

# focus

ON PERENNIALS

## in this issue



6

CRC provides support for student success



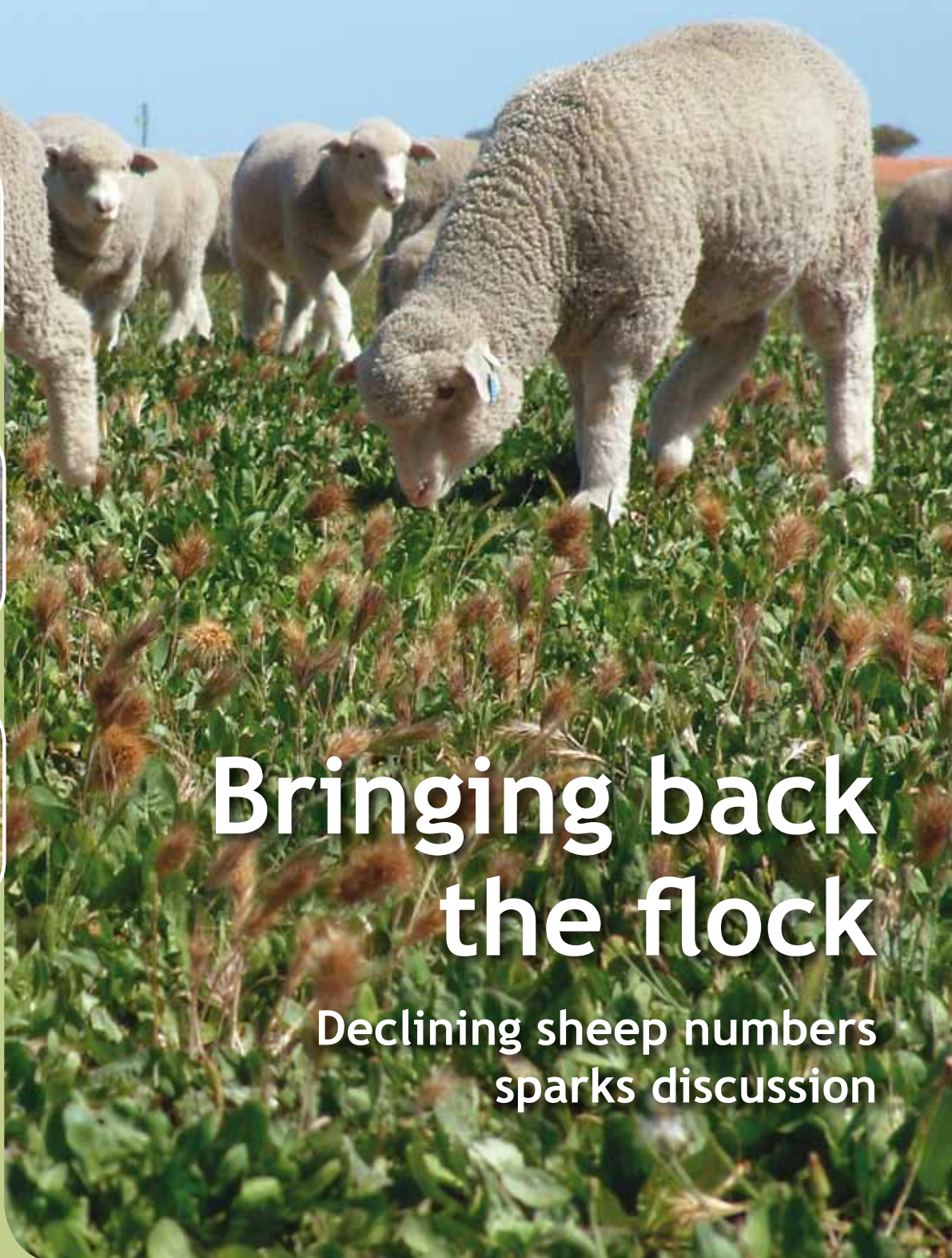
8

Woody perennials – not as tough as you may think



10

Barley steals the salt tolerance limelight



# Bringing back the flock

Declining sheep numbers sparks discussion



FUTURE FARM INDUSTRIES CRC



# Declining flock numbers sparks serious discussion

*LEFT: The size of the national sheep flock is dwindling as many producers make the switch from wool to cropping and meat production. The debate rages on how to sustain a breeding ewe population for future sheep-based enterprises. (Photo: Catriona Nicholls)*

## Not so fast

However, Alex Ball (MLA) suggests the current economic and climate conditions could see the flock stabilise for several reasons.

“With improved prices, and relatively attractive returns for lamb, we’re seeing a slow in the decline,” Alex said.

“There has been some improvement in seasonal conditions and the cropping enterprise expansion is slowing, particularly in Western Australia.”

Alex suggests producers are recognising the importance of sheep as a risk minimisation tool in a mixed enterprise operation. He also believes new flock improvement campaigns through MLA and its partners will have a stabilising effect on sheep numbers.

In light of Kimbal’s comments about the way forward, Alex points out that sheep slaughter figures are already showing signs of decline.

“During the nine months to September, sheep turn-off has declined 14% on the same period last year and is forecast to fall a further 14% during 2009.”

MLA forecasts also predict lamb production will increase at an average rate of 1-3% per year from 2008 to 2013 – a total increase of about 11% on 2008.

“Lamb prices are at a historic high,” Alex said. “This has been driven by resilient demand for lamb despite the global economic crisis and domestic economic downturn.”

“We expect prices to remain strong over the projection period to 2012-13.”

“It’s much the same for sheep prices, however limited supply has driven prices even higher.”

“We have seen strong demand for mutton and live exports and expect prices to move higher over the projection period due to the reduced capacity to supply sheep and continuing strong demand from the Middle East.”

**Table 1. Sheep balance sheet – 2008-09**

Opening number of sheep	76.9 million
Per cent ewes	61%
Per cent ewes joined	80%
Marking percentage	85%
Lambs marked	32.0 million
Lambs slaughtered	20.8 million
Sheep slaughtered	11.3 million
Live exports	4.2 million
Total turn-off	36.3 million
Deaths on farm (1.4%)	1.1 million
Closing number of sheep	71.6 million

Source: Kimbal Curtis (DAFWA)

By **Catriona Nicholls**  
Kondinin Group

**A**s Australia’s sheep population plummets and livestock production focus shifts from wool to meat, the Future Farm Industries CRC Board has called in the experts to provide their perspective.

During November, the Board saw presentations from different industry perspectives. They are now discussing the information in order to determine impacts on future research direction.

## Facts and figures

The national flock – currently estimated at 71.6 million – is lower than it has been for more than 100 years.

According to Kimbal Curtis (DAFWA) the reasons are fairly clear cut.

“Sheep numbers have been falling for the past 20 years, not because of any one factor, but due to a rolling sequence of factors,” Kimbal said.

“The offloading of the wool stockpile and the associated decline in prices started the population decline.”

“Continued low returns from wool and high returns for alternatives enterprises, such as cropping have further stimulated producers to move away from sheep.”

This trend has been compounded by widespread drought.

“Combine drought with high returns from grain production and producers simply haven’t wanted to feed their sheep.”

## Faltering focus

It’s not only grain prices that have driven the move out of wool. Steadily-rising lamb prices provide an incentive for stalwart sheep producers to make a more discreet shift – from wool to meat.

During the early to mid 90s the gross value of wool production was 10 times that of sheep meat (\$4293M per year vs \$470M/yr). During the past few years on-farm production for both commodities has been roughly equal (\$2112M/yr vs \$2215M/yr).

In response to the shift from wool to meat, there has been a shift in the composition of the flock from wethers to ewes and lambs.

“Merino ewes have increasingly been joined to other breeds to produce prime lambs,” Kimbal said.

However, total turn-off is exceeding the number of lambs marked exacerbating the declining flock numbers (see Table 1).

High prices for live exports and mutton have also led to a sell-down of the adult portion of the flock.

“With falling numbers, demand for meat has been holding and this combination has provided a unique opportunity for some disenfranchised wool producers to sell their sheep,” Kimbal said.

To arrest the situation Kimbal suggests a number of strategies: “Firstly an increase in marking percentages to about 94% would maintain current turn-off.”

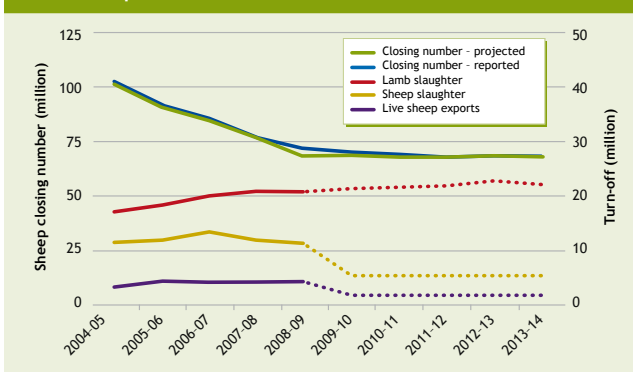
“Alternatively, reducing turn-off through sheep slaughter to four million and live exports to two million would allow lamb turn-off to continue without further liquidation of the flock.” (See Figure 1)

Kimbal also suggests lamb turn-off could be maintained if marking percentages reached 87% and overall sheep slaughter and live exports decreased to 47% of 2008-09 figures.

## key points

- Sheep numbers on a national level are plummeting and if the trend continues the outlook is grim
- Future Farm Industries CRC will review its R&D investment to better separate technology development for sheep meat and wool industries
- Increasing reproduction levels, retaining ewes longer and reducing sheep turn-off could stabilise the downward trend.

**FIGURE 1. Projected effect of reducing sheep slaughter and live exports**



The key question being asked is: ‘how many breeding ewes will be needed to maintain lamb production levels?’.

Alex’s answer is: In 2008-09 20.8 million lambs were slaughtered from 37.6 million breeding ewes at a marking rate of 85%.

“This level of lamb slaughter could have been achieved from 35.3 million breeding ewes.

“It goes without saying however, that a prime-lamb focused flock would be insufficient to support the growing demand for live sheep and mutton in export markets.”

In essence Alex and Kimbal agree – to halt the flock liquidation, productivity needs to improve and sheep turn-off needs to decline to meet the global demand for sheep meat and current forecast levels of turn-off.

However, in terms of boosting reproductive rates, Alex suggests Kimbal’s suggested goal of 94% could be unrealistic.

### Hesitant to invest

Internal research carried out by Landmark suggests producer confidence in sheep, regardless of the final commodity, is still low compared with grain production. And while grain producers are currently keen to invest in new technologies to improve and expand their cropping business, sheep producers may not be quite so motivated to do so.

This could impact on the levels of adoption of new production technologies aimed at boosting marking percentages according to Landmark National Farm Services Manager, Bruce Cairns.

“Of the producers we surveyed, 37% of grain growers described their enterprise as easily viable, while only 13% of sheep producers described theirs in the same way.”

“As such, it is not surprising they are reluctant to invest in new technologies to the same extent.”

When questioned on whether they were looking to grow or expand their business only 12% of sheep producers indicated this was the case, while 42% of grain growers were opting for growth.

“We see this as a potential challenge in terms of getting sheep producers to invest in new technology,” Bruce said.

“You may have the best new technologies but unless an enterprise is looking to expand they won’t invest.”

from a traditional livestock background,” Sandy explained. “These producers tend to take a rational approach to their decision making.”

In support of Bruce Cairns’ observation, those wool producers sticking to their guns are not expanding, let alone at a fast enough rate to compensate for those leaving the industry.

Long-term benchmarking data supports the notion that flock composition is changing.

“Currently, 65% less DSEs are devoted to Merinos than 10 years ago,” Sandy said. “This, combined with the a shift to ewe-dominant flock with a meat focus, is not conducive for stabilising or increasing sheep numbers – if that is the goal.

“Even though there has been a three-fold increase in DSEs devoted to prime lambs, the prime lamb industry is starting from a very low base in number terms,” Sandy said.

“What the industry needs to get their minds around is that replacing wool with sheep meat does not help increase flock numbers. Producers cannot run the same number of meat sheep per hectare as wool sheep.”

In other words a switch from wool to meat means less sheep for the industry not more.

Sandy believes the declining national flock will continue because the wool industry is not making strong enough productivity gains to stay relevant and remain the dominant source of sheep.

“Cropping will still remain the enterprise of choice as current and potential productivity gains make it inherently more profitable and expandable,” Sandy said.

However, Sandy suggests all is not lost for wool: “A core group of wool producers will inevitably remain and if profitability returns, the flock will expand from that core.”

### A broader perspective

Future Farm Industries CRC Research Director Dr Mike Ewing believes there is no need to panic about the recent decline in sheep numbers from a research perspective, given the time frame for developing technologies is often five to 10 years.

“We need to be able to ignore the short-term fluctuations and have a longer-term focus,” Dr Ewing said.

“If you think about it, producers, particularly in mixed farming areas have behaved quite

Benchmarking carried out by private farm business consultants, Holmes Sackett supports Landmark findings. Although, Director and consultant, Sandy McEachern admits up front that Holmes Sackett clients (the source of his analysis) do not represent the wider industry.

“We are dealing with a skewed sample of larger and more profitable producers who come

rationally in recent times – increasing the emphasis on cropping and reducing the emphasis on livestock.

“During early 2009 when producers were planning the current year’s activities, there was a contrasting outlook for crops vs wool, which support the recent trends presented.

“But if we look to early 2010, the position will have changed enormously and cereal outlook is substantially depressed, while the outlook for sheep, particularly wool is substantially better – any further decline in sheep numbers is likely to be reversed within the limits set by reproductive potential.”

Forward-looking producers traditionally use the balance between livestock and cropping to minimise long-term risks and we are likely to see adjustments back towards livestock during the coming 12 months.

According to Dr Ewing this strategy is supported by insights from whole-farm economic analyses developed through MIDAS modelling. Whereas cropping proportions in the range of 70-80% across farms were clearly logical 12 months ago the best profit outlook going forward might be as much as 20% less cropping, creating more opportunities for livestock expansion.

“In developing longer-term research strategies, this more balanced position appears to be the more appropriate context,” Dr Ewing said.

“If they over commit in any one direction it makes it difficult to shift back when the outlook changes.”

“If we look at the situation 12 months ago, when grain prices were in the order of \$350 per tonne, there was a view in some quarters that this represented some fundamental shift in the 10-year price squeeze between livestock and grains,” Dr Ewing said.

“But the events of the past 12 months remind us that this isn’t the case – we still need to have productivity growth across the whole farm business.

“There is no sign that the basic drivers have stopped and pasture and livestock, particularly meat production, remain key drivers of whole-farm profitability.

“A mixed enterprise emphasis is fundamental to the work of the Future Farm Industries CRC.”

### What next?

The Future Farm Industries CRC Board will consider these expert views when it discusses the impact of sheep decline for its port folio of R&D investment. Directors will be advised to consider technology pathways from sheep meat productivity and wool sustainability, each on their own terms. ➤

### ➤ 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)



# Perennials perform well on WA's south coast

By **Catriona Nicholls**  
Kondinin Group

*ABOVE: The ability to provide green feed during summer cement's lucerne's role in productive livestock systems on WA's south coast. (Photo: Paula Jacobsson)*

The latest results from the **EverGraze® – More Livestock from Perennials** Western Australian Proof Site are a testament to the project's adage 'Right plant, Right place Right purpose'.

Even under drought conditions perennials have proven their worth in terms of, productivity and persistence.

WA **EverGraze** Proof Site Leader Paul Sanford said trials in the high-rainfall farming systems of the WA south coast set out to test whether profits from Merino ewes mated to terminal sires could be increased by boosting the weaning percentage and introducing perennials.

"The project also aimed to improve environmental outcomes through reduced groundwater recharge and improved groundcover," Paul said.

The focus of the research was a 60-hectare Proof Site located on Rodney and Bernadette O'Meara's property at Wellstead, 100 kilometres east of Albany, WA. The site is typified by sandy soils, with an average annual rainfall of 550 millimetres.

Pasture types consisted of kikuyu\* (Whittet), lucerne (SARDI 10), summer-active tall fescue (Quantum Max P), chicory (Puna) and setaria/panic (Splenda/green panic) each combined with annual species such as subterranean clover. Merino ewes grazed the site and were joined to Poll Dorset rams – with lambing during July.

### Modelling the outcomes

"Before the research started, we carried out detailed computer modelling to determine the optimum mix of annual and perennials

at the site and the likely returns from using perennials compared with all annual pastures," Paul explained.

The modelling revealed that under average seasonal conditions, the most profitable option would be to combine perennials with annuals on 70 per cent of the farm. Under this scenario, perennials were predicted to increase profits by \$50/ha compared with annual-based pastures (see Table 1).

Later, the profitability of the perennial system was also modelled for a range of seasons including dry and wet years in addition to the average season.

Between 2006-08, researchers took detailed measurements of pasture production, composition, quality and persistence at the site and measured animal performance.

## key points

- Latest **EverGraze** results from south coast Western Australia pitted a combination of perennials and annuals against annuals only for profitability, productivity and persistence
- Computer modelling predicted perennial pastures would out-perform annuals in all but the driest of years
- Under drought conditions perennials still proved their worth and of the species trialled, kikuyu came up trumps for productivity and persistence.

Table 1. Predicted profits based on pasture and animal measurements

Season	Rainfall (mm)	Pasture type	Profit (\$/ha)	Profit difference as a result of perennials (\$/ha)	Optimum % perennial pasture
Pre-experimental modelling assuming average seasonal conditions					
Average season	600	Annual	32	–	–
		Perennial	82	50	70
Profit results based on modelling pasture and animal data					
Dry seasons	378	Annual	-97	–	–
		Perennial	-89	8	30
Average seasons	524	Annual	78	–	–
		Perennial	114	36	40
Wet seasons	646	Annual	230	–	–
		Perennial	302	72	20

**Weed Risk Note:** Kikuyu has a high weed risk in WA, NSW and SA. Any system considering kikuyu should consider the potential risk to other values. In particular, assess whether natural vegetation is at risk. A kikuyu Management Guide is in preparation.

“The measurement period coincided with a period of severe drought, with rainfall of 290, 333 and 427 mm compared with the long-term average of 550 mm,” Paul said.

“It is important to note the economic analysis from the Proof Site is in broad agreement with the modelled dry season.”

### On-the-ground results

The modelling predicted perennials in an average season would increase profit compared with annual pastures. However under the drought conditions experienced, the estimated profitability of perennials and annuals was similar.

According to Paul, the benefit of perennials to a producer's bottom line during a dry year is marginal.

“The perennial advantage during summer and autumn over annuals is reduced due to lack of moisture,” he said.

The losses for both perennial and annual pastures in the region, and limited benefits from perennials, is in line with local producer experience during the past three years.

“Based on the information collected at the site and modelling, we now suggest the optimum perennial area on a farm in this region is 20-40%,” Paul said.

Despite tough seasonal conditions, per-head performance of the ewes mated to terminal sires was high, with weaning rates averaging 120%, weaning weights about 26 kilograms and fleece weights of 4.4 kg/hd greasy. Lamb turn-off averaged 201 kg liveweight/ha.

However, stocking rates were lower than predicted, and had to be reduced from 13 dry sheep equivalents per hectare in early 2007 to 8DSE/ha by 2008 due to drought.

“However, our modelling predicts perennials will be more profitable than annuals during average and wet seasons, by \$36 to \$72 per hectare respectively,” Paul highlighted.

“Perennials can provide pasture growth and green feed during summer when soil moisture is adequate. Annuals finish in spring and only provide dry feed outside the growing season.”

### Pasture performance

All perennials, except kikuyu, were grazed rotationally.

“Kikuyu is best managed under set stocking, but species such as lucerne, chicory, and tall fescue require rotational grazing to allow the rest period critical to their persistence,” Paul explained.

Kikuyu, lucerne, chicory and setaria/panic persisted well throughout the trial period, despite the dry conditions (see Table 2).

“However, the summer-active tall fescue did not persist despite being spelled from grazing during summer and autumn,” Paul revealed.

“The summer-active types of tall fescue are unsuited to the deep sands and variable rainfall of this region. However, results from

Table 2. Pasture growth and basal cover of different perennials at Wellstead

	Year	Kikuyu	Tall fescue	Lucerne	Chicory	Setaria panic	Annual pasture
Pasture yield (tDM/ha)	2006	5.4	4.1	3.9	2.2	1.4	4.0
	2007	4.5	1.2	3.2	2.7	2.3	3.3
	2008	4.6	2.2 <sup>a</sup>	5.4	2.4	2.3	3.4
	TOTAL	14.5	7.5	12.5	7.3	6.0	10.7
Basal cover (%)	2006	84	3.7	1.4	2.7	1.0	—
	2007	85	0.0	0.3	2.6	4.0	—
	2008	97	4.2 <sup>a</sup>	0.3	2.9	5.0	—

<sup>a</sup> resown tall fescue

an *EverGraze* satellite site in the area suggest winter-active tall fescue is persistent during drought as a result of its summer dormancy.”

“In contrast, summer-active tall fescue persisted well on heavier soils with higher rainfall on the west coast of WA and at eastern Australian *EverGraze* sites.”

Kikuyu pasture produced 35% more dry matter than the annual control pasture, demonstrating its drought tolerance and ability to grow and provide green feed during summer and autumn.

During 2008, lucerne had the highest production due to strong growth during summer. Throughout the three years, the area of lucerne sown contracted most likely due to soil constraints. The best of the lucerne maintained plant density throughout the trial, illustrating the importance of site selection.

Chicory yield was lower than the most productive pastures due to a lack of companion annual species to provide winter pasture growth. Particular attention needs to be given to establishing sub-clover and temperate grasses to fill the winter feed gap in chicory pastures. Chicory had the highest forage quality (average 11.2 megajoules/kg and 18.4 % crude protein) so is well suited to young stock during summer and autumn.

The setaria and panic pasture was sown on the poorest soils at the site and so yield was constrained by soil conditions. However, their drought tolerance, particularly that of panic, is very good.

“The results suggest these subtropical grasses have a lower yield potential under sheep grazing than kikuyu in this environment,” Paul said.

### Right plant, Right place, Right purpose

The results from the research highlight the importance of matching plants to soils and landscape and thinking carefully about their intended purpose and management.

‘Kikuyu is King’ on the WA south coast according to Paul. “It is robust, can handle set stocking, survives dry years and provides groundcover and green feed during summer.

“It responds to summer rain and fits well with sheep systems on the south coast.

“Furthermore, kikuyu will maintain sheep through autumn, allow higher stocking

rates and reduced supplementary feed requirements.”

Paul does concede that lucerne provides a highly nutritious feed for livestock during late spring through to autumn.

However, it is only suited to particular soils (soil pH(CaCl<sub>2</sub>) > 5) and rotational grazing is essential for persistence.

Chicory's persistence was surprising and the Wellstead experience shows it is drought tolerant. While yield was lower than other species, it provided high-quality forage and when used correctly to finish lambs or to flush ewes before joining, has a purpose on many farms in the region.

“The important thing is to plant chicory with a winter-active species,” Paul advised.

“In contrast, summer-active tall fescue was not the right plant for the region but is suited to heavier soils in higher-rainfall areas.”

### Looking to the future

*EverGraze* in WA is moving to measure the on-farm benefits of perennials at four locations from Manjimup to Esperance. At each site, researchers will measure pasture and animal performance on annual and perennial pastures under typical farming conditions. The measurements will provide a better idea of the likely benefits of perennials in different soil, climate and grazing situations.

In addition, *EverGraze* has 10 on-farm Supporting Sites where producers are measuring their pastures and animals.

Paul would like to acknowledge the team involved with this research, Eric Dobbe, Paula Jacobsson, Elysha McCready, Jeremy Ryan, Andrew Bathgate and John Young. Details of these sites, current results, farm case studies and fact sheets detailing the management and use of perennials are available the *EverGraze* website [www.evergraze.com.au](http://www.evergraze.com.au).

*EverGraze*® is a FFI CRC, MLA and AWI research and delivery partnership. ↓

### More information

Paul Sanford, DAFWA  
T: (08) 9892 8475  
E: [paul.sanford@agric.wa.gov.au](mailto:paul.sanford@agric.wa.gov.au)

# Quality student program cultivates next generation

Quality researchers are essential for the future of sustainable agriculture in Australia. The Future Farm Industries CRC's *Postgraduate Development Program* (PDP) has played a key role in ensuring the continuity of research and fostering the next generation of researchers.

The Program started in the former Salinity CRC during 2002 and then transferred to the Future Farm Industries CRC. A key feature of the Program is it recognises the need for graduates to apply their research skills as soon as their studies have finished – to be 'industry ready'.

The Program's objectives despite the transition have provided all (CRC) postgraduates with:

- An opportunity to gather annually
- Financial assistance to attend conferences
- Financial assistance to enhance professional development.

## Building networks

Future Farm Industries CRC Education Manager, Daryll Richardson explained that the CRC postgraduate annual gatherings have been a central element of the Program.

"During these gatherings, postgraduates participate in a range of formal and

## key points

- The Future Farm Industries CRC Postgraduate Development Program has provided a myriad of opportunities for participating students to develop skills and networks for a future in agricultural research
- The Program provides participants with mentoring and financial support while building a sound network of professional support
- Since its inception during 2002, 117 postgraduate researchers from 11 universities have participated in the Program.



By Jill Griffiths  
Kondinin Group

informal activities designed to increase their professional skills, give insight into other CRC research activities, develop knowledge of issues affecting Australian agriculture, and build their professional networks," Daryll said.

Many postgraduates cite these events as the highlight of being a CRC postgraduate.

*"These opportunities allowed me to develop confidence in presenting my research, learn from other students about up-to-date salinity research activities and results. I was very conscious at this time that I was part of a growing network of future scientists who would provide the generation of knowledge to manage such a significant natural resource management issue in Australia as salinity."*

DR ANNA DUTKIEWICZ (2003-2007:  
THE UNIVERSITY OF ADELAIDE).

*"...perhaps the most enjoyable aspect of the Program was the annual student meetings from which I have established many long-term friendships and professional relationships with other early-career researchers... the meetings provided a great opportunity for me and my fellow postgrads to learn about the other research being conducted within the CRC, discuss and lament everyday problems and issues, as well as engage in argument and thinking on many contemporary global issues."*

DR LINDSAY BELL (2002-2006: THE UNIVERSITY  
OF WESTERN AUSTRALIA).

According to Daryll, the annual event is essential for establishing 'connections' among the postgraduate group, exposing them to CRC research occurring outside their own discipline and providing opportunities to engage with senior CRC researchers.

He said; "Meetings are planned to maximise opportunities to meet CRC and non-CRC scientists and are timed, where possible, to coincide with other planned CRC activities."

## Attending conferences

Postgraduates are encouraged to attend national and international conferences based on themes relevant to the CRC's mission. Conference attendance exposes postgraduates to both the scientific and broader communities.

"Here students have the opportunity to present their work and learn about other relevant research," Daryll said.

Conference attendance has been a significant and well funded component of the Program.

*"Financial support throughout my candidature was generous, allowing me to travel, attend and present at national and international conferences, which were integral experiences in my early scientific career. I feel that all these benefits of the PDP add up to provide me with a substantial base of skills, knowledge, support and experience that may not have been available to me as post-graduate researcher elsewhere."*

DR MELISSA MILLAR (2004-2008: THE UNIVERSITY  
OF WESTERN AUSTRALIA).

*"...with support from the CRC I have presented my research at student meetings, attended and presented at conferences, both nationally and internationally and most recently, communicated my work to a broad audience at the CRCA conference in Canberra. This experience has encouraged me to network with other students and scientists from across Australia and has provided an invaluable opportunity to reflect on my research outcomes and the future direction of my project."*

MELISSA FRASER (2005 - ONGOING: THE UNIVERSITY  
OF ADELAIDE).



ABOVE: Annual gatherings allowed students to develop strong connections and share their experiences. Back row left to right: Kim Brooksbank (UWA), Wendy March (CSU), Cathy Waters (CSU), Nikki Mouat (UWA) in front of Maggie Raeside (CSU), Sarah Rich (UWA), Justin Hughes (CSU), Richard Bennett (UWA). Front row left to right: Robyn Whipp (CSU), Daryll Richardson (CRC), Eleftheria Dalmaris (UWA), Sommer Jenkins (UWA), Lori Kroiss (UWA). (Photo: Random bushwalker)

*“...the CRC awarded me a travel grant to attend the Australian and New Zealand Society of Animal Production (ANZSAP) conference in Brisbane. Here I was able to meet key researchers in my research area, pick their brains for some good ideas and most importantly, develop contacts for future research. It was a fantastic trip that inspired me to keep working hard and focus on my career aspirations.”*

CATHERINE GULLIVER (2008 - ONGOING: CHARLES STURT UNIVERSITY).

### Well represented

At the Second International Salinity Forum in Adelaide during 2008, there were 45 CRC postgraduate delegates registered for the event of a total of more than 400, (slightly more than 10 per cent of the total delegate list). Postgraduate researchers presented 19 oral papers and five posters and took out the



best two oral presentation awards (Richard Bennett, Nikki Mouat) and the best poster (Bree Wilson), also making a significant contribution to Forum outcomes.

Postgraduate research has been presented on behalf of the CRC at events all around the globe with the support of the Program. Papers have been presented at 25 international conferences in Europe, Asia, North and South America, New Zealand and South Africa. With CRC support, 67 papers and posters have been presented at national conferences across all Australian states.

### Professional development

Postgraduates are given opportunities to participate in CRC-organised professional development. While participation is voluntary and a small number of postgraduates have chosen not to become involved, the participation rate has been greater than 80%.

“Topics for workshops vary greatly and are selected based on advice from senior CRC researchers in terms of the skills required by emerging scientists,” Daryll said.

“Participants also provide feedback on the types of training activities they believe will enhance their professional development.”

Past workshop topics have included; intellectual property, leadership skills, communication skills, project management, conflict resolution, getting your paper published, ‘Salty Business’/‘Future Farm Business’, job seeking skills, interview skills, working with the media, and ‘PowerPoint anarchy’.

Support has also been provided to individual postgraduates for other activities, such as statistical analysis and scientific writing courses.

### Considerable contribution

While the intent of the Program is to ensure graduates are industry ready, postgraduate research carried out to date has contributed greatly to a range of wider CRC activities. PhD research is an important element in the overall output of the CRC, with many postgraduate researchers having links to larger CRC projects (for example, *EverGraze*<sup>®</sup> and *INFFER*<sup>™</sup>).

The knowledge generated by individual projects contributes to overall project outcomes, and to CRC intellectual property.

CRC project teams also capitalise on and enhance the contribution of postgraduate research by recruiting students for specific projects.

“Where possible, PhD researchers are embedded in larger projects, enabling them to contribute to broader research outcomes, while developing teamwork and communication skills,” Daryll said.

LEFT: Carrying out a PhD in a supportive environment has been critical to the Program’s success according to current student Richard Bennett. (Photo: Lalith Suriyagoda, FFI CRC PhD Student)

### Elements of success

Since the Program started during 2002, 117 postgraduate students from 11 universities have participated. Students have come from almost all disciplines in the agricultural research sector. Of those enrolled between 2001 and 2003, the completion rate is 78%. Four students (11%) are currently enrolled and another four withdrew during the first two years of the PhD Program.

The figures compare favourably with a national study\* of postgraduates that showed only 53% of students completed their studies after eight years.

The impressive success rate of the Future Farm Industries CRC PhD Program is at least partly due to the fact that ongoing involvement with the CRC gives postgraduates support from outside their institutions. Postgraduates have access to advocacy and additional guidance not necessarily available in a more traditional postgraduate environment.

*“One of the most important things for me has been the peace of mind that comes with knowing that there is an advocate in Daryll if anything goes askew with my institution (or anything else for that matter). Luckily, I haven’t really needed to draw on this, but it’s nice to know the support is there.”*

SERENITY HILL (2008 - ONGOING: THE UNIVERSITY OF MELBOURNE).

*“On the whole, the CRC PDP experience of working together in team-building exercises, networking with fellow postgraduates and researchers and opportunities to learn about the research and administration that makes up the CRC has given me a sense of belonging to a large research team that is working on a common cause. This is one impact of the PDP that stands out for me – the development of a sense of purpose and a sense of place within a large research team – and this has been an incredibly valuable source of motivation for my PhD and future career.”*

RICHARD BENNETT (2006 - ONGOING: UWA). ↘

### More information

Daryll Richardson, Future Farm Industries CRC

T: (07) 5446 6094

E: drichardson@agaveeducation.com.au

> \*Martin, Y. M., Maclachlan, M. and Karmel, T. 2001. Postgraduate completion rates. Canberra: Department of Education, Training and Youth Affairs. (quoted in Richardson, see below)

All student quotes taken from: Impact of the Future Farm Industries CRC’s Postgraduate Professional Development Program, prepared by Daryll Richardson. <

# Woody perennials – not as tough as you may think



By Catriona Nicholls  
Kondinin Group

The recent completion of the Rural Industries Research and Development Corporation (RIRDC) and Future Farm Industries CRC-funded *Direct seeding of woody crops* project has been somewhat of a myth-busting exercise according to project leader Dr Geoff Woodall, University of Western Australia (UWA).

“One of the key assumptions about native woody perennials has been that because they are indigenous plants, they are tough enough to establish in local conditions without too much support,” Dr Woodall said.

## key points

- Supplementary nitrogen nutrition is of key importance to improving the reliability of direct seeding native woody perennials
- Seed placement in a stable soil environment at the right depth will increase establishment success
- Water harvesting is essential in dry environments
- Native woody perennials are at risk of attack from the same suite of pests and diseases as many more traditional crops.

“But our investigations have revealed that the reality is these fine-seeded plants need as much tender loving care as many of our more traditional crop species, such as canola.

Four eucalyptus species – *E. cladocalyx*, *E. loxophleba*, *E. polybractea* and *E. occidentalis* – were the main subjects studies, as they represent a group of plants practitioners have difficulty establishing from field-sown seed. The group also has considerable commercial potential and the findings are relevant to other eucalypts used in revegetation and biodiversity projects.

A series of laboratory experiments was used to investigate germination characteristics and the effectiveness of enhancement strategies. Pot trials were used to investigate general germination biology and numerous field trials were used to investigate herbicide responses, best-bet treatments and the interaction between site preparation and soil moisture.

Dr Woodall said that some of the key findings suggest that success with direct seeding will be greatest if soil nutrition (especially soil nitrogen) is optimal, seed is placed at the right depth in a stable soil environment that efficiently harvests water and pests, weeds and diseases are well managed during the early growth stages.

### Nitrogen responses

It was the large differences in early growth between soils collected from sites that were

ultimately revegetated, that led Dr Woodall and his team to develop a working hypothesis that ‘nutrition may be of importance’.

“Direct seeding practitioners do not tend to use supplementary fertilisers when direct seeding native plants,” Dr Woodall said.

“The general view – including my own – was that our agricultural soils are nutrient enriched and native plants don’t require supplementary nutrition.

“However, in two soils collected from areas where commercial revegetation had been implemented, we observed a significant response to the addition of supplementary fertiliser.”

Further investigation revealed the response was due to the addition of nitrogen.

“Averaged across two mallee species, the addition of nitrogen in the form of ammonium delivered a greater than 10-fold increase in total plant biomass when compared with seedlings provided either a balanced nitrogen-free nutrient regime or given no supplementary nutrition at all – control plants watered with rainwater only,” Dr Woodall explained (see Figure 1).

“What was most impressive was that this increase occurred during a very short period – 34 days,” Dr Woodall said.

“The net result was the production of larger, more robust seedlings in a time-frame relevant to the short growing season available in the dryland agricultural regions of southern Australia.”

LEFT: Dr Woodall at trial site preparations in the WA wheatbelt. A stable soil environment that harvests water, accurate seed placement and sufficient soil nitrogen are critical to the success of establishing native woody perennials. (Photo: Dr Geoff Woodall)

### Well placed for success

The project also highlighted why precision machinery and seeding depth is so important to the successful establishment of woody perennials.

“Good seed placement creates a stable soil niche,” Dr Woodall said. “We discovered the absolute importance of a stable soil niche for fine-seeded woody crops.

“These plants cannot stand up to any washing and blowing of the soil and success depends heavily on minimal soil movement post seeding.

“Eucalypts also have a low level of plasticity to sowing depth when compared with agricultural crops,” Dr Woodall said (see Figure 2).

“However, all fine-seeded species can be sown deeper than previously thought.”

As such, Dr Woodall recommends practitioners not use current and widely published rules of thumb to guide seeding depth.

“Sow eucalypts that have medium-sized seed (for example *E. cladocalyx* and *E. occidentalis*) at a depth of 10 millimetres in light-textured soils and at 5 mm in medium- to heavy-textured soils,” Dr Woodall said.

“If dry conditions prevail or are expected seed use, efficiency can be compromised and seeds sown at a depth of 15 mm.

“For fine-seeded eucalypts (for example *E. polybractea* and *E. loxophleba*) sow seeds at 5-10 mm in light-textured soils and 5 mm in medium- to heavy-textured soils.

Dr Woodall warns that these guidelines should not be used for myrtaceous species that require light for germination.

FIGURE 1. Eucalyptus species response to nitrogen

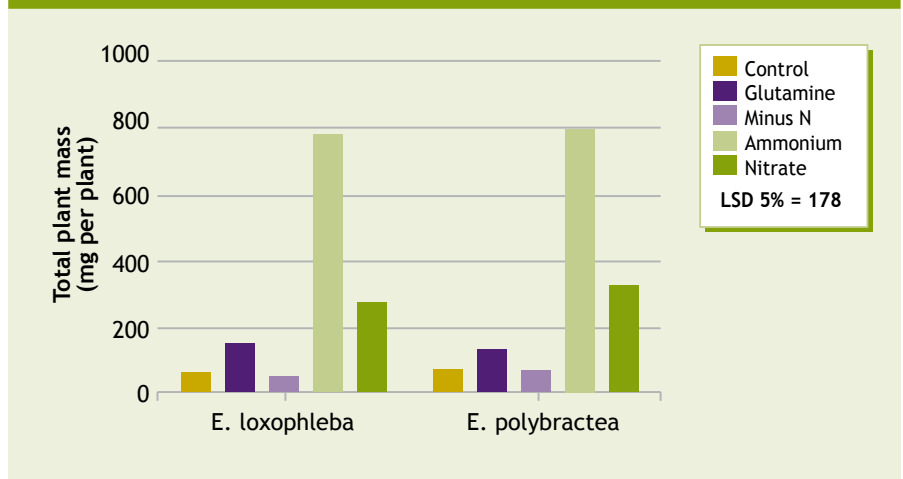
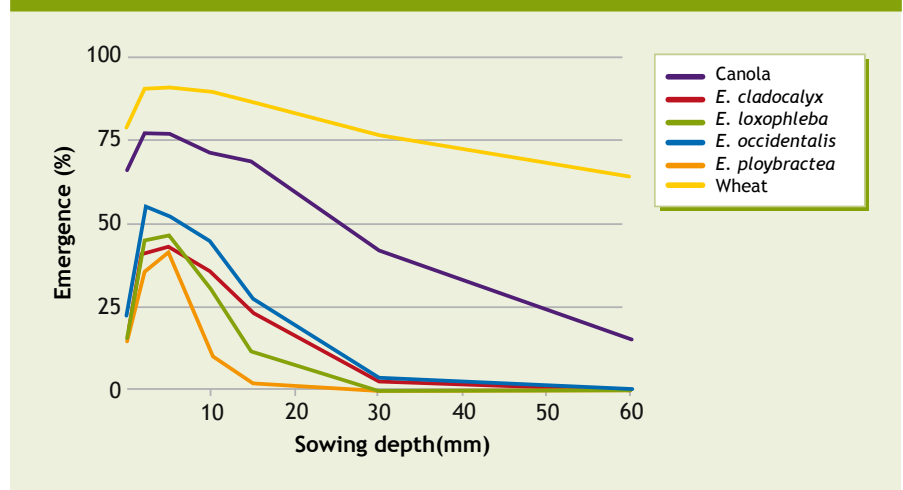


FIGURE 2. Effect of sowing depth on emergence



### Protection a must

“The common position before the project was that native plants were quite robust,” Geoff said. “The key message from our research is that they’re very susceptible to the same suite of pests and diseases that cause problems in traditional crop establishment.

“Insect pests present in agricultural land were shown to cause major problems to all species we investigated.”

Redlegged earth mite (RLEM) was only one of many pests responsible for seedling damage and death, and tolerance varied greatly among species.

“Seedlings do eventually become robust when they reach the four-to-six leaf stage,” Dr Woodall.

### Looking forward

While much insight has been gained throughout the project, Dr Woodall believes

the early results require fine tuning through further investigation.

“We’re not at the stage where we have a total agronomy package, instead we have ironed out a few of the key preliminary issues that determine success under field conditions.

“This project gives us a really strong backbone to go forward from here,” Dr Woodall said. “Not only to produce an economic establishment method for commercial-scale operations, but also for revegetation work and projects focussed around increasing landscape biodiversity.”

Dr Woodall’s plan is to mull out the results in various environments through more field testing before rolling the findings out on a commercial scale.

Dr Woodall collaborated with researchers from UWA and DAFWA and Kings Park. ↘

### More information

Dr Geoff Woodall, UWA

T: 0427 449 644

E: geoff.woodall@uwa.edu.au

LEFT: Project findings reveal seeding depth recommendations could need some revision. (Photo: Kondinin Group)



# Upstaged: Barley steals the salt-tolerance limelight

By Laureta Wallace  
Kondinin Group

ABOVE: The profile of barley as a salt-tolerant crop has been raised significantly with the unexpected outcomes of recent wheat trials. (Photo: Dr Ed Barrett-Lennard)

**B**y chance, Future Farm Industries CRC plant researchers are changing the way they think about salt-tolerant cereals and their development.

Department of Agriculture and Food Western Australia (DAFWA) Principal Research Officer Dr Ed Barrett-Lennard says the change is the result of a bit of ‘serendipity’ during a recent field experiment funded by the Future Farm Industries CRC and the Grains Research and Development Corporation (GRDC).

“During the past two years, we have conducted a proof-of-concept trial comparing the performance of the salt- and waterlogging-tolerant sea barleygrass/wheat amphiploid, with its wheat parent (cv. Westonia) and a barley cultivar (CM72),” Dr Barrett-Lennard said.

“Unexpectedly, the barley performed exceptionally well when waterlogging was not present – it had higher biomass production than either the wheat or the amphiploid.”

The two-year trial was carried out on the Lake Grace property of Michael Lloyd

former chairman of WA’s Saltland Pastures Association.

“The property varies widely in its salinity status and this gave us the opportunity to lay out a number of plots of different salinity over a reasonably short distance,” Dr Barrett-Lennard said.

“During this time we measured the salt concentrations in the soil solution at different soil depths on a monthly basis – a practice that is not usually performed in this type of trial.

“We discovered salt concentrations were highest at the start of the season, declined as salt was leached from the soil by winter rainfall, and then rose again at the end of the growing season as the soils dried out.”

According to Dr Barrett-Lennard, the findings raise the profile of barley as a salt-tolerant crop.

“We’ve always known that barley has the reputation for being more salt tolerant than wheat, but measuring the ongoing salt concentrations and witnessing the performance of the CM72 was a revelation,” Dr Barrett-Lennard said.

“We now have a far clearer picture of which traits are desirable for salt-tolerant cereals.”

These traits include:

- High salt-tolerance during germination and establishment
- High salt-tolerance during grain fill
- A short-growing season.

“By having a short growing season, say 100 days, the crop is done and dusted before salinity rises to a dangerous level again,” Dr Barrett-Lennard said.

“This was particularly evident when we harvested this year’s cereal trial during mid-November.

“In general, the yields of the longer-season cereals was low.

“Even at the relatively benign end of our salinity transects, our measurements revealed that by early October salt concentrations in the top 100-250 millimetres of soil had risen to about 70 per cent of the salinity of seawater.

“Under these conditions only the short season CM72 had reasonable yields.

“People’s first reaction when I mention growing cereals with a shorter growing season is that there may be a loss of yield due to the lack of tillering.

“But our suggestion is that we need to focus primarily on filling the head on the main culm and letting the grains in this part of the plant ripen and finish as fast as possible.”

## Insightful outcomes

Dr Barrett-Lennard said the past two years had revealed an interesting ‘set of insights’ for himself and his colleagues about the methods being currently used for salt-tolerance screening.

“During recent years there has been an increased focus on the screening of plants for salt tolerance in climate controlled glasshouses,” Dr Barrett-Lennard said.

“Although this approach does have practical advantages, our work suggests that glasshouse screenings need to be tightly linked with field screening that better represent the real world.”

“While work on the cultivar will continue, we remain committed to the development of a wheat amphiploid with better waterlogging and salinity tolerance.” 🌱

## More information

Dr Ed Barrett Lennard

T: 0418 133 611

E: [ed.barrett-lennard@agric.wa.gov.au](mailto:ed.barrett-lennard@agric.wa.gov.au)

## i key points

- To be productive in saline areas, crops need to have high levels of salt-tolerance during germination and establishment as well as at seed fill
- Selecting plants with a short growing season is also beneficial as it enables plants to avoid the rise in salt concentrations that generally occurs at the end of the season as soil dries out
- Testing for salt-tolerance is best carried out using combinations of field and glasshouse screening.

New drought-tolerant plants being developed by the South Australia Research and Development Institute (SARDI) are now protected by a two-hectare bird-proof enclosure. The \$70,000 enclosure located at SARDI's Genetic Resources Centre at the Waite Campus, Urrbae will be integral in the development of plants suited to withstand the rigours of climate change.

By eliminating bird damage, germplasm representing a diverse range of native and exotic pasture and shrub species can now be reliably established, characterised and harvested for agricultural and environmental research and ultimately the development of new plants and management techniques.

### Under attack

Before the establishment of the new enclosure SARDI Genetic Resource Centre staff went to incredible lengths to protect valuable plants that were besieged year-round – first by pigeons, then ducks and then cockatoos. At one stage, staff mounted a 24-hour-watch from a nearby caravan, always at the ready to shoo away birds.

Other bird-repellent methods have been tried with limited success, including scarecrows, eagle kites, bird wire and chemical repellent. More recently, 1000 mobile steel cages were systematically, and manually moved between the plots. Although successful for low-growing annual species, these cages were extremely laborious and became of limited value when the emphasis on new germplasm shifted towards perennial species, especially the shrubs.

The new enclosure will now allow research to nurture and develop new varieties unhindered by bird attack.

### Native shrub focus

A major research program currently underway within the new enclosure is assessing about 80 Australian native shrub species. Sourced predominately from remote inland areas, these species are being grown alongside a larger-scale seed orchard of 20 'best bet' species as the foundation for the research and development of the Future Farm Industries CRC, *Enrich*<sup>™</sup> project – identifying new shrubs and profitable systems for livestock industries.

The enclosure also provides a safe and secure environment for the seed multiplication of new CRC-funded *Lotus corniculatus* cultivars (for more information see *Focus on Perennials* Issue 8). It also includes 240 plots of *Cullen australasicum* a native leguminous sub-shrub under development within the CRC's *Perennial Legumes For A Dry Mediterranean Climate* project (for more information see *Focus on perennials* Issue 2).



# Bird-proof cage keeps research under wraps

By Steve Hughes  
SARDI

ABOVE: The new bird-proof enclosure will relieve SARDI research staff from their bird watching duties in the name of plant protection. (back row, left to right) Steve Robinson, Jake Howie, Steve Hughes, Hugh Drum (front row Left to right) Michelle Williams, Amanda Benger, Geoff Auricht, Erica Marshall, Yanjing Wang. (Photo: Grace Taylor, SARDI)

### Recognising research

The new bird-proof enclosure was named after SA's first Plant Introduction Officer and Genebank Curator – Eric Crawford. Eric established the Australian Medicago Genetic Resource Centre and developed many pasture cultivars for low- to medium-rainfall zones in SA during his 40-year career, until his retirement during 1989.

The SA Minister for Agriculture, Food and Fisheries, Paul Caica, officially opened the enclosure in Adelaide on the September 17. Guests included representatives from PIRSA, SARDI, DWLBC, CSIRO, Adelaide University, the Australian Centre for Plant Functional Genomics, SAFF, AusIndustry, GRDC Southern Panel, Future Farm Industries CRC, The Australian Seed Federation, private seed companies and agricultural suppliers as well as scientists and related staff, along with Eric Crawford and his family.

Minister Caica explained that the new enclosure was a nationally-significant investment, which would play an important

role in securing agriculture across Australia under increasingly harsh climate conditions.

"Pastures underpin Australia's annual \$21 billion grazing industries, and add \$1 billion in value each year to SA farming systems. This new enclosure means a diverse range of native and exotic pasture and shrub species, from clovers and lucerne to grasses and dryland shrubs, can now be grown safely for agricultural and environmental research," he said.

"This research provides the building blocks for future food supplies as farmers look to new pasture varieties to cope with more extreme weather conditions, water shortage, the need for new perennials for improved livestock production, as well as managing the carbon balance. The pastures also provide groundcover to safeguard our soils."

"SARDI's Pasture Research plots protected by this enclosure represent the future foundation of SA's – and much of Australia's – pasture industry, as most plants and shrubs that are eventually introduced into farming practice start here."

The SA State Government funded the Eric Crawford Pasture Enclosure with the AW Howard Memorial Trust provided funding for the rock-mounted memorial plaque and opening ceremony. ↴

### More information

Steve Hughes, SARDI  
T: (08) 8303 9408  
E: [steve.hughes@sa.gov.au](mailto:steve.hughes@sa.gov.au)

## key points

- A bird-proof enclosure in South Australia is protecting some of the nation's most precious perennial plant germplasm
- Bird attack was a major threat to research programs investigating the potential of a range of native and exotic pasture and shrub species
- The development of new perennial species will prove critical in the toolkit required to meet climate change challenges.

# About Focus on Perennials

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

Future Farm Industries CRC was established in 2007 under the Commonwealth Government's CRC Program and builds on the research of the CRC for Plant-based Management of Dryland Salinity. Future Farm Industries 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 Future Farm Industries 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 Future Farm Industries CRC to assist public knowledge and discussion and to help improve profitability of farming and sustainable management of natural resources and biodiversity. Neither Future Farm Industries 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 me 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



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)



## Future Farm Industries CRC Contacts:

### CHIEF EXECUTIVE OFFICER

Kevin Goss

T: (08) 6488 2555

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

### RESEARCH DIRECTOR

Mike Ewing

T: (08) 6488 1876

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

### AGRIBUSINESS DIRECTOR

Scott Glyde

T: 0427 517 279

E: [sglyde@csu.edu.au](mailto:sglyde@csu.edu.au)

### COMMERCIAL MANAGER

Peter Zurzolo

T: (08) 6488 1429

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

Design & production:  
Kopdinin Information Services

Front cover:  
Photo: Paula Jacobsson

