has developed greatly in recent years, but this also serves to remind us that past 'best practice' may no longer be for the best, and could even make things worse," added Mr Goss. Accepting the award, Professor Pannell reflected on the many tensions that affect salinity policy in Australia.

"Among these tensions are crisis-driven politics versus slow and inexorable salinity and simplistic and uniform political solutions versus complex and diverse salinity problems," he said. "These and other tensions will interact with our improving scientific knowledge of salinity and with ongoing social and economic changes in rural Australia to shape future policies."

The W.E. Wood Award was instituted by Australia's National Dryland Salinity Program to recognise the outstanding contribution Australian scientists have made to the fight against salinity.

Professor Pannell leads the 'People, Land and Water' program of the CRC and chairs its Research Evaluation Committee.

■ **CONTACT:** Bruce Munday, Tel. (08) 8538 7075;
E-mail: bruce@clearconnections.com.au



Prof. David Pannell (left) is presented with the award by NDSP Chair and CRC Salinity CEO, Kevin Goss.

Photo: C Twomey

Can science provide the answers that farmers want?

By Chris Twomey

Science has much to offer modern agriculture and increasingly farmers look to scientists for answers. However, can we be sure that the scientists are answering the right questions, or that the answers are acceptable to the farmers?

Speaking at the *Salinity Solutions* conference at Bendigo, CRC Salinity National Communications Manager Dr Bruce Munday outlined steps that researchers should take if their work is to be relevant to farmers.

"Applied research must be part of the real world," said Dr Munday. "The ultimate reward for a scientist is to see his or her research being used, with benefits to farmers, communities and the environment. This affirms the researcher's belief that the project was well conceived, the effort has been worthwhile and it has made a difference. It also encourages the end user to re-invest in further R&D.

"The most obvious way to reach this desirable outcome is to make sure that both farmers and scientists are asking the same questions.

"This in turn means that scientists should engage farmers in their research from the very early planning, through the implementation stage (being ready to adapt to changing circumstances) down to the final delivery of outcomes.

"Consulting with farmers can be a valuable part of the research planning process, not only because innovative farmers often identify research issues overlooked by scientists, but because the collaborative relationship with farmers will be an advantage throughout the whole of the project. No matter how much research we do, most of the relevant knowledge about natural resource management resides with the community.

"Farmers need scientists to continue research to find solutions to dryland salinity. These must be economically, environmentally and socially feasible options in the hands of those who manage the vast majority of Australian landscapes – the farmers. So it is essential that this research is undertaken in partnership with farmers and their advisers, to ensure that the solutions are both practical and affordable."

Dr Munday listed seven criteria that research should meet if it is to connect with farmers:

- Makes intuitive sense
- Is consistent with local experience
- Offers hope – is profitable and technically feasible
- Supports the farmer's vision
- Comes from a credible source
- Is supported by relevant case studies
- Has the enabling technologies.

"We should not lose sight of the fact that farmers are running businesses, so practical solutions will be those that offer farmers an economic reward. But the nature of that reward, be it income generation or asset protection, might vary between the broadacre cropping, irrigation and amenity farming landscapes."

■ **CONTACT:** Bruce Munday, Tel. (08) 8538 7075,
E-mail: bruce@clearconnections.com.au

Creative solutions begin at the farm scale

By Chris Twomey

Economics will drive land use change, but we currently lack perennial species that can be adopted commercially on the scale needed to meet targets recommended by hydrogeologists.

This was the key message delivered by Dr Ted Lefroy (leader of the CRC Salinity's Biodiversity Program) in his keynote address to the *Salinity Solutions* conference.

"We have looked carefully at the potential of currently available perennial plants and farming systems for water management," said Dr Lefroy. "This allowed us to examine the assumptions behind current plant-based salinity solutions research, and helped us identify crucial research gaps."

Dr Lefroy and his colleagues' review of farming system water use are based on national farm surveys revealing levels of adoption. They have reviewed the economic potential for adoption based on whole farm modelling, and then compared these results with required levels of adoption based on catchment hydrogeology.

"The answers are sobering, and clearly spell out the limits of using current commercial perennial species within existing production systems," said Dr Lefroy.

"In the majority of the areas examined, the profitability

of existing options (such as lucerne, perennial grasses, saltland pastures and agroforestry) suggests that adoption will fall well short of the targets recommended by hydrogeologists, with the exception of the higher rainfall coastal margins.

"The CRC accepts that profit is the only real incentive that could lead to the adoption of perennial farming systems at a sufficient scale, without imposing a major economic and social burden on the wider community.

"However, where driven by profit alone, the predicted levels of adoption of current

perennial farming options peaks at 30 per cent in the high rainfall region and 8-15 per cent in the cropping zone. These fall well short of the areas suggested by groundwater modelling."

How should we approach this problem?

Most salinity studies start from the perspective of water use, with paddock-scale data used as an input to catchment scale hydrologic models which then predict how much and where to plant perennials.

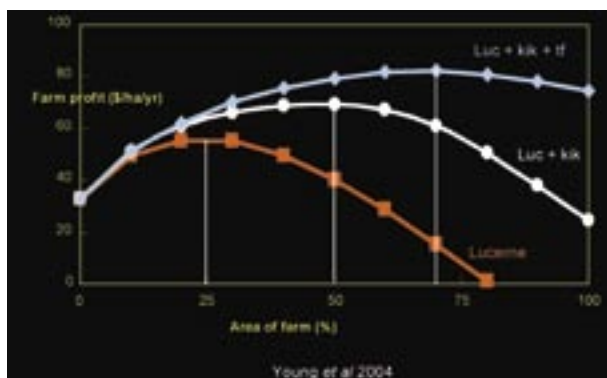
Economics is then usually applied after these hydrologic studies, reinforcing its reputation as a dismal science by leaving it to calculate the (usually) enormous opportunity costs of new land uses. This is what Garry Stoneham has described as "Rolls Royce science and roller-skate economics."

"An alternative approach is to start at farm scale and explore the water use implications of potentially viable options," says Dr Lefroy.

"This is a more promising approach than calculating the opportunity cost of non-commercial options that control leakage."

The point, says Dr Lefroy, is that creative solutions are more likely to be generated at farm scale – which is the scale at which the landscape is managed.

■ **CONTACT:** Dr Ted Lefroy,
Tel. (08) 9333 6442,
E-mail: Ted.Lefroy@csiro.au



Creative Solutions – an example

Lucerne only – optimum area under perennials is 15 to 35 per cent, profit is increased by \$20/ha compared with no perennials. Beyond this level the lower winter growth and the higher cost of establishing the lucerne outweighs the benefit of high quality feed in summer.

Lucerne + kikuyu – optimum area of perennials increases to 30 to 60 per cent of the farm and increases profit a further \$15/ha.

Lucerne + kikuyu + tall fescue – optimum area of perennials increases to between 50 to 90 per cent of the farm and increases profit a further \$13/ha.

Salinity Solutions – now see the movie!

Those at the *Salinity Solutions* conference may have noticed a (handsome) bloke with a video camera recording the proceedings. Those of you who couldn't make it along can rest assured that you haven't totally missed out – a number of the key sessions (including all keynote and invited papers) have been recorded for posterity on digital video tape.

These recordings will be part of the resource materials the CRC is preparing for the undergraduate units and short

courses it is developing in natural resource management. These include courses currently under development in farm forestry, natural resource economics, and systems simulation for which we are compiling course software and resources on DVD.

Because of the level of interest since the conference we are now looking at making some of these presentations available on a conference DVD, subject to the agreement of the individual presenters. We hope to have

it edited to coincide with the publication of the special edition of the *Australian Journal of Experimental Agriculture* (AJEA) containing selected papers from conference proceedings. The DVDs will be available for the cost of production.

Find out more about the AJEA special edition at: <http://www.publish.csiro.au/>

■ **CONTACT:** Chris Twomey,
Tel. (08) 6488 8553

E-mail ctwomey@fnas.uwa.edu.au

Salinity mapping and hazard assessment

By Ken Lawrie and Tim Munday

A key focus in CRC LEME's Salinity Mapping and Hazard Assessment Program in the past year has been the finalisation of externally-funded National Action Plan for Salinity and Water Quality (NAP) projects in South Australia and in the Lower Balonne catchment (Queensland).

These projects differ in approach from previous studies, being set up to evaluate the use of airborne geophysics to address specific land management questions, as part of broader NRM strategies in the regions. The projects involved a staged and targeted approach, working within NRM policy frameworks, in close collaboration with local stakeholders.

In general, previous studies involving airborne geophysics had been effective at knowledge generation, but ineffective in delivering outcomes for salinity management. This is despite the insights into regolith and salinity that they bring, but partly because a better understanding of the sub-surface is only a first step in delivering outcomes, and partly because geophysics is only adding value to some of the required knowledge.

The new projects involved an integrated geoscience approach combining regolith landscape and bedrock geological studies

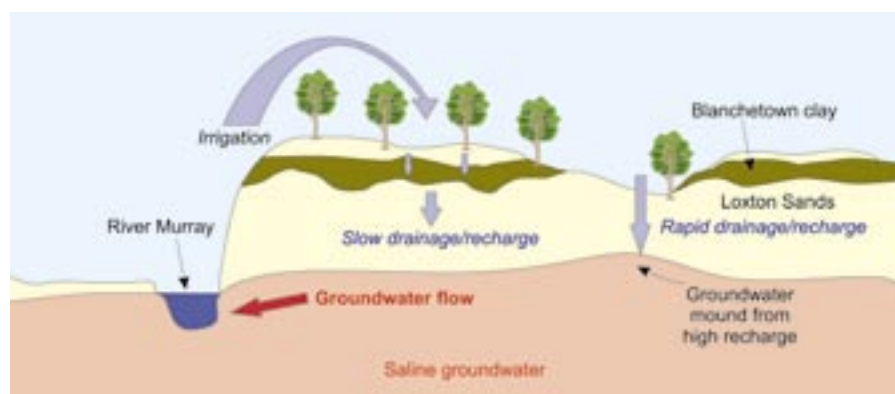


Figure 1. Schematic cross-section of the Blanchetown Clay and Loxton-Parilla Sands aquifer showing slower drainage where the clay is present.

with airborne and/or ground geophysics, hydrogeology and hydrogeochemistry, to underpin outputs largely at sub-catchment scales. Preliminary external assessments of outputs from these projects have been very positive.

South Australian NAP Projects

CRC LEME collaborated with the SA Department for Water, Land and Biodiversity Conservation, CSIRO Land and Water and the Bureau of Rural Sciences in five geographic areas: the Riverland, Tintinara, Bremer Hills, Angas Bremer Plains, and Jamestown

These five projects were not about 'salinity hazard assessment' nor about 'salt mapping', but concerned with better understanding

the nature and distribution of geological and regolith materials influencing water and salinity management. Careful preparation and use of established technologies ensured that the products derived from the geophysical data could be readily used in targeted salinity and water management options.

Each of the SA projects was unique, but the cluster of inter-related projects in the Riverland typified the approach taken. There was a clear appreciation that airborne geophysics by itself was unlikely to define salinity management strategies for the area. Rather, its value lay in better defining the biophysical attributes of the landscape. In this case, it was a map of the Blanchetown Clay, not 'salinity' or 'salt stores', and the objective of the survey was to map the distribution and thickness of these clay materials which were known to significantly inhibit drainage and natural recharge (Figure 1).

The increase in aquifer recharge in the Riverland region as a consequence of land clearing is one of the uncertainties in our ability to predict the rates of increase in River Murray salinity. With our SA partners we used high resolution helicopter EM data to map the spatial distribution and thickness of a near surface conductor associated with the Blanchetown Clay.

Overall, the project provided data at a more useful scale for land use planning in five priority catchments (Figure 2). Products

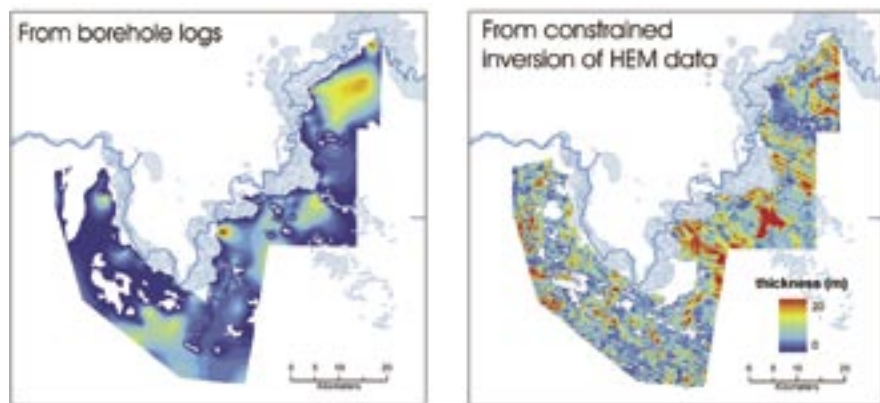


Figure 2. Comparison of clay thickness maps from borehole data and HEM data.

generated from the geophysics are now contributing to new salinity management plans and the planning of economic activities, including the location of future irrigation, and other recharge reduction works. Specifically, the clay thickness maps have contributed to new estimates of aquifer recharge for dryland agriculture for the present - and future years - (2023, 2053 and 2103) for this reach of the river. Salinity credits are being gained on the basis of this work.

The results also provide data for hydrogeological models (MODFLOW and SIMPACT) predicting where to invest in revegetation in the Riverland region, and elsewhere, for the greatest impact on river salinity.

Data from Loxton-Parilla Sand Aquifer have also been used to assist the design and targeting of borefields to intercept saline groundwaters at Loxton and Bookpurnong, reducing the salinity inputs to the River Murray.

Lessons from the South Australian studies concerning the application of geophysics to land management include:

- Airborne geophysics, particularly Airborne Electromagnetics (AEM), is very useful in salinity management given a well defined target and set of applications;
- Design of the survey should also consider other targets that may be useful in a salinity management context, but the expectation of an unplanned beneficial result should not be the principal driver;
- Airborne geophysics, particularly AEM, can map the extent and character of other materials as well as salt;
- The success of the constrained inversion of airborne EM data was assisted by the wealth of existing hydrogeological information – the more data, the more accurate the product;
- Airborne geophysics can still be justified even where a large pool of land-management data exists at an appropriate scale, but only where the derived information can be translated into something of value;
- The value of airborne geophysical (particularly AEM) data increases with

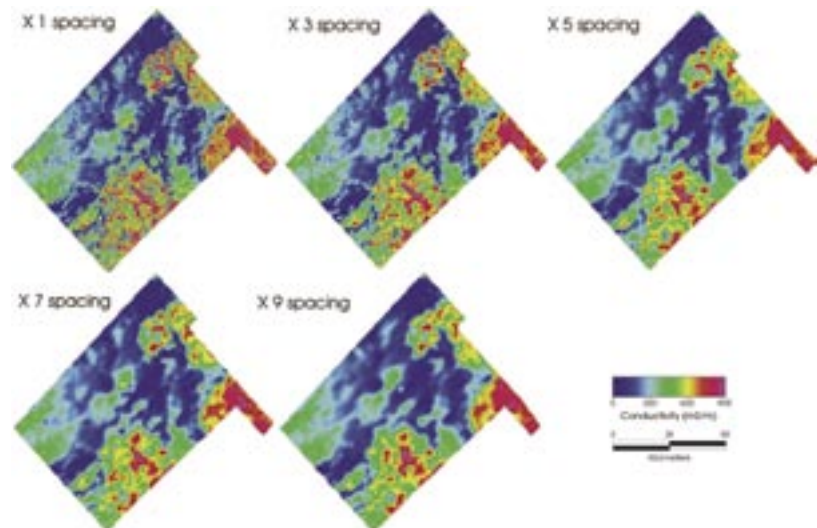


Figure 3. Lower Balonne survey with data from flight line profiles chosen at spacings x3, x5, x7, x9 of the original survey, showing little loss of resolution with increased line spacings.

the value of the asset at risk. Where the predicted economic benefits are marginal, great care must be taken to minimise costs through planning and management considerations, and the use of landscape understanding for innovative survey design;

- Where limited hydrogeological information is available, full value from AEM datasets may require a proportionally greater investment in ground programs;
- The project planning process must ensure that data generated will contribute to implementing salinity management plans (which are invariably economic only when protecting significant assets); and
- Derived products have value only if they contribute to the planning of economic activities, including the location of future irrigation, recharge reduction etc.

Cost-effective Airborne Geophysics

A Geoscience Australia-CRC LEME funded project has assessed the survey designs and costs of acquiring airborne geophysics datasets. This has shown that the cost in acquiring AEM datasets can be reduced by

up to an order of magnitude if the critical landscape elements controlling salinity and groundwater can be identified prior to surveying, thus allowing relatively wide line spacings to be used.

This has been achieved through adopting a knowledge-based approach to resolving the critical landscape and salinity elements. Re-processing existing AEM datasets at wider line spacings for several datasets, including the GILMORE, Lower Balonne and Honeysuckle Creek TEMPEST AEM suggests that one kilometre line spacing is adequate to map most landscape and salinity elements in these depositional landscapes. Even 2 km line spaced data provides catchment and sub-catchment scale salt store data, and this may be sufficient for broad scale planning and national audit purposes (Figure 3).

For 1 km and 2 km line spacing (assuming the same total distance flown), significantly larger areas can be flown for the same cost, reducing the potential costs of AEM surveys to less than \$0.7 and \$0.4 per hectare

• Continued next page >

Making the switch to profitable pasture phases

By Bruce Munday

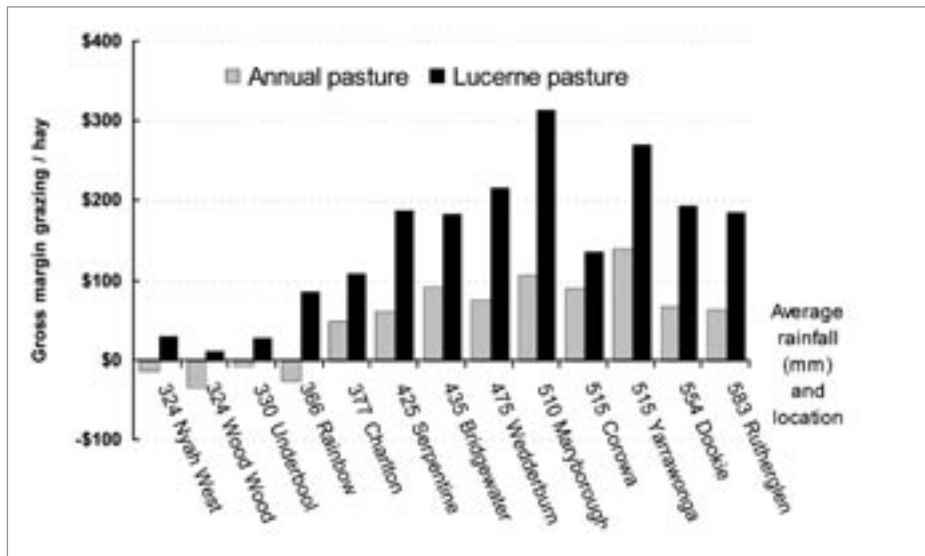
What happens to whole-farm profits when the pasture phase is changed from annual sub-clover or medic pastures to lucerne?

A study of 13 mixed farms, conducted by Department of Primary Industries (DPI) Victoria and jointly funded by Grains Research and Development Corporation, has shown that in every case, profits from the pasture phase increased significantly.

“The key feature of all these case studies was the highly profitable lucerne pasture phase,” said researcher Kieran Ransom. “The follow-on benefits of lucerne to subsequent crops was far less pronounced.”

Pasture phase profitability revolved around some key management changes that included:

- Increased stocking rates;
- Greater emphasis on lamb meat production;
- Merino wethers sold as prime lambs;
- Merino ewes used as prime lamb mothers;



- Lucerne hay available for sale.

The effect of lucerne on the profitability of the crop phase was less significant except at the higher rainfall sites and inconsistent, some farms increasing crop gross margins, others showing a decrease.

Across the case studies the observable characteristics of profitable cropping phases included:

- Crop selection, some farmers reducing the frequency of less profitable crops such as peas, oats or triticale;
- Increased wheat proteins on some farms;
- Less nitrogen fertiliser in some situations; and
- Higher yields after lucerne, although some farmers reported lower or unchanged yields.

The research team is now compiling the detailed findings from these case studies, including the key factors influencing profitability, into a book to be published in autumn 2005.

■ **CONTACT:** Kieran Ransom, Tel. (03) 6263 6510; E-mail: kieran.ransom@dpi.vic.gov.au



Photo: K. Ransom

Barley inter-cropped into immature young lucerne.

Salinity mapping and hazard assessment

- From page 15

respectively. This represents very substantial potential cost savings, and could make time domain AEM data affordable for many more NRM applications. However the above per-hectare costs assume that line km costs do

not exceed \$85 per km, and all other survey mobilisation and operational costs remain similar to previous surveys. However it is likely that survey costs would significantly increase if wider line spacings were to be

flown over the same initial area without taking advantage of the greater area that could be flown.

■ **CONTACT:** Dr Ken Lawrie, Tel. (02) 6249 9847; E-mail: Ken.Lawrie@ga.gov.au

State roundup

New South Wales

Elizabeth Madden, Communication
Coordinator (NSW)

SGSL Workshops

The Land, Water & Wool Sustainable Grazing on Saline Lands (SGSL) Producer Network is holding a series of workshops to evaluate project progress and provide networking opportunities for participating farmers and government staff. The first workshop was held at Cranbury Hall in the Central West of the State with three more scheduled for Wagga Wagga, Inverell and Wellington.

■ **CONTACT:** Luke Beange, Tel. (02) 6881 1294;
E-mail: luke.beange@agric.nsw.gov.au

Salt Action teams salt training continues

The Salt Action Teams formed as part of the NSW Salinity Strategy continue implementing Key Tool No. 5: Strengthening government front-line staff and private agricultural advisors' ability to provide consistent salinity advice to land managers.

Eight workshops have been held across the State since July 2004 for private agronomists, Landmark agronomists and CMA community service officers. Another eight workshops will be completed by December 2004 in Wagga Wagga, Griffith, Tamworth, Moree, Yass, Cowra and Albury.

■ **CONTACT:** Deb Slinger, Tel. (02) 6938 1901;
E-mail: deb.slinger@agric.nsw.gov.au

New perennial pasture booklet

The recently released NSW Department of Primary Industries booklet *Perennial pastures, their place in the rotation* is now available. This 24-page publication is farmer-focused and explains how to incorporate perennial pastures into a cropping rotation in southern NSW for improved profit and environmental outcomes.

■ **CONTACT:** Elizabeth Madden,
Tel. (02) 6938 1985; E-mail: elizabeth.madden@agric.nsw.gov.au

Kyeamba Action Plan in place

The Kyeamba Valley Targeted Salinity and Water Quality Control Program is

one of the first interim NAP projects to be commissioned by the Murrumbidgee Catchment Management Authority. The defining feature of this program is the targeting process used to maximise effectiveness of funded works and achieve the aims of reducing salt and sediment loads to the Murrumbidgee River. Targeted lands include hills on metamorphosed sediments, salt-affected land and actively eroding creeks and gullies. Land managers on targeted country may access the project's funds of \$511,900 for prescribed works. The project runs until December 2005.

■ **CONTACT:** Paul Hutchings,
Tel. (02) 6923 0400;
E-mail: paul.hutchings@dipnr.nsw.gov.au

Victoria

Jo Curkpatrick, Communication
Coordinator (Victoria)

Building the dialogue with Catchment Management Authorities

CEO of the CRC Salinity Kevin Goss, Node Manager Garry McDonald, Program 4 Leader Anna Ridley and Communication Coordinator Jo Curkpatrick recently hit the road, visiting several of Victoria's Catchment Management Authorities (CMAs).

The aim was to strengthen relationships by identifying mutual interests and objectives and seeking input and ideas. The links made will develop into improved knowledge exchange and potential research opportunities and partnerships with CMAs. Other issues discussed included knowledge management and brokerage strategies, and third party training needs.

On this trip, the group met with the Corangamite, Glenelg-Hopkins, Wimmera, North Central and Goulburn-Broken CMAs. They also met with senior officers from the Departments of Sustainability and Environment and Primary Industries.

According to Node Manager Garry McDonald, the visits were a valuable exercise for the CRC. "The CMAs we visited now better understand our role, scope and R,D&E activities in Victoria, and the range of talent in our CRC," he said. "In return we have a clearer picture of their needs

and research and knowledge requirements, and we have started a strong dialogue with them."

The CRC's new brochure on partnering with catchment organisations was also well received by the CMAs.

Site map

The Victorian Node of the CRC Salinity has put together a map of CRC research sites in the State. With the help of Primary Industries Research Victoria, and in particular Wayne Harvey from Spatial Sciences Bendigo, the spread of the CRC's research can now be seen, with brief descriptions of each project on the reverse side.

NSW and Victorian scientists to get together

The spirit of collaboration is alive and well in the CRC Salinity with a visit by scientists from southern NSW to the Rutherglen region now in planning. Scientists will discuss their common research interests within a similar agro-ecological region and take a close look at some of the CRC's research in Victoria. Feedback indicates a high level of interest in modelling tools for salinity management developed jointly by CRC Salinity, DPI Victoria and CRC Catchment Hydrology.

■ **CONTACT:** Jo Curkpatrick,
Tel. (03) 9328 5301; E-mail: jo@spancom.com.au

Western Australia

Chris Twomey, Communication
Coordinator (WA)

Saltlanders talking \$\$

The Sustainable Grazing on Saline Land (SGSL) Producer Network in WA along with the Saltland Pastures Association (SPA) conducted three regional forums bringing together leading saltland farmers, researchers from the CRC and other members of the Producer Network.

The forums, titled *It's time for profit from saltland*, showcased some of the important R&D results emerging from the CRC that are immediately relevant to farmers, took in

• Continued next page >

field tours so everyone could kick the salt, and of course provided a great opportunity for networking. A real feature of each forum was the keynote presentation by SPA's founding member and saltland pastures legend, Clive Malcolm. Clive not only reflected on his 50 years of experience but also provided many insights for future work.

■ **CONTACT:** Justin Hardy, Tel. 08 9892 8408; E-mail: JHardy@agric.wa.gov.au

What makes our systems tick?

The November meeting of WA Node of the CRC will cast the spotlight on one of the pillars of its approach to salinity management. Program 2, *Function of Natural Ecosystems*, provides the theoretical and philosophical framework for the CRC – that new land systems should be informed by the processes of natural ecosystems. This Program studies the native vegetation of southern Australia – its biodiversity, the form and function of its components and its pattern of water and nutrient uptake.

■ **CONTACT:** Chris Twomey, Tel. (08) 6488 8553; E-mail: ctwomey@fnas.uwa.edu.au

South Australia

Bruce Munday, *Communication Coordinator (SA)*

Plants that like salt

The SA Dryland Salinity Committee along with the Department of Water, Land and Biodiversity Conservation and the CRC for Plant-based Management of Dryland Salinity sponsored a seminar on salt tolerant plants – new and familiar.

Dr Ken Marcum, Arizona State University described work in the USA on '*Salinity tolerance mechanisms of native North American desert grasses, and the domestication of distichlis for turf*'.

A feature of Dr Marcum's presentation, perhaps surprising to Australian audiences, was the recognition that salt-tolerant turfs are now high value products in the US.

John Leak, Managing Director, NyPa Australia Ltd, provided an update on the development of NyPa Forage™, including recent trial results on its productivity and nutritive value.

Michael Lloyd, saltland farmer and McKell Medal winner, discussed where saltland management fits in to more general natural

resource management, and how saltland management can be sustainable and profitable - something that a lot of people won't or don't believe.

■ **CONTACT:** Bruce Munday, Tel. (08) 8538 7075; E-mail: bruce@clearconnections.com.au

Are we making progress?

Rural Solutions SA has recently completed a case study review, for the South Australian Dryland Salinity Committee, to determine the efficiency and effectiveness of broad scale agricultural land use and land management change in managing dryland salinity.

The Coorong District Local Action Plan (LAP) was chosen as an appropriate case study, partly because this group has been very successful in implementing land management change.

This review provides useful insight for future monitoring and evaluation initiatives at the state, regional and local levels.

■ **CONTACT:** Glenn Gale, Tel. (08) 8303 9345; E-mail: gale.glenn@saugov.sa.gov.au

Alison Southwell picks up A.W. Howard fellowship

Congratulations to CRC post-graduate student Alison Southwell (pictured), awarded a research fellowship from the A.W. Howard Memorial Trust Inc.

Alison, a student at Charles Sturt University, is investigating the influence of native perennial pastures on water use, in particular the effect of pasture composition and density of perennial species on soil moisture balance of temperate pastures of the high rainfall zone.

Much of the grazing land in south-east Australia is degraded and pasture composition and density are measures of this degradation. Alison's project will help determine the extent to which various native pastures can modify recharge, and eventually dryland salinity.

Alison comes from a farm in the Yass region of southern NSW, and a feature of



her work is its involvement of the local community where strong connections and a good general knowledge of the area are well established.

The A.W. Howard Memorial Trust Inc. was established by the Australian Institute of Agricultural Science and Technology in

1964 to commemorate the unique contribution by the late Amos Howard, a South Australian farmer, in the use of subterranean clover as a pasture plant in Australia. The aims of the trust are to encourage and promote research and investigation in the fields of natural science and social science, including economics, which relates to the development, management and use of pastures. The Research Fellowship provides Alison with an annual \$5000 'top up', tenable for up to three years.

In addition, Alison has won an A.W. Howard travel grant to the International Grasslands Congress in Ireland in June 2005. She is the second CRC Salinity student to win this award, following Lindsay Bell in 2003.

■ **CONTACT:** Oksana Dniprowyi, Secretary, A.W. Howard Memorial Trust Inc, Tel. (08) 8303 9433

The answer might have been here all the time

By Bruce Munday

Native grasses, so often un-noticed or unrecognised, might be hold the key to recharge management over much of southern Australia. Grasslands and grassy woodlands, particularly on non-arable slopes, have often been 'cleared' almost by accident. Under-managed grazing, along with weed invasion have resulted in many of the native perennial grasses being displaced by exotic annuals. As this has happened over vast areas of southern Australia, the impact on groundwater recharge might be quite significant.

The CRC Salinity's New Farming Systems Program is addressing this issue as it develops and tests currently available land management options that minimise recharge and maximise the use of stored soil and groundwater. This program is establishing paddock scale examples of integrated production systems that demonstrate the capacity to manage watertables, and applying economic analyses of commercial scale production.

One of the projects, led by Dr Jim Virgona of Charles Sturt University, focuses on low-cost, practical management strategies for non-arable country that still contains a low



Wayne Dempsey and Alandi Durling measuring native pasture growth at Tarrawingee in north-east Victoria.

proportion of native grass species. These management strategies aim to increase the proportion of summer-active perennial native grasses and hence increase water use over a wide area of the landscape.

"After classifying sites according to their potential for native grass regeneration, we are now trialling low-cost management strategies to encourage these native perennial pastures at the expense of annuals," says Dr Virgona. "Different grazing strategies will be explored at trial sites, along with weed control with and without herbicides. At the same time, climatic factors and changes in soil water content will be measured to determine the

recharge at each site.

"For much of the permanently grazed part of the higher rainfall zone, native grasses are the only widely adapted perennials that can be utilised to increase water use in the system", said Dr Virgona. "Farmers we interviewed have confirmed that economic and physical factors make it unrealistic to sow exotic species. This, combined with the lack of availability of native grass seed, means that in order to increase perenniality in these pastures, the only option for graziers is a management strategy that encourages the existing natives to flourish."

The potential benefits from implementing these strategies are underpinned by the huge area - millions of hectares - of land in southern Australia characterised by these conditions.

These benefits will include:

- Increased water use and decreased recharge
- Maintenance of cover over summer/autumn and reduced erosion
- Greater stability of pasture production over the year.

■ **CONTACT:** Dr Jim Virgona, Tel. (02) 6933 4174; E-mail jvirgona@csu.edu.au

CRC Salinity online

The CRC for Plant-based Management of Dryland Salinity launched the second stage of its website in August 2004. A wealth of new information has now been uploaded onto this important resource, particularly in the 'Research' and 'Education' sections, along with useful resources for CRC 'insiders' in the Administration section.

The main focus of stage two has been to create an online 'knowledge management system' that allows researchers and communicators within the CRC to upload,



The Salinity CRC website - a wealth of new information online.

modify and update content remotely.

This online system for managing projects and information is also extremely useful to other CRCs. The MyCRC system has now been commercialised with three other CRCs buying in. This consortium is pooling its wisdom and experiences, and sharing the ongoing development costs of the system as new functionality is added.

■ **CONTACT:** Chris Twomey, WA Communication Coordinator, Tel. (08) 6488 8553, E-mail: ctwomey@fnas.uwa.edu.au



About Focus on Salt

Focus on Salt is published by the CRC for Plant-based Management of Dryland Salinity (CRC Salinity) in collaboration with the CRC for Landscape Environments and Minerals Exploration (CRC LEME).

CRC Salinity core partners are Charles Sturt University (CSU); Commonwealth Scientific & Industrial Research Organisation (CSIRO); Department of Agriculture WA (DAWA); Department of Conservation and Land Management WA (CALM); Departments of Primary Industries (DPI) and Sustainable Ecosystems (DSE), Victoria; NSW Department of Primary Industries (DPI); Departments of Primary Industry and Resources (PIRSA) and Water, Land and Biodiversity Conservation (DWLBC), SA; The University of Western Australia (UWA); University of Adelaide (UA).

CRC Salinity's supporting partners are Australian Conservation Foundation (ACF), Australian Wool Innovation Limited (AWI), Office of Science and Innovation, WA (OSI), Grains Research & Development Corporation (GRDC), Land & Water Australia (LWA), Meat & Livestock Australia (MLA), Murray-Darling Basin Commission (MDBIC), National Farmers' Federation (NFF), Rural Industries Research and Development Corporation (RIRDC), Landmark AWB (formerly Wesfarmers Landmark).

Important information

The information contained in this newsletter has been published in good faith by CRC Salinity and CRC LEME to assist public knowledge and discussion and to help improve sustainable management of land, water and vegetation.

Neither CRC Salinity, the CRC LEME nor the other partners in the CRC, endorse or recommend any products identified by tradename, nor is any warranty implied by CRC Salinity and its partners about information presented in *Focus on Salt*.

Readers should contact the authors or contacts provided and conduct their own enquires before making use of the information in *Focus on Salt*.

■ For further information, contact the CRC Salinity on Tel. (08) 6488 8559 or
E-mail: salinity@fnas.uwa.edu.au or visit our website www.crcsalinity.com

CRC Salinity Programs

- | | |
|---|---|
| 1. Education & Communication
(Dr Ian Nuberg, University of Adelaide) | 5. Economic & Social Assessment
(Prof David Pannell, University of Western Australia) |
| 2. Function of Natural Ecosystems
(Assoc. Prof. David Chittleborough, University of Adelaide) | 6. Grazing Systems
(Dr David Masters, CSIRO) |
| 3. New & Improved Plant Species
(Assoc. Prof. Mike Ewing, Department of Agriculture, Western Australia) | 7. Biodiversity
(Dr Ted Lefroy, CSIRO) |
| 4. New Farming Systems
(Dr Anna Ridley, Department of Primary Industries, Victoria) | |



CRC FOR
PLANT ~ BASED
MANAGEMENT
OF DRYLAND
SALINITY



CRC Salinity Contacts:

CHIEF EXECUTIVE OFFICER

Kevin Goss
T: (08) 6488 2555
E: kgoss@fnas.uwa.edu.au

DEPUTY CEO & WA NODE MANAGER

A. Prof. Mike Ewing
T: (08) 6488 1876
E: mewing@cyllene.uwa.edu.au

SA NODE MANAGER

Glenn Gale
T: (08) 8303 9345
E: gale.glenn@saugov.sa.gov.au

VICTORIAN NODE MANAGER

Dr Garry McDonald
T: (02) 6030 4502
E: garry.mcdonald@dpi.vic.gov.au

NSW NODE MANAGER

Peter J. Regan
T: (02) 6391 3185
E: peter.j.regan@agric.nsw.gov.au

BUSINESS MANAGER

Mark Stickells
T: (08) 6488 1429
E: mstickel@fnas.uwa.edu.au

COMMUNICATIONS MANAGER & SA COMMUNICATIONS

Dr Bruce Munday
T: (08) 8538 7075
E: bruce@clearconnections.com.au

WA COMMUNICATIONS

Chris Twomey
T: (08) 6488 8553
E: ctwomey@fnas.uwa.edu.au

VICTORIAN COMMUNICATIONS

Jo Curkpatrick
T: (03) 9328 5301
E: jo@spancom.com.au

NSW COMMUNICATIONS

Elizabeth Madden
T: (02) 6938 1985
E: elizabeth.madden@agric.nsw.gov.au

EDUCATION OFFICER

Daryll Richardson
T: (07) 5446 6094
E: drichardson@csu.edu.au

HEAD OFFICE

T: (08) 6488 8559
E: salinity@fnas.uwa.edu.au