

# focus

ON PERENNIALS

## in this issue



4

Climate change could reduce the risk of salinity



10

Workshops lead to greater confidence in technologies



12

Native shrubs provide natural alternatives



FUTURE FARM INDUSTRIES CRC

# Kikuyu – the easy choice

A perennial pasture that is proving a winner for set stocking systems

# Research and ideas shared at salinity forum



By Jill Griffiths  
Kondinin Group

**H**eld during late March and early April in Adelaide, South Australia, the 2nd International Salinity Forum provided researchers from the Future Farm Industries CRC (FFI CRC) and former CRC Salinity researchers with an ideal opportunity to share their research with a highly receptive audience. FFI CRC had a visible presence with a perennially-green booth in the Forum's Expo area.

The CRC was well represented with many researchers and postgraduate students attending, giving papers, or presenting posters at the Forum. The quality of their work was reflected by the number of prizes awarded to FFI CRC staff and students:

- Best Poster Award – Ed Barrett-Lennard (pictured top right), Tim Colmer and Sarita Bennett
- Best Student Poster – Bree Wilson
- Best Student Presentations – Nikki Mouat and Richard Bennett.

The Forum also featured the official launch of the FFI CRC's *Saltland Prospects* publication and a speech from the 2008 Farrer Memorial Medal winner, and former CRC Salinity CEO, Emeritus Professor Philip Cocks, on the failure of democratic institutions to deal with climate change.

Seven concurrent sessions were held throughout the Forum, giving delegates a

wide selection of presentations from which to choose.

International scientists were well represented at the Forum, especially those from the USA. FFI CRC Research Director Dr Mike Ewing, said it was apparent that international researchers were more strongly focused on irrigation salinity issues.

"Australia is different, in that dryland salinity represents a bigger part of our interest," Dr Ewing said.

"There are very large areas of salinity in Asia, particularly India, Pakistan and China, associated with the major river irrigation systems that attract a lot of attention."

Dr Ewing said the 2nd International Salinity Forum was a special event that encouraged a cross-disciplinary approach to problem solving. It brought together a substantial body of new information and it was evident from the presentations that saltland is being better utilised. Rather than being seen as useless, saltland is now viewed more as something that can be productively managed as part of an agricultural system.

"The difficulties in applying preventative strategies through recharge control was a particular feature and there was a telling paper by Richard George," Dr Ewing said. "The paper basically concluded that the circumstances in which tree planting would be an effective strategy for salinity prevention were rare.

"We need to move away from the idea that we can justify these interventions in terms of salinity management alone – for long-term forestry to be an option it has to be profitable as well. In moving from CRC Salinity to FFI CRC we have taken on board these balances in a much more integrated way.

"Speaking at the Forum, CSIRO's Tom Hatton made the point that salinity as a single driver of natural resource management, and as an icon of environmental issues, no longer has the 'pulling power' it previously had. It's about getting things into context – this can be a challenging view for some, others have seen it this way for some time."

Dr Ewing went on to say that in Australia we have moved away from rhetoric which implied the need for panicked actions towards delivering strategies that provide the greatest returns on any public or private investment. We now have concrete details about how salinity can be managed across a wide range of sub-environments in Australia, as well as greater details about what realistic prevention options are available.

A selection of papers from the ISF are available on-line at [www.futurefarmcrc.com.au/events](http://www.futurefarmcrc.com.au/events) ↘

## More information

Greg Lawrence  
Communication Manager, FFI CRC  
T: (08) 6488 7353  
E: [greg.lawrence@futurefarmcrc.com.au](mailto:greg.lawrence@futurefarmcrc.com.au)

# Myth busting – critical for smart investment



**F**FI CRC Research Director Dr Mike Ewing (pictured right) has called for researchers to either uphold or ‘bust’ current salinity management myths by focusing on where the greatest economic benefits can be made.

Speaking at the 2nd International Salinity Forum, Dr Ewing said that when focusing attention in the landscape it was important not to tackle the worst areas first; economic benefits were generally best maximised by intervening on less salinity-impacted areas.

“We should not confuse economic and aesthetic benefits,” Dr Ewing said.

Dr Ewing said it was a myth to think plants on saline land always had low inherent productivity and that scarce resources should be directed towards improving productivity and income on non-saline land. Rather, some saline land justified investment in production and research.

## Looking beyond halophytes

Another perpetuated myth is that saline agriculture depends entirely on the discovery of new halophytes (extremely salt-tolerant species). Although new salt-tolerant plants

By Jill Griffiths  
Kondinin Group

are needed, selection and development of some existing crop species for improved salinity tolerance presents a clear alternative to domestication of halophytes.

There is also a need to look beyond salt-tolerant shrubs, as they did not necessarily offer the best prospects for forage innovation and livestock production.

“Legumes represent a priority opportunity for saline pasture innovation based on their high grazing value for livestock, enhancement of companion species, cost savings in fertiliser nitrogen, and under-exploited genetic variation,” Dr Ewing said.

## Molecular technologies take time

Researchers and farmers alike have high expectations around the ability of molecular technologies in delivering us quick and easy solutions needed for change. The difficulties involved in using molecular technologies to produce plants with useful field salt tolerance restricts their potential to become short- and medium-term solution providers.

“While substantial resources are currently being directed towards understanding salt tolerance at gene level, with some success, it is not a given that associated genetic engineering will lead to substantial or rapid improvements in performance of major field crops when grown in saline environments,” Dr Ewing said.

“Research has shown tolerance to salinity is physiologically and genetically complex, so comprehensive tolerance is unlikely to be delivered by a single gene. In this setting, genetic engineering is challenging.

“The observed complexity of salinity tolerance reduces the likelihood that this knowledge will rapidly translate into useful transgenic cultivars.” ↓

## More information

FFI CRC Research Director, Dr Mike Ewing

T: (08) 6488 1876

M: 0409 116 750

E: [mike.ewing@futurefarmcrc.com.au](mailto:mike.ewing@futurefarmcrc.com.au)

## Do trees really work to tackle salinity?

**P**lanting trees on cleared agricultural land to lower water tables and reduce salinity has been promoted since the mid-1980s.

However, research by hydrologists from the Department of Agriculture and Food, Western Australia (DAFWA) shows that in some systems this may not hold true.

Research published by DAFWA hydrologists during 1999 concluded that trees were best planted in recharge areas, as discharge plantings rarely reclaimed saline areas and water table responses were generally confined to beneath the tree plantings. Extensive planting (up to 80 per cent of the landscape) was needed to significantly reduce the area of salinity.

Recent work supports this earlier research, such as the recent study presented at the 2nd International Salinity Forum by DAFWA hydrologists Don Bennett and Dr Richard

George. For the study, trials were established on 15 farms in south-western Australia between 1990 and 1996. The trials featured a variety of tree-planting configurations, mostly within upland catchments with the planted areas covering over 98% to less than 5% of the landscape.

The effect of the vegetation on the water table was calculated from regular measurements made from 226 piezometers and observation bore holes.

Research results concluded that the proportion of vegetation was the most significant factor influencing the water table – the larger the area planted, regardless of configuration, the greater the reduction in water table.

Areas of less than 50% of plantings were unlikely to measurably reduce salinity at the farm scale. Some catchment-scale salinity benefits may occur when moderate

revegetation is undertaken, but these benefits may be countered by reduced freshwater run-off.

The research also found that the level of revegetation required to provide significant salinity benefits at a farm-scale was unlikely to be attractive to ‘mainstream farmers’, unless there was income derived from the revegetation.

Even so, Dr George said it was still important to plant trees.

“There is still a valid set of reasons to plant trees, but the original goals of salinity management have not been realised. Our expectations in that regard were probably too high.” ↓

## More information

Don Bennett, DAFWA

T: (08) 9780 6298

E: [dbennett@agric.wa.gov.au](mailto:dbennett@agric.wa.gov.au)



# Climate change reduces salinity risk

By Jill Griffiths  
Kondinin Group

Salinity continues to expand in Western Australian agricultural areas, but not at the rate previously predicted. Recent analysis of groundwater trends has shown that very dry conditions since 1975 are moderating the spread of salinity.

FFI CRC researcher, Dr Richard George (DAFWA), presented revised salinity figures at the 2nd International Salinity Forum held during April 2008. The figures were drawn from an analysis of more than 1300 surveillance bores in about 100 catchments across 19 million hectares in the Western Australian agricultural region.

Dr George said that in the northern agricultural region of WA, water levels in most monitoring bores are now falling, reversing a trend established to 2000.

"We are seeing the cumulative impact of a short, intense dry period when rainfall fell by more than 40 per cent below the pre-2000 level," Dr George said (see Figures 1 and 2).

Falls in groundwater levels (or reduced rates of rise) signal reduced risk of salinity, not a reduction in salinity as such.

## key points

- The drying climate is moderating the spread of salinity in some agricultural regions
- Planting perennials is still crucial for a range of management outcomes
- Monitoring is critical to enable future trends to be detected and allow appropriate focus of investment.

"In contrast to the northern agricultural area, in terms of salinity extent and risk, it's basically business as usual for the rest of WA's wheatbelt," Dr George said.

"In much of the central region, the south-west and western south coast, especially areas cleared during the past 50 years, water tables are either rising or stable, despite lower than average rainfall since 2000.

"In the eastern wheatbelt, some valleys show downward trends, especially where water tables are close to the surface. The magnitude of the trends vary, but usually the water table has only reduced by less than a metre."

It takes significant time for the effects of clearing to show up as salinity – in high rainfall areas this can be in the vicinity of 20-50 years; in low rainfall areas it can be centuries. The groundwater system needs time to reach an equilibrium before it stabilises.

In catchments that are still actively filling with groundwater and not yet near equilibrium, reduced rainfall appeared to have little or no impact on rising trends.

"As these catchments approach equilibrium and discharge (saline) areas grow, we expect climate impacts to become the dominant controller of trends."

### Rethinking the approach

This recently reported change in groundwater trends may have significant implications in assessing the likely future extent of salinity, and effects of management activities.

"Observed reductions in water tables under trees, drains or similar plantings of perennials must be corrected for climate.

Failure to do this may exaggerate the expected benefits of management on the salinity problem," Dr George said.

Far from signalling that trees and other perennials should not be planted, Dr George said the new figures could help refine where they should be planted.

"During the past, the paradigm has been that recharge management was good and more recharge control was better. However, our results suggest that in some areas we don't need them for that purpose now – climate change is doing the job for us.

"In the rest of the wheatbelt and on the south coast – especially broad valleys where the water table is less than five metres and rising – the focus on recharge management is still appropriate.

"In other words, instead of all options everywhere, it's now regionally specific."

### Role of perennials

While the need to develop recharge systems may have diminished in dry areas, the need for perennials remains, but for other reasons. For example, in drought-affected areas there is a heightened priority to prevent erosion.

In others, large areas of perennials may dry out surface and groundwater resources.

"As the land becomes drier, water deficiency becomes more of an issue and being aware of the effects of perennials on water resources grows in importance.

"These results also suggest that we now need to re-assess the many natural and man-made assets that have previously been thought to be at risk," Dr George said.

"For example, specified biodiversity assets in some wheatbelt valleys may now no longer be at risk, or the risk may have been postponed."

### Looking further afield

Dr George said the situation is similar right across Australia, although the drying started earlier in the east. Southern New South Wales, Victoria and parts of South Australia are analogous to the northern Western Australian agricultural region.

Since 1996, or earlier, the number of bores in those areas with rising trends has diminished, to the point where few remain with rising trends. By contrast, much of southern WA still has rising trends depending on where you are in the landscape.

A new drilling program is underway in WA to fill in the gaps, especially in areas at risk, where there is no data, or where reduced recharge may lead to water shortages.

"We now have 1-2 Mha salt affected, depending on how you do the figures," Dr George said.

He points out it is the area at risk that has diminished, or in other words, the time to realise that risk has lengthened. If the climatic trend observed since 2000 continues, the data suggests that, in the north eastern agricultural areas, the risk of salinity may further diminish, or no longer exist.

Future climates may have other impacts on salinity. For example, salinisation could also be significantly affected by an increase in flood frequency, which is a possible scenario under climate change.

Dr George said despite lower than average rainfall over much of the Western Australian wheatbelt since 2000, episodic floods in 1999-2000, 2001 and 2006 caused a rapid expansion of salinity.

### Monitoring is the key

The research results have highlighted the importance of monitoring.

"It's cheaper and easier to monitor and to be discerning of investments," Dr George said. "These figures capitalise on more than 10 years of consistent monitoring – it gives us the ability to notice changes.

"Given the trends, some areas' and regions' risks, and hence investment priorities, have changed, and may change again. We need to know when. It's cheaper to monitor than to invest in actions that aren't effective. For farmers, early warning enables them time to act." 🌱

### More information

Dr Richard George, DAFWA

T: (08) 9780 6296

M: 0404 819 532

E: [rgeorge@agric.wa.gov.au](mailto:rgeorge@agric.wa.gov.au)

FIGURE 1. Change in annual rainfall (%) from pre-1976 to 1976-1999

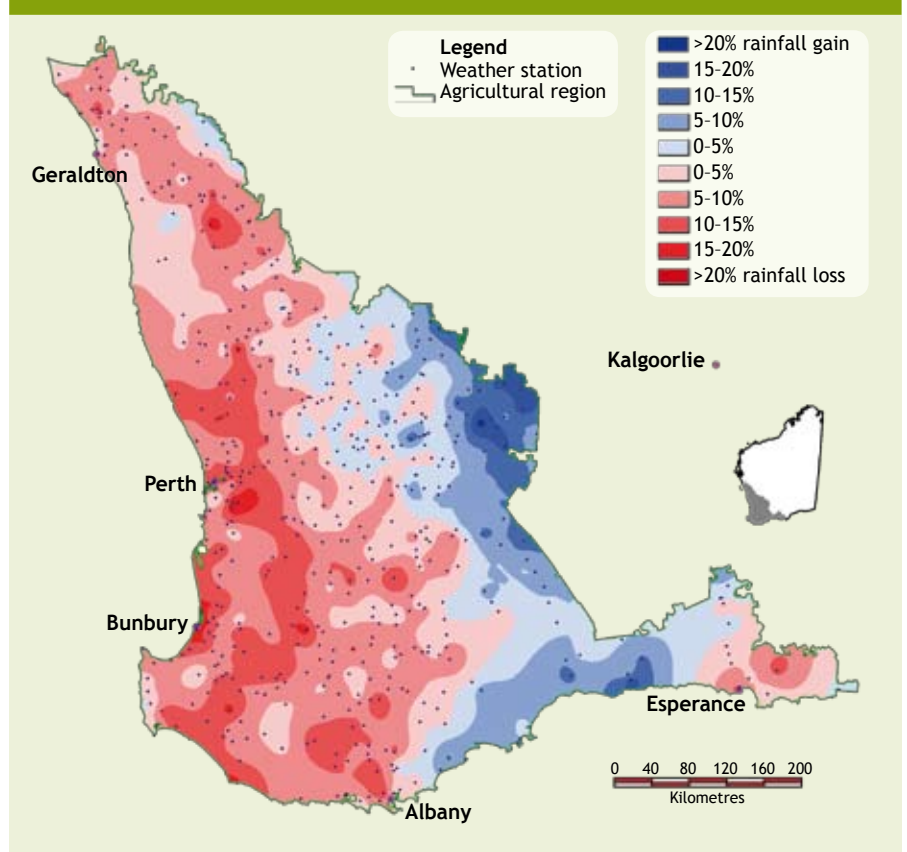
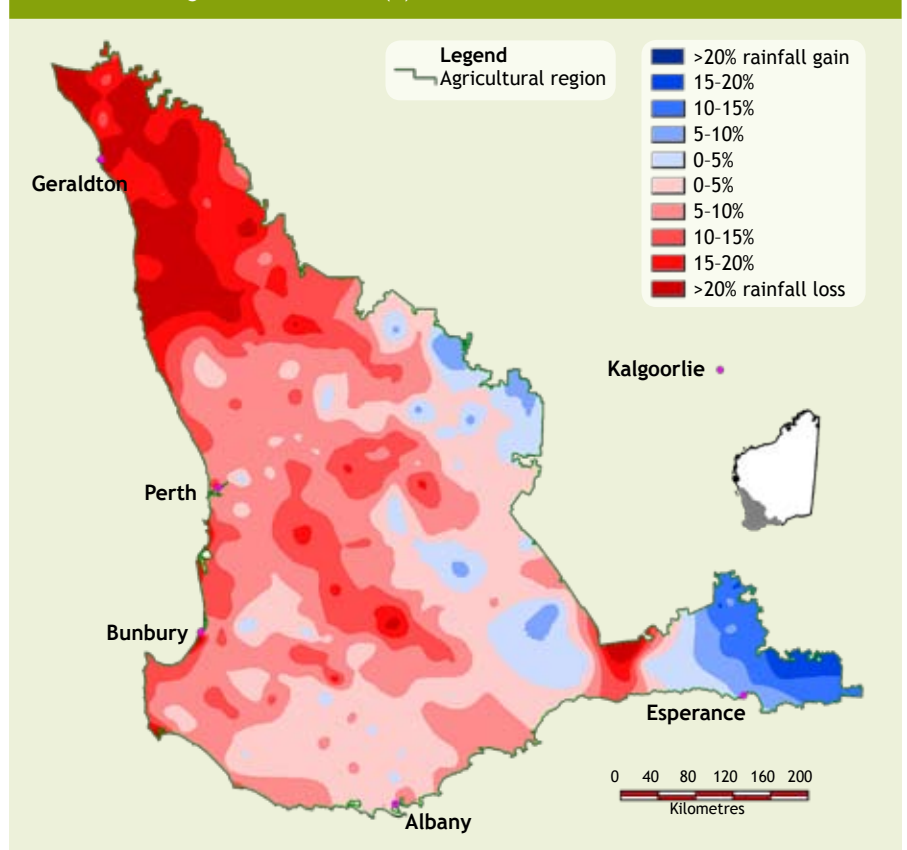


FIGURE 2. Change in annual rainfall (%) from 1976-1999 to 2000-2007



# Kikuyu makes on-farm adoption easy



LEFT: Morgan Sounness (kneeling) and Paul Sanford (standing) examine the extensive root profile of kikuyu. INSET: Kikuyu (Photos: Tim Prane).

FAR RIGHT: Sub-clover is a suitable companion for kikuyu. (Photo: Paula Jakobsson)

practices and in fact buy more stock and graze harder,” Paul said. “And they like that approach.”

Paul believes the other two critical adoption factors have been that kikuyu fills the autumn feed gap typical of the region and it protects soils from erosion.

“The soils in this region are fragile and prone to erosion during autumn, before the break of season,” Paul said. “Particularly the sandy surface soils.”

Kikuyu’s ability to protect the soil is to a large extent down to its morphology – kikuyu rhizomes (runners) encourage a growth habit that is prostrate and covers the soil like a mat or carpet.

“In addition to its grazing potential, this superior erosion protection has been a big carrot for our local producers,” Paul said.

## High water use potential

According to Paul, measurements have shown that kikuyu has a deep root system that in some soil profiles can go as far as 3 metres.

“Soil moisture readings have proven kikuyu is a high water user that can substantially reduce groundwater recharge and the impact of salinity,” Paul said.

## Kikuyu fills the gap

Paul describes the south coast of WA as a region characterised by mild summer temperatures and out-of-season rainfall.

“Trials have shown that in areas receiving more than 400 mm kikuyu can provide out-of-season green feed, consistently resulting in increased stocking rates and reduced supplementary feed,” Paul said.

Kikuyu has been particularly impressive at filling the autumn feed gap when moisture availability is low and most temperate perennials have ceased to provide feed.

In the research conducted to date, kikuyu has resulted in increased stocking rates compared with annual pastures of between 40 to 100 per cent depending on rainfall (see Table 1).

“That these increases have been achieved under continuous grazing systems highlights

By **Catriona Nicholls**  
Kondinin Group

Researchers on the south coast of Western Australia have been keeping a close eye on kikuyu and are impressed with what it offers local livestock producers – and so are the livestock producers themselves.

## key points

- Kikuyu offers livestock producers a perennial pasture option that doesn’t require a change in grazing management
- The morphology of kikuyu allows it to offer superior protection to soils prone to erosion
- The combination of kikuyu with sub-clover yields a pasture that delivers year-round growth and grazing potential.

Paul Sanford (DAFWA), WA EverGraze™ Site Leader working in the south coast region of WA has been involved with kikuyu research for the past 12 years.

His interest in hardy perennial pastures stems from consistent research results showing the significant increases in stocking rates they offer.

However, to Paul, the key success story about kikuyu has been the high rate of adoption by livestock producers in the region.

“Adoption is rapid because kikuyu fits well with the existing grazing strategies of many local producers,” Paul explains. “It can be set stocked and unlike most other perennials does not require rotational grazing – something which has been a significant barrier to the adoption of other perennial pastures such as lucerne.

“We say to producers they can adopt kikuyu, continue with their existing management

TABLE 1. Comparative performance of annual- and kikuyu-based pasture at Albany, WA

| Year | Annual rainfall (mm) | Pasture type | Stocking rate (dse/ha) | Grain fed (kg/ha) | Clean wool (kg/ha) | Micron (µm) | Staple strength (N/ktx) |
|------|----------------------|--------------|------------------------|-------------------|--------------------|-------------|-------------------------|
| 1999 | 706                  | Annual       | 13                     | 70                | 53.7               | 20          | 16                      |
|      |                      | Kikuyu       | 22                     | 0                 | 91.8               | 20          | 41                      |
| 2000 | 642                  | Annual       | 10                     | 336               | 34.7               | 18          | 33                      |
|      |                      | Kikuyu       | 21                     | 0                 | 70.5               | 20          | 45                      |



the fact that kikuyu is a very grazing-tolerant and persistent species.”

Forage analysis and livestock measurements have shown that kikuyu is typically a maintenance diet, though it is possible to grow livestock at modest rates on a sward that is made up of mostly young leaf.

“Interestingly, trials have demonstrated that wool from sheep grazing kikuyu has a higher staple strength compared with that from sheep grazing annual pasture,” Paul said. “This is due to the more consistent plane of nutrition throughout the year.”

The most productive kikuyu pastures on the south coast of WA are characterised by high

legume content during winter and spring. Sub-clover is the most common companion.

“The legume drives pasture growth during the cooler months and provides nitrogen to the kikuyu,” Paul explained.

Red-legged earth mite control and hard grazing during autumn to provide space for sub-clover growth during winter are the keys to maintaining high legume content.

Broadleaf weeds such as capeweed are not common in kikuyu swards as the perennial likely out competes these species for moisture and nutrients at the break of season. ↘

➤ **More information**

Paul Sanford, DAFWA  
 T: (08) 9892 8475  
 E: psanford@agric.wa.gov.au

> The smell of success has spread all the way to Kangaroo Island, South Australia where producers with similar soil and climatic conditions are also reaping the benefits of this hardy perennial pasture (see Trevor and Lyn Bolto’s Kangaroo Island case study in the FFI CRC’s new Future Farm magazine, Issue 1) <

## New EverGraze™ website up and running

**A** new website to showcase the progress and achievements of the EverGraze™ project is up and running.

Launched earlier this year, the new website has dedicated links for each EverGraze™ region across the country. Within each link visitors can access all the research details at their local Proof Site and the regional Supporting Sites. Information on who is running each Proof and Supporting Site is available, as are the trial results as they come to hand.

“We will use the site to publicise coming events, field days, farm walks and other EverGraze™ activities,” said Geoff Saul, National EverGraze™ co-ordinator. “And if people want to know what is coming up in their area, the site is a great reference.

“We are in the process of producing a series of factsheets and there are already three on the website – hedges for lambing, managing tall fescue and chicory.”

Each factsheet can be downloaded directly from the site, free of charge.

In addition to the downloadable fact sheets there are audio-visual presentations of EverGraze™ project staff talking about their recent work in the field.

“In addition to the website we produce EverGraze™ updates which go out every two months to subscribers,” Geoff said. “Anyone can sign up to be a subscriber via the links on the website.”

Subscribers to the EverGraze™ Updates will automatically receive either an email or hard copy Update.

Anyone who is interested in becoming a subscriber, but doesn’t have an email address can contact Geoff via snail mail to subscribe to the hard copy newsletter.

A series of recent field days, which have been promoted via the website, have seen more than 500 attendees.



Watch out for an increasing number of fact sheets coming out during the next couple of months, which will focus on a range of pasture species and livestock systems to come from EverGraze™ project research. ↘

➤ **More information**

Geoff Saul  
 National EverGraze™ Co-ordinator  
 98 Leura Lane  
 Hamilton Victoria 3300  
 T: 0419 328 590  
 E: geoff.saul@bigpond.com  
 W: www.evergraze.com.au

# Oil mallees – native fauna sanctuaries

By **Catriona Nicholls**  
Kondinin Group

**A**s the Western Australian Oil Mallee Industry aims to plant a million hectares of oil mallees by the year 2025, primarily for economic and water use benefits, recent research shows there is the potential for habitat benefits for some of our endangered animals.

As leader of the *Biodiversity value of oil mallee farming systems* project, Dr Patrick Smith investigated the potential for oil mallee plantations to provide additional habitat for native animals. And where this appeared to occur, compared populations found in oil mallee plantations to those in natural and planted vegetation.

“Two endangered species – the woylie (brush-tailed bettong) *Bettongia penicillata* and the wambenger (red-tailed phascogale) *Phascogale calura* – were among half a dozen small mammals found foraging in oil mallee plantations in the WA central wheatbelt region,” Dr Smith said. “The mouse-sized western pygmy possum (*Cercartetus concinnus*) appears to be especially benefited by the oil mallees,” (see following story).

Researchers found that mallee plantations provide food and/or shelter for about two-thirds of the region’s bird species

## **i** key points

- Oil mallee plantations have the potential to support biodiversity on-farm as well as providing economic and water use benefits
- The greatest biodiversity benefits come from natural bush habitat followed by mixed revegetation
- These results provide important guidelines for land managers who are planning to revegetate areas on-farm for habitat outcomes.

and more than half of the local reptiles. Hundreds of native arthropods – including dozens of species of beetles and ants – recolonise farm paddocks when belts of oil mallees are planted. The research was co-funded by the former CRC Salinity and also involved students from TAFE WA, Curtin and Edith Cowan universities.

### Realistic expectations

Although important in terms of providing habitat to a range of native fauna species, oil mallee plantations still lag behind other vegetation types studied – mixed revegetation and natural bush.

The planted vegetation was at best only half as good as the natural bush habitat, so a proportional response from the native fauna is to be expected explained Dr Smith (see Figure 1).

“This result is not surprising but it is nonetheless important for two reasons,” Dr Smith said. “Firstly, it helps us have realistic expectations about the contribution planted vegetation can make to the resource requirements of native fauna species.

“Secondly, the component-by-component assessment of the habitat quality of different vegetation types identifies why planted vegetation falls behind natural habitat, allowing us to assess the degree to which these plantings might be improved with respect to their habitat values.”

The results reveal that oil mallees and mixed revegetation fall behind natural bush in two main ways:

- structurally and
- floristically.

“The structural component of habitat comprises elements such as overall height of vegetation, presence of multiple strata

ABOVE: Many native animal species were found to recolonise farm paddocks when belts of oil mallees were established. (Photo: Patrick Smith and David McFall)

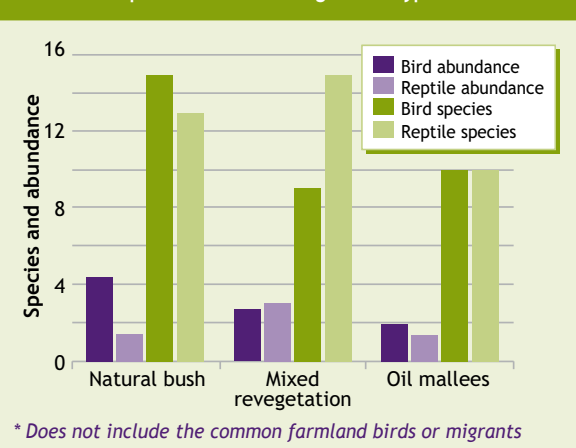


(or layers) of interconnecting vegetation, soil cover with litter and woody debris, and the presence of tree hollows,” Dr Smith said. “It is probably unimportant which plant species provide these structures or even whether the species is native or not. Many of these features are the product of vegetation age (height, hollows, dead branches) and could develop in planted vegetation as it ages.”

According to Dr Smith height and debris were starting to appear in some of the older mixed revegetation sites in the study.

Other structural features are contingent upon a diversity of plant forms being present, particularly the presence of lower strata and living groundcover – features that are almost always absent in planted vegetation unless a range of structural plant forms was deliberately introduced at the outset.

FIGURE 1. Diversity and abundance of declining resident birds\* and reptiles in different vegetation types



"Management can also impact on habitat quality," Dr Smith said. "Grazing and fire management will affect characteristics such as soil cover and plant regeneration."

Diversity is the second key area in which the planted vegetation lags behind natural bush.

"This diversity affects not only the structure but also the additional plant conservation values it can contribute (more species planted equals more species conserved)," Dr Smith explained. "It also provides a greater resource diversity for other wildlife, such as dense foliage versus open foliage, smooth bark versus rough bark; winter versus summer flowering and so on."

Greater diversity and abundance of native plant species recruits occurs in mixed revegetation compared with oil mallees. This may be partly be due to oil mallee plantations often being grazed where revegetation is usually not grazed, but also because greater species diversity in the

mixed revegetation leads directly to greater species diversity in the recruits.

Such diversity in planted vegetation is primarily restricted by the species choice.

"Mixed revegetation sites in our study had less diversity than even the most degraded natural bush," Dr Smith said. "However, boosting the diversity of mixed revegetation is feasible, and considered current best practice for habitat creation."

Boosting the diversity of oil mallee plantations is less likely, although some farmers have planted diverse species mixes on inside rows of belts, with mallees planted on the outside belts where they can potentially be harvested.

Even though the results favoured natural bush over other types of vegetation, Dr Smith pointed out that any habitat value offered by oil mallees was beneficial, especially given the key focus for the plantations was usually for other reasons.

"In terms of getting the best overall biodiversity benefits from oil mallees it seems that blocks are better than belts and plantations adjacent to bush are better than isolated plantations," Dr Smith said. "Birds don't really care if planted vegetation is next to natural bush or not – they can fly over large distances, but mammals and reptiles were found only in natural bush or planted vegetation next to natural bush."

"The researchers also noted that bird activity was substantial throughout the year." 🌿

### ➡ More information

Dr Patrick Smith, CSIRO

T: (08) 9333 6467

E: [patrick.smith@csiro.au](mailto:patrick.smith@csiro.au)

## Plenty of appeal for tiny visitor

It's not only farmers and researchers that are attracted to oil mallees. For her Environmental Management Honours project, Edith Cowan University student Marie Short focused her thesis on the western pygmy possum (*Cercartetus concinnus*).

Throughout the broader biodiversity studies undertaken by CSIRO and FFI CRC researchers, western pygmy possums were regularly observed and Marie was keen to delve further into the potential habitat values widespread farm plantings of oil mallee stands were providing these tiny native animals.

"The use of farm tree plantations by the western pygmy possum was an unexpected discovery and so my research attempted to determine their habitat utilisation patterns in the WA southern wheatbelt region, where farmers have undertaken widespread oil mallee plantings," Marie said.

"Through my research I also aimed to understand the characteristics of farm tree plantations that provide a suitable habitat for the western pygmy possums."

Using pitfall traps already established by CSIRO, Marie monitored the numbers of western pygmy possums in the various types of vegetation and then used radio transmitters to track their movements.

"I found that oil mallees provided a rich source of feed for the pygmy possums during flowering, and pygmy possum numbers and the time they spent in the oil mallees were much higher during this period than those in other vegetation sources, such as remnant vegetation and mixed revegetation plantings (see Figure 1).

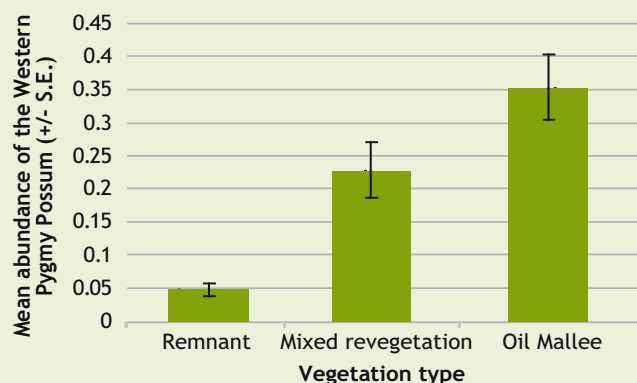
"However, it is thought that without other habitat options, the oil mallees would not sustain the population of pygmy possums out of flowering season."

Marie discovered that the pygmy possums were able to travel over several hundred metres to exploit other habitats and believes the most beneficial oil mallee plantings will be those located near remnant vegetation that can provide additional food sources and nesting sites.



ABOVE: Oil mallees provide a rich source of feed for Western pygmy possums. (Photo: Marie Short)

FIGURE 1. The average western pygmy possum abundance at sites of remnant vegetation, mixed revegetation and oil mallee plantations within the southern wheatbelt region of Western Australia



"Results from my study indicated western pygmy possums in the southern wheatbelt region that inhabit oil mallee plantations rely on the hollows of paddock trees as nesting sites. Paddock trees are important for the conservation of species such as the western pygmy possum; too often paddock trees are cleared because nobody knows of their biodiversity benefits.

"Revegetation, particularly oil mallee plantations, has the potential to enhance conservation of wildlife, such as the western pygmy possum, in rural environments." 🌿

### ➡ More information

Marie Short, DEC

T: (08) 9881 9200

E: [marie.short@dec.wa.gov.au](mailto:marie.short@dec.wa.gov.au)

# Hitting the road with headline technologies



By **Catriona Nicholls**  
Kondinin Group

*ABOVE: Workshop participants enjoyed the shadows created by raised barley beds on a hot afternoon at the Thomson Farm near Katanning. (Photo: Greg Lawrence)*

**R**ecent path to adoption workshops and forums are proving successful in their goal to increase the knowledge and confidence of advisers and other 'next users' in extending 'headline technologies' according to FFI CRC Adoption Manager, John Powell.

The 'headline technologies' are 13 key products and outcomes that came out of more than 50 research projects in the former CRC Salinity.

During the past nine months events have been held in Katanning, Western Australia (October 2007), Cummins and Minlaton, South Australia (February 2008) and Tammin, WA (April 2008).

"Essentially the intention of the events was, firstly, to invite people who have the biggest influence on the adoption of new farming and grazing technologies in their region – the key movers and shakers," John explained.

Participants included researchers, public and private advisers, farm consultants and leading producers.

"By bringing these people together we gave them a chance to see the technologies operating in commercial farm environments.

"Secondly, we wanted to sit the diverse group down in an informal setting to really get a clear understanding of the pros and cons of the technologies in each region."

"Each event had a regional focus, so it was about looking at the technologies relevant to the region and inviting people most likely to influence adoption of those technologies."

The third principle behind the events was that by providing a relaxed setting and sufficient time through table groups, each group (researchers, advisers and farmers) could really grill each other on potential benefits and challenges, face-to-face, over an extended period.

"This is an opportunity these people don't normally get."

John believes that one of the real success stories from the events was the level of exchange between the participants.

"I think this was because we had drawn together such a diverse group of people who bring their own background and experiences with these technologies," John suggested.

## Katanning workshop

Finding the best ways to spread the message and get farmers using CRC Salinity technologies was the focus of the *Path to Adoption* workshop held during late October 2007 in Katanning, WA.

More than 40 participants attended the two-day workshop, which provided an overview of the technologies and gave insights into ways for extension officers and other specialists to spread the news.

A field trip to selected farms in the Katanning region demonstrated perennial pastures and saltland grazing systems, as well as engineering-based technologies, such as raised beds.

After a series of presentations that provided extra theory and data about the technologies seen in field, participants worked in small groups to provide feedback on how FFI CRC can increase both an understanding of the

technologies and confidence in advisers about promoting them to farmers.

There was strong support for more commercial-scale demonstrations and trials to provide further proof of the technologies' advantages and the development of subsequent 'bullet-proof' agronomic packages. Advisers recommended the development of training programs to help them deliver the packages.

## Cummins and Minlaton workshops

In SA, the headline technologies were presented at two one-day *Profitable Perennials in the Landscape* forums during February 2008. The events aimed to extend CRC research outcomes to 'end users' (primarily land managers) and a wider audience. Both events were well attended and included land managers, Landmark advisers, researchers and consultants.

Dr Anna Dutkiewicz, SA Adoption Manager for the FFI CRC from the Department of Water Land and Biodiversity Conservation (DWLBC) explained that the focus topics for the forums were lucerne, saltbush and other perennials and their role in increased production, livestock gains and the management of dryland salinity in the region.

"In the morning sessions, speakers presented CRC research outcomes on the suitability and benefits of lucerne in farming systems. Speakers at both forums included Trevor Dooley (Rural Solutions SA), David Maschmedt (DWLBC), Dr Bill Bellotti (The University of Adelaide) and, at Cummins, local Landmark agronomist Jarrod Kemp," Dr Dutkiewicz said.

Local land managers Peter Treloar and Neil Forrest also shared their own experiences with lucerne on-farm.

Afternoon sessions saw presentations on saltland pastures from researchers Jock McFarlane (Rural Solutions SA), Liz Abraham (SARDI) and land manager Geoff Kroemer.

## key points

- Workshops and forums brought together key movers and shakers across four regions
- Events had both on-farm and inside sessions to accommodate different learning styles of participants
- The event format allowed an in-depth discussion about the merits of the technologies between a diverse group of participants.

Final presentations from each workshop, from land manager Gavin Rehn and researchers Jim Franklin McEvoy (FFI CRC) and Craig Neumann (DWLBC) covered the role of saltbush.

"Respondents to follow-up surveys from the events indicated that they gained new knowledge and understanding from the presentations, in particular, on saltland pastures and saltbush followed by lucerne and other perennials," Dr Dutkiewicz said.

"The feedback also suggested the CRC needs to ensure grower experiences are documented and transferred to others to fill the gap between research and adoption."

### Tammin workshop

All 30 advisers and other 'next users' who influence grower decisions rated the workshop at Tammin as 'useful to very useful' in increasing their knowledge and confidence in advising on technologies featured at the workshop.

The workshop featured 'headline' technologies for whole farm and landscape water management in the eastern wheatbelt of WA, including lucerne phase farming, saltland pastures, and oil mallees.

Day one of the workshop started with presentations on the technologies from lead

CRC researchers Perry Dolling, John Bartle and Ed Barrett-Lennard.

Participants then learned more about the practical side of the technologies on four farms, where growers talked about why they adopted the technologies, the challenges in adopting them, and whether they delivered the anticipated benefits.

"There was lively discussion and networking through the day (and night) among the participants," John Powell said.

Table group sessions on day two saw growers, CRC researchers and 'next users' having in-depth discussions about the merits of the technologies. They also put forward their 'big ideas' for what should happen next to increase adoption of the technologies.

The 'big ideas' to come out of the Tammin workshop were:

- Promote lucerne to croppers as a tool to preserve cropping yields and land value, instead of promoting it as part



ABOVE: Land manager, Gavin Morgan, uses 2 m deep soil pits to demonstrate the effect of lucerne in preserving his future grain yields at the Tammin workshop. (Photo: John Powell)

of lucerne-livestock systems to address waterlogging and salinity

- Promote saltbush as part of normal farm and landscape management, rather than something to do when land is no longer useful for anything else
- Establish regional partnerships between the Oil Mallee Association, State agencies and Shires, for co-ordinated oil mallee industry development. ⚡

### More information

John Powell, Adoption Manager, FFI CRC

T: (02) 6226 5298

E: [jpowell@optimalicm.net.au](mailto:jpowell@optimalicm.net.au)

## Fellowship recognises post-graduate perennial work

Dion Nicol is one of only two students nationally to win the highly contested 2008 AW Howard Memorial Research Fellowship that recognises students who have a research project pertaining to the development, management and use of pastures.

A Curtin University of Technology Environmental Biology Honours graduate, Dion has been acknowledged for his outstanding post-graduate research with native legumes.

Dion's work focuses on using native perennial legumes as an alternative to lucerne to improve the productivity of Western Australian low-rainfall regions.

"I am particularly interested in low rainfall soils and the chemical constraints restricting root growth of current crop and pasture varieties," Dion said.

"My studies in environmental biology provide an excellent background to study native legumes.

"WA has a unique environment and a diverse and well-adapted native plant population. I hope to use this diversity and adaptability to find crops that will grow well in stressful environments."

Hailing from WA's central wheatbelt, Dion hopes the field trials on his uncle's property will capture agronomy and water usage information on two legume species – *Cullen cinereum* and *Cullen graveolens*.

"The legumes, found as wild populations in low rainfall areas, could be a future profitable crop for the WA wheatbelt."

"In natural grasslands, these species are highly productive and remain so much longer than almost all other herbage under water stress. If successful, they could provide an income from summer rain and stored soil moisture while reducing recharge."



Dion has started his doctoral studies at the University of Western Australia (UWA) with assistance from the FFI CRC and UWA's School of Plant Biology.

The \$15,000 AW Howard Memorial Research Fellowship bursary will help finance Dion's research and field experiments. ⚡

### More information

Dion Nicol, UWA

E: [nicold02@student.uwa.edu.au](mailto:nicold02@student.uwa.edu.au)

# Native shrubs could offer a natural alternative

By **Catriona Nicholls**  
Kondinin Group

ABOVE: Dr Zoey Durmic (left) doing impact tests of plant extracts on rumen bacteria in the anaerobic chamber. (Photo: Zoey Durmic)

**U**nique chemicals found in many native shrubs could provide new benefits to livestock producers and satisfy consumer demand according to rumen microbiologist Dr Zoey Durmic.

Dr Durmic is working with other researchers as part of the FFI CRCs *Enrich* project to develop new forage shrubs. Her work is part of activities led by Dr Phil Vercoe (UWA) to investigate the potential for new plants to improve rumen function. The project is currently investigating many characteristics of these shrubs – from agronomic properties, nutritive values, to their 'bioactivity potential' to modulate rumen function.

"As a survival and defence mechanism, native plants have evolved to produce Plant Secondary Compounds (PSC)," said Dr Durmic.

## **i** key points

- As part of an adaptive process native shrubs have evolved to produce plant secondary compounds in response to stress
- These compounds could prove a viable and natural alternative to synthetic feed additives used in livestock production.

"These are commonly produced in response to stress, such as during defoliation (grazing), low soil fertility, lack of water or high temperatures, microbial and insect attack.

"Traditionally, Australian native plants, perennial shrubs in particular, have not been considered as valuable livestock fodder, not only because of their low biomass productivity and nutritive value when compared to crops, but also because of anti-nutritive effects of PSCs.

"However, trends in consumer demands could be about to change our opinion and shift the way we perceive our native shrubs."

### Taking an inside look

Dr Durmic's focus is largely on the potential effects of these shrubs on rumen microbiology. This area of research, within the broader *Enrich* project, builds on results from a large European research project, *Replace*, that investigated plant extracts that could improve rumen microbial fermentation.

While the Europeans were looking into something that can be potentially 'bottled', *Enrich* is taking different approach.

"Our project looks into an on-farm approach, and includes bioactive species as a grazing fodder rather than a feed additive," Dr Durmic said.

In addition to their potential livestock benefits, native shrubs are well adapted to

our soils and climate conditions because of their tolerance to environmental stresses (for example, drought and salinity) and are less impacted by variation in rainfall and temperature. They are important as ecosystems stabilisers reducing soil erosion, carbon build-up and providing shelter. Some shrubs also have relatively high nutritive value, and average to good palatability.

As the management of dryland salinity moves towards including more resilient native species as forages, the interest and value of shrubs may rise further.

### Better for animal production

Ruminants consume large quantities of fibre, which is broken down in the rumen by microbes, providing energy for the animal.

However, there are some negative consequences of this and moderating rumen microbial fermentation by antimicrobials can have positive effects on feed efficiency and promote animal growth.

"Shrubs containing PSC with antimicrobial properties may provide a solution," Dr Durmic said. "So far we have found that many shrub species have good fermentability and therefore the potential to be considered as fodder, but some also have those specific and desirable rumen-modulating properties." Properties include better gas profile (less methane), more favourable end-products

(propionate), and less dietary protein breakdown in the rumen (see Figure 1).

**Better for the environment**

With increased concern about climate change and global warming, consumers also are demanding animal production methods that have less impact on the environment.

“Large amounts of gas are normally produced in the rumen during fermentation of feedstuff and is then eliminated by belching,” Dr Durmic said. “Eructated methane represents a loss of 2-12 per cent of the gross energy consumed by ruminants, but it is also a potent greenhouse gas.”

“There are some synthetic antimicrobials that can be fed to animals to control this, but plants that can reduce or inhibit rumen methanogenesis could prove beneficial, and provide a more ‘natural’ alternative.”

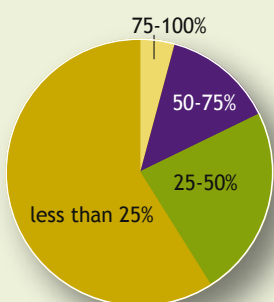
Among the shrubs that have been examined in the *Enrich* project, nearly half inhibited methanogene concentrations, with one fifth reducing it more than 50% (see Figure 2).

**Better for the livestock**

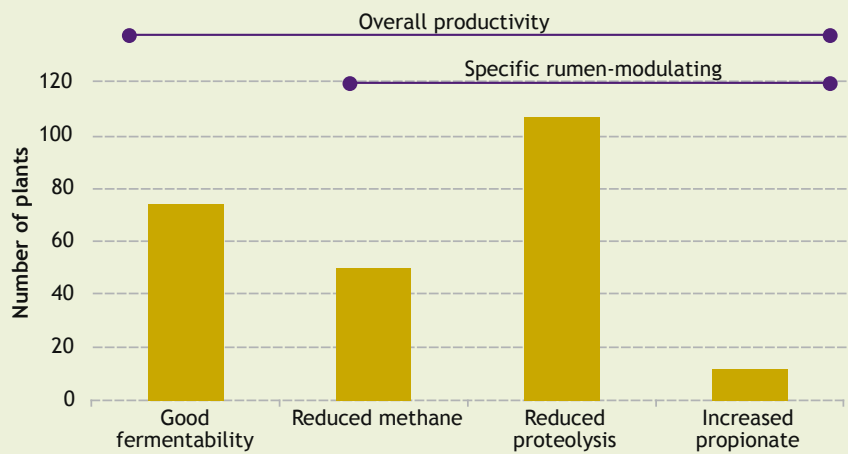
Antibiotics are commonly used to control ruminal disorders such as lactic acidosis and bloat, and to inhibit gut pathogens. Withdrawal of in-feed antibiotics from livestock production due to consumer demands is expected to have an instant and severe impact on animal health and welfare – something that has already happened in Europe.

Researchers at UWA and CSIRO investigated another set of Australian plants for the specific antimicrobial properties that control these disorders. Several plants (including some shrubs represented in *Enrich*) were capable of preventing growth of the bacteria responsible for ruminant lactic acidosis, while others were potent inhibitors of gut pathogenic bacteria (see Figure 3).

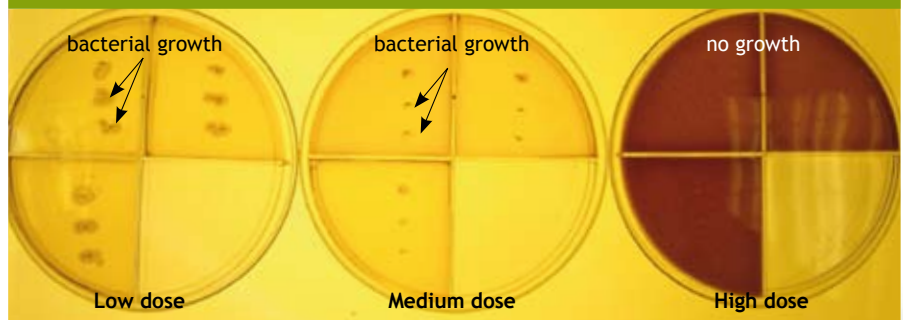
**FIGURE 2. Distribution of plants capable of reducing methane production during rumen fermentation**



**FIGURE 1. Shrubs that can potentially improve animal production.**



**FIGURE 3. Test demonstrating inhibitory effect of plant extracts on three gut pathogens.**



**Test tube to paddock**

So far these preliminary results were only obtained in test tubes and they need to be translated into animals and validated in vivo.

“Although preliminary studies in sheep show some encouraging results,” Dr Durmic said, “there is more work to be done before we can start ‘prescribing shrubs’ for better production and health.”

Managing microbial activity in the rumen to enhance productivity and animal welfare while meeting consumer demands remains a task, but plants containing PSCs are already high on the list to meet all these requirements.

A strong need to find safer rumen-modulating antimicrobials, while providing sustainable farming solutions could see, for example, livestock producers combining native shrubs along with other pasture species (complementary feeding), to reach the full potential of production, health and environmental benefits. ⬇

**More information**

Dr Zoey Durmic, UWA  
 T: (08) 6488 1475  
 E: [zdurmic@cyllene.uwa.edu.au](mailto:zdurmic@cyllene.uwa.edu.au)





# Establishment proves challenging for warm-season perennials

By Jill Griffiths  
Kondinin Group

ABOVE: Direct sowings of old man saltbush at the Meckering site. (Photo: Brad Wintle, DAFWA)

**P**roviding cost-effective approaches for reliable establishment of perennials is one of the aims of a national research project, based primarily in Western Australia. The project will use recently-developed seed treatments to find ways to improve the establishment of saltbush, warm-season grasses and legumes and native pasture species from seed.

It will combine germination-enhancing chemical treatments and seed coatings with agronomic studies into seeding techniques.

The seed biology investigations are being carried out by Kings Park and Botanic Gardens and Parks Authority (BGPA).

## key points

- Sowing depth is critical for successful establishment of warm-season perennial pastures
- Grading seed to increase the proportion of viable seed will boost germination rates
- Soil temperature at seeding could affect the establishment of saltbush.

The four-year project, commissioned by Meat & Livestock Australia, Australian Wool Innovation, Land and Water Australia and the FFI CRC, will develop a wide range of establishment recipes for target species.

Project team member Ron Yates from the Department of Agriculture and Food Western Australia (DAFWA) said more farmers had turned to planting perennial pastures, particularly warm-season grasses, but had experienced poor pasture establishment due to many factors, including incorrect seed depth, poor seed quality and dormancy issues.

“It’s critical for all warm-season species to be sown at a depth of between 5-10 mm,” Ron said. “We have found that it is important to have independent sowing points that can ride with the bumps – we use a depth wheel so the seeding depth is precise.”

Ron said that furrow depth and configuration were also vital, as was seed-soil contact.

“In sandy soils there are problems with furrow collapse and seed being buried too deeply, sometimes with as much as 30 mm soil coverage.”

Ron said there were also problems with seed quality. Seed viability was generally low and in many batches only reached 20 per cent.

By grading the seed and sowing only the heaviest 20%, higher germination rates can be achieved.

Chemical priming appeared to offer new options for increasing establishment success according to Ron. The interplay between seed maturity and dormancy was also being investigated. It was apparent that to obtain successful germination from direct seeding, the interaction of many factors needed to be considered.

### Direct seeding saltbush

“With regards to direct seeding of saltbush, initial field experiments at Meckering, WA, looked at a range of species including old man saltbush (*Atriplex nummularia*), river saltbush (*A. amnicola*), wavy leaf saltbush (*A. undulata*) and small leaf bluebush (*Maireana brevifolia*). Of these the most exciting results have been achieved with old man saltbush.”

The trial was sown at the end of August 2007 using an experimental cone-seeder on a mildly saline, duplex soil.

A range of seed treatments were used before seeding to determine which gave the best germination. These included chemical and water priming (in which seeds are soaked and then dried down) and removal of the bracts surrounding the seeds (de-bracting), compared with bracted seed.



## SGSL survey seeks source

Other aspects of germination were also trialled in the experiment, including light requirements and aspects of the machinery to be used. One trial investigated whether lucerne points were suitable for seeding.

"We achieved exceptional establishment of old man saltbush, with less success for the other species. We think a lot of this was to do with how cold the soil was when the trial was sown. Temperature requirements for the germination of old man saltbush appear to be lower than the other species. We will investigate this in the warmer northern agricultural regions of WA this year," Ron said.

### Bracts enhance germination

Results indicated that the de-bracted seed also showed poor germination. This led researchers to surmise that

the bracts may act like a sponge to keep the seed moist, thus enhancing germination. The only area in which the de-bracted seed established well was in a section of waterlogged soil, perhaps indicating the importance of a stable moist surrounding for seed germination.

These hypotheses will be tested in the laboratory this year.

Further field trails will be carried out in other agricultural regions of WA this spring.

Different soil types will be targeted and trials will be sown using a modified commercial seeding combine to more closely represent the type of seeding machinery that farmers might use.

The aim is to find a viable way to direct seed saltbush, which would prove a far more economic way of establishing perennials over broad areas. ↴

### More information

Ron Yates, DAFWA  
T: (08) 9368 3665  
M: 0427 550 125  
E: ryates@agric.wa.gov.au

Farmers talk to farmers when it comes to salinity according to a survey conducted by Currie Communications late last year.

The survey included 100 farmers with salt-affected areas of land within their farm and 100 agronomists, extension, catchment and local government authorities who deal with land managers who have salt-affected areas of land.

It asked primary producers how they are informed about salinity and concluded that nine out of 10 talk with their peers when looking for information.

The survey aimed to highlight a way to deliver to farmers the extensive information that comes out of the *Sustainable Grazing on Saline Lands (SGSL)* sub-program of Land Water Wool, a national research program funded by Australian Wool Innovation, Land & Water Australia, Meat & Livestock Australia and the FFI CRC.

Aside from their peers, 80 per cent of those surveyed also turned to relevant state departments of agriculture for information.

The survey showed that almost all farmers used a variety of

publications and newsletters for gathering information on salinity.

But only 28% said they turned to the internet for this advice. While the research concluded that the internet was becoming an ever-increasing business management tool for farmers, page download speed remains a barrier to internet use. Only 28% had access to broadband, with 29% using satellite and 34% still on a dial-up connection.

Topics of most interest to farmers surveyed were information on saltland pasture and re-vegetation, and preferably on a local and practical level. Farmers wanted to see the cost:benefit analysis of various options for managing salinity (77%), but two-thirds were also interested in the environmental opportunities for saltland, as well as pasture and management issues.


The second group surveyed – made up of intermediaries in the industry – had similar interests when it came to salinity information. ↴

### More information

Greg Lawrence  
Communication Manager, FFI CRC  
T: (08) 6488 7353  
E: greg.lawrence@futurefarmcrc.com.au



# About Focus on Perennials

 **Focus on Perennials** is a quarterly research-in-progress newsletter published by the Future Farm Industries CRC Ltd (FFI CRC) ACN 125 594 765.

FFI CRC was established in 2007 under the Commonwealth Government's CRC Programme and builds on the research of the CRC for Plant-based Management of Dryland Salinity. FFI CRC is a unique co-investment between meat, grains and wool industry research corporations, the Landmark agribusiness company, and the combined research power of CSIRO, six State agencies and four universities. For further information about FFI CRC visit [www.futurefarmcrc.com.au](http://www.futurefarmcrc.com.au)

**Focus on Perennials** draws on the work of both CRCs, to describe the potential application of Profitable Perennials™ to innovative farming systems and new regional industries better adapted to southern Australian dryland-farming conditions.

The information contained in this newsletter has been published in good faith by FFI CRC to assist public knowledge and discussion and to help improve profitability of farming and sustainable management of natural resources and biodiversity. Neither FFI CRC nor the Participants in the CRC endorse or recommend any products identified by trade name, nor is any warranty implied by the CRC and its participants about information presented in **Focus on Perennials**. Readers should contact the authors or contacts provided and conduct their own enquiries before making use of the information in **Focus on Perennials**.

## Subscription/change of address:

- Make a free subscriber to Focus on Perennials*
- Do not send me Focus on Perennials*
- Please change my subscription address*

Title  First name

Surname

Position

Company/property name

Address

Suburb/town  State  Postcode

Phone  Fax

Email

## FFI CRC Contacts:

### CHIEF EXECUTIVE OFFICER

Kevin Goss

T: (08) 6488 2555

E: [kevin.goss@futurefarmcrc.com.au](mailto:kevin.goss@futurefarmcrc.com.au)

### NATIONAL ADOPTION MANAGER

John Powell

T: (02) 6226 5298

E: [jpowell@optimalicm.net.au](mailto:jpowell@optimalicm.net.au)

### NSW ADOPTION MANAGER

Peter J. Regan

T: (02) 6391 3185

E: [peter.j.regan@agric.nsw.gov.au](mailto:peter.j.regan@agric.nsw.gov.au)

### SA ADOPTION MANAGER

Dr Anna Dutkiewicz

T: (08) 8303 9735

E: [dutkiewicz.anna@saugov.sa.gov.au](mailto:dutkiewicz.anna@saugov.sa.gov.au)

### VICTORIAN ADOPTION MANAGER

Austin Brown

T: (03) 9742 8728

E: [austin.brown@dpi.vic.gov.au](mailto:austin.brown@dpi.vic.gov.au)

### WA ADOPTION MANAGER

David Bicknell

T: (08) 9881 0222

E: [dbicknell@agric.wa.gov.au](mailto:dbicknell@agric.wa.gov.au)

### COMMUNICATION MANAGER/EDITOR

Greg Lawrence

T: (08) 6488 7353

E: [greg.lawrence@futurefarmcrc.com.au](mailto:greg.lawrence@futurefarmcrc.com.au)

## Head Office:

T: (08) 6488 8559

E: [enquiry@futurefarmcrc.com.au](mailto:enquiry@futurefarmcrc.com.au)

W: [www.futurefarmcrc.com.au](http://www.futurefarmcrc.com.au)



FUTURE FARM  
INDUSTRIES CRC

## Please return this form to:

Future Farm Industries CRC  
The University of Western Australia M081  
35 Stirling Highway, Crawley WA 6009  
Tel (08) 6488 8559 Fax (08) 6488 2856  
Or email: [gmadson@futurefarmcrc.com.au](mailto:gmadson@futurefarmcrc.com.au)

