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Published by Bereku Pty. Ltd.,

40 Creek Street, Brisbane

Registered by Australia Post Publication No.

PP100002295. ISSN 1449-2970.

Published bi-monthly.

Grain Yearbook published in April

**FRONT COVER**

Jessica Crettenden (pictured) has been researching the effect of sheep grazing on wheat performance. After seven years of trials – coordinated by the Minnepa Agricultural Centre in SA – results indicate an improvement in outcomes for the whole farming system. See article page 6. (PHOTO: Robert Lang)



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**T**HE early July release of the federal government's Agricultural Competitiveness White Paper appears to be a pleasing and long-awaited step in the right direction. There will be a few dismissive moans along the lines of "here we go again" or "looks like the script for a new series of Utopia" but this document – and the new policy direction outlined – promises a lot more. The White Paper shows there is undeniable support from Canberra for the farm industry and that the powers that be are gearing up to put words into action. In fact some initiatives have already been enacted such as doubling the level of farm management deposits from \$400,000 to \$800,000 as well as allowing farmers to use their FMDs as a loan offset to reduce interest. There is a lot of emphasis on using the hand of government to help create a business and infrastructure environment that nurtures and encourages smarter farming and ultimately more efficient delivery of Australian farm products to premium markets.



The White Paper also outlines policy directions which potentially puts more of the 'business side' of farming back into the hands of growers. There is a \$14 million package to help farmers form cooperatives – this is a turnaround from the pattern of demutualisations of the past couple of decades. The Business Council of Co-operatives and Mutuals chief executive Melina Morrison, says this will improve growers' access to information on forming cooperatives so that they can compete for better access up and down the supply chain and a fairer return at the farm gate.

There is also on-the-ground funding to help farmers to be better prepared for the inevitable vagaries of farming with more appropriate risk management insurance packages (see Jay Horton's article on page 31).

All in all, the White Paper is an ambitious and welcome move towards creating the framework for a more efficient and dynamic farm sector – it deserves industry-wide support to help turn platitudes into practice.

## **Cotton Trade Show image has gone a little 'grainy'**

The trade show – Narrabri August 5–6 – again incorporates a Modern Cropping Systems Expo featuring summer and winter crop rotations, both irrigated and broadacre. With over a hundred leading edge companies exhibiting there's plenty for the grain grower: grain handling; new PBR grain varieties; broadacre machinery including new gear from Precision Seeding Solutions and all the Precision Farming suppliers are on-site: Satamap; SST Software, Topcon Precision Ag; Trimble Ag, and Precision Cropping Technologies – [see www.cottontradeshow.com.au](http://www.cottontradeshow.com.au)

## **Central Europe, Alps & Anzacs**

There are still a few spots left on the Australian Grain/Greenmount Travel farm study tour to Central and Eastern Europe. But with a departure date of September 4, you need to be quick.

It has been more than 25 years since the collapse of the Soviet collective system which made way for a 'new' way of farming throughout many countries in Central and Eastern Europe. This tour takes in fertile farmlands, the stunning Swiss Alps, beautiful medieval cities, the magical Danube River and much more – all culminating in an emotion-stirring visit to Gallipoli.

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## **In this issue...**

### **Grain and graze a winning combo**

Integrating sheep grazing into a cropping system improves productivity, as demonstrated by a seven year trial on the Eyre Peninsula, South Australia. Jessica Crettenden says the trial shows that over a range of seasons, grazing sheep improves overall outcomes.



**See article . . . . . Page 6**

### **Research probes profitability of OP vs hybrid canola**

As canola production spreads into lower rainfall areas from its traditional high rainfall heartland, an important question facing growers is whether to grow hybrid or open pollinated (OP) canola varieties.



**See article . . . . . Page 13**

### **National roundup of grain farm sales**

Confidence levels in the national grain property market are currently considered firm on the back of strong commodity prices and low interest rates. But in the regions where adverse climatic conditions have prevailed for extended periods, there is reduced buyer confidence.

**See article . . . . . Page 18**

### **Classic Tractor Tales:**

#### **Fuel for thought**

Can you imagine pulling into a service station and filling up your vehicle's fuel tank with gunpowder? Or how about filling the tractor tank with coal dust? Sounds a bit bizarre certainly. But away back in the days of yore (had there been cars and tractors then) it would not have seemed so weird.



**See article . . . . . Page 20**

### **In-crop weed control in pulses**

Some growers are facing a challenge to manage high density, herbicide resistant annual ryegrass populations in chickpea this year, potentially limiting yield.



**See article . . . . . Page 33**





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# Grain and graze proves a winning combo in seven-year trial

■ By Rebecca Barr

**I**NTEGRATING sheep grazing into a cropping system improves productivity, as demonstrated by a seven year, GRDC-funded Grain and Graze trial on the Eyre Peninsula, South Australia.

SARDI research officer Jessica Crettenden, from the Minnipa Agricultural Centre (MAC), says the trial shows that over a range of seasons, grazing sheep improves overall outcomes.

“Over seven seasons, incorporating sheep into the rotation has no negative effects on wheat performance, while improving weed and pest control and nitrogen cycling,” she said.

The trial found no decrease in organic carbon over time, and no negative effect on soil health, quelling common grower

concerns that sheep will adversely affect crop production.

Since 2008, the trial has incorporated a wheat-wheat-medic rotation. Four options were compared;

- Low inputs without grazing;
- Low inputs with grazing;
- High inputs with grazing; and
- High inputs without grazing.

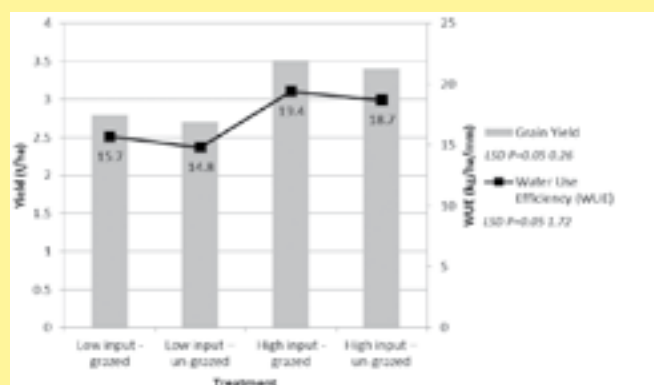
In the wheat crops, high inputs were achieved through higher fertiliser application, for example 13 kg N and 15 kg P in 2014 compared to 7 kg N and 8 kg P in the low input paddock. In pastures the high input scenario simulated rotational grazing with higher stocking rates in an improved pasture, including re-sowing the medic in 2010.

In the ‘grazed’ options, sheep grazed the medic as well as wheat stubbles. Stocking density averaged 8 to 12 DSE per hectare in summer and 15 to 22 DSE per hectare in winter for high-input, compared to 2 to 4 DSE per hectare in summer and 7 to 11 DSE per hectare in winter in the low-input option, with stocking rate determined by feed on offer.

“Across all years, the wheat grain yield was the same or higher in the paddocks that had been grazed compared to the un-grazed paddocks with the same inputs, and the high input options gave higher yields than the low input,” Jessica said.

Figure 1 demonstrates that in 2014, high input-grazed produced the highest yield and water use efficiency (WUE), followed by high-input un-grazed, low-input grazed and low input un-grazed, which Jessica said was representative of the overall results.

**FIGURE 1: Grain yield (t/ha, bars) and water use efficiency (kg/ha/mm, line) for 2014 wheat**



Further work in 2015 and 2016 will consider the cost versus the benefit to achieve the higher yields of the high-input scenarios.

## Grazing benefits

“With no decrease to wheat yields over seven years, the trial has proven that sheep don’t negatively impact on any component of the cropping system, including water use efficiency, soil quality, soil nutrients (nitrogen, organic carbon and phosphorous), pests or diseases in the cropping phase as a result of sheep grazing.



Jessica Crettenden has been researching the effect of grazing on wheat performance at the Minnipa Agricultural Centre. (Photo: Robert Lang)

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But further to that, we've found a number of benefits that come along with grazing sheep in break years," Jessica said.

A major benefit is improved weed control. Grassy weeds including ryegrass, brome and barley grass are a significant issue



**Sheep grazing medic pasture at the Minnipa Agricultural Centre in August 2012.**

on the Eyre Peninsula, with dormancy and herbicide resistance development reducing control options.

"While some growers might be concerned the grazing will increase weed problems, we have seen a visual reduction in summer weed populations where grazing is used, with yield results showing improved water use efficiency in the following crop. By grazing pastures in break years, the animals can keep down the size of the weeds, delaying seed set," Jessica said.

"The sheep are making use of what would otherwise be a waste product – the weed biomass – while keeping weed size down so they can be adequately controlled."

A second benefit was in pest control. Reduced populations of both mice and snails have been observed in the grazed paddocks, with 50 per cent reduction of live snails recorded in the summer of 2013.

"Snails are effected by stubble grazing, because the sheep knockdown the stubbles, so the snails cannot retreat up the stubble in high temperatures and they die. Grazing over summer also eliminates the feed and habitat source for mice," she said.

Soil health factors were also monitored, with no change seen in organic carbon levels, or erosion. An increase in nitrogen cycling was observed in the grazed areas, with an average increase of total mineral nitrogen of 52 per cent and 37 per

## ALTERNATIVE OPTIONS FOR BARLEY GRASS CONTROL

Barley grass has become a major weed in northern Eyre Peninsula in recent years, causing high control costs and yield losses. Through the GRDC projects 'Maintaining profitability in retained stubble systems' and 'Overdependence on Agrochemicals', researchers at the SARDI Minnipa Agricultural Centre are investigating methods to control the problem weed.

Senior research officer Amanda Cook is currently doing trials and on-farm monitoring to look at alternative options for weed control in low rainfall farming systems other than relying on current chemical options for barley grass control.

Research by the University of Adelaide has shown that barley grass has developed high levels of dormancy in cropping situations, due to selection pressure from practices such as knockdown herbicides. Barley grass seeds taken from paddocks had much higher levels of dormancy, well into winter, compared to fence-lines or pastures.

The longer term use of winter cleaning barley grass in low rainfall systems has resulted in some Group A herbicide resistance being detected in paddocks.

"The development of dormancy means we can't effectively control barley grass before sowing with knockdowns, and the early seed shedding habit means we are unsure of control levels at harvest with options like weed seed collection," Amanda said.

### Other control options in low rainfall systems

"Other options which still need to be researched in low rainfall systems are increased crop competition, two year breaks for lowering weed seed banks, other cultural methods and alternative in-crop herbicides."

Barley grass is particularly difficult to control using weed seed collection compared to ryegrass because the weed sheds seeds before harvest. The level of weed seed capture is being investigated in farm paddocks at the Minnipa Ag Centre and at local farmer Bruce Heddle's property with weed seed capture systems in place.

"Stubble retained systems create a further challenge, because of the reduced effectiveness of pre-emergent herbicides. A trial



**SARDI researcher Amanda Cook is investigating methods to control barley grass. (Photo: Robert Lang)**

with three different stubble management systems – a windrow system, spread stubble and stubble removed by burning – has been established at the Minnipa Ag Centre this season to investigate chemical performance and barley grass weed control," Amanda said.

Another trial being performed at the Minnipa Ag Centre by University Adelaide researcher Ben Fleet is aiming to reduce the barley grass weed seed bank by using two years of alternative control options, such as pasture topping or cutting for hay before seed shedding.

While some chemical options may be too expensive for growers in low rainfall systems, using two year breaks within rotation of break crops may be useful in lowering the seedbank to manageable levels.

**More Information:** Amanda Cook, 08 8680 6200, [Amanda.cook@sa.gov.au](mailto:Amanda.cook@sa.gov.au)



cent in the low-input and high-input areas respectively, though the exact cause is not yet fully understood. Groundcover was not significantly affected, with a five per cent and one per cent reduction from grazing for the low input and high input systems respectively in 2014.

"We are thinking that the grazing is increasing nitrogen cycling and somehow making the nitrogen more available to the plant, but further research is in progress to get to the bottom of this effect," she said.

The trial will investigate the risk of compaction from grazing in 2015, but Jessica believes if there is any impact it will be minor.

"Seven years is quite a long time, so to see no negative response over that period, we expect that there won't be a significant impact on crop and pasture production from compaction, but we'll be testing over the next two seasons to see if there is any effect."

### Future trials

The grazing trial will continue at least through 2015 and 2016, for a total of nine years. In addition, two other GRDC-funded Grain and Graze trials are underway at the MAC.

"The first is a study into soil rhizobia, the bacteria in soil that fixes nitrogen to the plant roots. We know a good medic stand increases rhizobia populations, so what we're looking at now is twelve different treatments to look at the best options for increasing rhizobia through improved medic production," Jessica explained.

The treatments include volunteer compared to sown medic, and seed and soil applied inoculation, with each treatment assessed with and without grazing, with the team expecting that grazing will increase fixation.

The second trial will investigate dual-purpose crops, grazing up



**Seven year trials show that the whole farming system is improved with the introduction of sheep.**

to GS30 and then assessing the nitrogen requirements to achieve the same yield as not grazing.

### A winning combination

Including sheep into a cropping system can benefit the whole farming system with no negative influence on wheat yields, but Jessica says the decision to graze sheep should also be about risk.

"In a low rainfall area, sheep can help growers better manage their risk and the effects of seasonal variability. Just like with any diversification, grazing can limit exposure to risks posed by diseases and pests, while also providing another source of income in years when yields or grain prices are low," she said.

#### More Information:

Jessica Crettenden, 08 8680 6227, [jessica.crettenden@sa.gov.au](mailto:jessica.crettenden@sa.gov.au)



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# Conservative but considered crop and herbicide rotations



**C**ROPPING history dictates the crop rotation decisions on Grant and Kate Wilson's Hopetoun farm in Victoria's southern mallee region. The Wilsons use a conservative rotation with up to one-third of the farm under vetch or fallow at any one time.

Their no-till cropping rotation – which includes wheat, lentils, canola, barley, lupins and field pea – is governed by disease and weed management considerations, proving that integrated weed and disease management can go hand in hand.

"There was a time when we just ignored summer weeds, but not now," says Grant. "We are very conscious of weed management all year round and the potential for herbicide resistance to really limit our options if it gets out of hand."

Following a 'no cereal after cereal' policy, Grant usually tries for a two year break between cereal crops. "We also rotate between different wheat cultivars to make the most of their disease management traits," he says.

"Following a cereal we would be looking to plant a legume – usually a lentil crop – but if we were faced with a broader weed problem we would choose an 'imi' tolerant lentil or possibly

decide to grow field pea instead of lentils to take advantage of the wider range of selective herbicides registered in field pea."

Being in a lower rainfall zone (325 mm or 13 inches), the Wilsons find a conservative rotation is safer in the long run and gives them more options to manage annual ryegrass.

## Pulses to tackle ryegrass

Pulse crops offer the best combination of tactics to tackle ryegrass in-crop using grass selective herbicides and desiccation. Recently Grant started using pre-emergent herbicides such as Boxer Gold and Sakura to reduce their reliance on trifluralin in wheat. "So far we have had mixed results, especially in dry weather, when there was insufficient moisture to properly activate the herbicide, on top of poor crop competition due to the seasonal conditions," he says. "It is an expensive option but when it works it provides good control across the paddock."

Grant prefers to use Boxer Gold before sowing with knife-points and press wheels on the seeder.

The heavier soils are in a fallow rotation to conserve soil moisture. Most fallow paddocks will usually be sprayed once or twice, depending on rainfall, over the summer.



Legumes in the rotation reduces the amount of starter-N needed for cereals while legume crop desiccation stops weed seed set. This avoids the need for narrow windrow burning after harvest.



Annual ryegrass on the Wilson's property has some resistance to Group A 'fops' but so far 'dim' herbicides are still effective. Kate customises their herbicide mixes to preserve the effectiveness of the dim herbicides by avoiding unnecessary usage.





**Grant usually keeps a two year break between cereal crops to maintain effective control of diseases. Pulse crops sown into standing stubble offer the best combination of tactics to tackle ryegrass in-crop using grass selective herbicides and desiccation.**

The Wilsons grow vetch as a green manure crop on their lighter soils to improve soil health and control weeds. When the vetch reaches maximum biomass Grant sprays it out to gain maximum benefit from the high biomass production. All other crops are left as standing stubble and this year they will be moving into inter-row sowing.

"We now have RTK guidance fitted to the seeder and expect to see some real improvements in crop establishment," he says. "With a more even sowing depth we should get more uniform germination and that will increase the crop's ability to out-compete weeds."

The soil type across the Wilson's farm ranges from sand to loam and varies in pH. Kate, an independent agronomist, takes production-limiting factors such as soil pH and boron levels into account when planning the rotation, particularly with lupins being more sensitive to higher pH and lentils being sensitive to boron levels. The potential for herbicide residues to still be present after a dry summer is also a consideration, particularly on higher pH soils.

The Wilsons crop between 4000 and 5000 hectares a year and generally do not have livestock, but they do fatten lambs on stubble as the opportunity arises.

### Resistance management

Annual ryegrass has some resistance to Group A 'fops' but so far 'dim' herbicides are still effective. Kate customises their herbicide mixes to preserve the effectiveness of the dim herbicides by avoiding unnecessary usage.

They have also resisted a move into glyphosate tolerant varieties because they are concerned about the potential over-use of glyphosate that may lead to glyphosate resistance in weeds. But they do grow some herbicide tolerant crops that utilise different herbicide modes of action.

The Wilsons choose not to grow imi-tolerant cereals because they believe this would lead to an over-use of Group B chemistry, which is known to lead to herbicide resistance in weeds such as brome grass.

They use imi-tolerant Clearfield canola to a limited degree as another option to control annual ryegrass using imazapic/imazapyr (Group B) products and rotate herbicides as best they can in an attempt to stave off herbicide resistance in grass weeds.



**The Wilsons plant their crops as narrow as possible, on a 250 mm row spacing using a standard cereal seeding rate of 60 kg per hectare. This row spacing provides early crop competition against weeds while still allowing inter-row sowing.**

"We use crop desiccation to stop weed seed set to avoid the need for narrow windrow burning to destroy weed seeds after harvest," says Grant. "Desiccation seems most effective in legumes, particularly lentils. In cereals we have also used herbicides to croptop weeds according to product label instructions."

"Fleabane is a new weed in this area having become noticeable for the first time during the wet summer in 2010," says Grant. "A double knock treatment has been recommended for fleabane control and we will also introduce cultivation if required in some situations."

### Plant health the main interest

The Wilsons tread a fine line between maximising crop competition and conserving soil moisture. "Plant health is our main interest and we use a range of tactics to reduce weed pressure in-crop," says Grant. "With legumes in the rotation we avoid applying much starter-N fertiliser and we make an effort over summer to get the paddocks as clean as possible before seeding."

The Wilsons plant their crops as narrow as possible using a standard cereal seeding rate of 60 kg per hectare on a 250 mm row spacing. They find this row spacing narrow enough to provide early crop competition and not be too rough, while still being able to inter-row sow.

Taking a thoughtful and long-term view of herbicide use within their cropping system has kept a lid on herbicide resistance on the Wilson's farms so far and preserved a wide range of herbicide chemistry. Herbicide use is supported with non-herbicide tactics and the rotation of modes of action within and between crop types.

**For more information on planning a strategy to manage the risk of herbicide resistance, visit [www.weedsmart.org.au](http://www.weedsmart.org.au)**

# Silverleaf nightshade can be beaten

**T**HE focus of a weed control program is to run down the seed bank – doing everything possible to prevent seed set. But, what about weeds that spread vegetatively?

What could possibly control a perennial weed with a huge network of roots that is able to produce multiple stems metres apart, propagate new plants from tiny root fragments and produce seeds that remain viable in the harshest soil conditions and in the gut of grazing animals?

These are the questions that researchers are keen to find solutions to as silverleaf nightshade infiltrates crops and pastures across southern and western Australia. Silverleaf nightshade infestations typically reduce crop yield by 20–40 per cent and render pasture unusable if it is not contained. A collaborative project between NSW Primary Industries and Murrumbidgee Landcare, with funding from Meat and Livestock Australia (MLA) and Australian Wool Innovation (AWI) is targeting silverleaf nightshade control across four states.

Project officer Phil Bowden, Murrumbidgee Landcare at Cootamundra, NSW said that silverleaf nightshade (SLN) is of increasing concern in NSW, Victoria, South Australia and Western Australia, yet many landholders are unaware of the effect of the weed or how easily it is spread.

“Silverleaf nightshade has an extensive root system, linking plants across the paddock and up to several metres in depth, making control very difficult,” he said. “It competes with pasture and crops for soil moisture and nutrients, and does not respond to the usual chemical control measures.”

## There is some good news

The good news is that field trial results confirm that a ‘dual action’ spray program, implemented over successive years can reduce the impact of this difficult weed.

“The dual action program involves spraying silverleaf nightshade at the early flowering stage – both in spring or autumn – to prevent



**Silverleaf nightshade is easily spread on machinery and can establish new plants from very small root fragments.**

(Photo: Rex Stanton)

seed set. A follow-up spray in autumn controls re-shoots and helps run down the root reserves,” said Phil.

■ Several herbicides, such as picloram, glyphosate and 2,4-D amine products, are registered for the control of silverleaf nightshade.

Consult with your local agronomist for advice on product choice, application rates and adjuvants, keeping in mind that application timing is more important than product choice.

## Crop and pasture competition

Crop and pasture competition can suppress silverleaf nightshade over winter and delay emergence in spring, but silverleaf nightshade stems will emerge during summer if there is no competition for summer rainfall.

Competition in spring reduces the number of new shoots that emerge and helps synchronise flowering, making herbicide application at flowering more efficient.

Although SLN does produce a large quantity of seed, the predominant source of new stems is its rootbank. Cultivation is more likely to spread the weed than control it because fragments just one cm in length are capable of forming a new plant.

Trials have shown that managing smaller (less than 0.25 hectares) or less dense infestations (less than one stem per m<sup>2</sup> and less than one hectare) will lead to a decline in the rootbank and the seedbank to the point where eradication is realistic.

But to eradicate it requires intensive monitoring and control for up to five years to ensure no re-infestation occurs.

Optical weed detection technology such as the *Weedseeker* is worth considering when applying expensive herbicides in low density situations.

A series of workshops are planned for many of the SLN ‘hot spots’ around Australia in early spring.

For more information on SLN workshops and control strategies, contact Phil Bowden on 0427 201 946. To plan a strategy to manage the risk of herbicide resistance, visit [www.weedsmart.org.au](http://www.weedsmart.org.au)



**Treating silverleaf nightshade before it flowers and again when it reshoots has proven to be an effective strategy to control this difficult crop and pasture weed.** (Photo: Rex Stanton)



# Research probes profitability of OP versus hybrid canola systems

■ By GRDC western regional panel deputy chairman, Dr Mike Ewing

**A**S canola production spreads into lower rainfall areas from its traditional high rainfall heartland, an important question facing growers is whether to grow hybrid or open pollinated (OP) canola varieties.



GRDC western regional panel member Mike Ewing says a recent study has provided new information about the comparative performance and gross margins for hybrid and open pollinated (OP) canola.

Hybrid canola is more vigorous and competitive against weeds, and can yield up to 20 per cent more than OP varieties, but it is a more expensive system due to significantly higher seed costs.

Research funded by the Grains Research and Development Corporation (GRDC) suggests that hybrid varieties can be more profitable than OPs in medium and high yielding environments, but OPs tend to be more profitable in lower yielding areas.

The study in 2013 and 2014 compared the performance and gross margins for hybrid and OP canola across a wide range of environments in Western Australia and in National Variety Trials across Australia.

Led by CSIRO and involving the Department of Agriculture and Food (DAFWA), ConsultAg, Planfarm and the Department of Primary Industry, New South Wales, it tested about 20 canola varieties in five field experiments in low, medium and high rainfall areas of WA at Merredin, Cunderdin and Kojonup.

Seeding rates were set to achieve 40 plants per square metre.

CSIRO researcher Heping Zhang said the research showed that the yield performance and profitability of hybrids depended strongly on growing season rainfall and the magnitude of the yield advantage of hybrid varieties over OPs.

"Gross margins were strongly linked to yield potential – hybrid

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# Pre-harvest weed control in canola

**O**NE downside of the widespread production of canola is the increase in clethodim-resistant annual ryegrass populations on many farms across southern Australia.

Dr Chris Preston, University of Adelaide (UA) Associate Professor – Weed Management says growers are noticing that in some areas clethodim may be only suppressing rather than controlling ryegrass. “All tactics in the weed management program need to minimise seed set,” he says. “End of season control measures have been limited to narrow windrow burning in canola and this is not always a practical option for growers.”

Through a GRDC funded trial, Chris investigated the pre-harvest use of a number of herbicides, looking at efficacy, crop safety and residue levels. “Our trials concluded that only glyphosate was effective and safe to use for pre-harvest weed control in canola,” he says.

This research supported the registration of Nufarm’s weedmaster DST as the only glyphosate product registered for pre-harvest application in canola.

Chris, who is also Chair of the Australian Glyphosate Sustainability Working Group says that, once again, glyphosate has proved to be a valuable chemical but a word of caution is required.

## Don’t over-use glyphosate

“Pre-harvest weed control with glyphosate must not be over-used in the rotation. It is essential that many other non-glyphosate measures are also being used in a weed management strategy.”

“Keep track of how often you are applying glyphosate across the rotation and include as much diversity as possible,” he says. “For example, if you use glyphosate for pre-harvest control in canola it would be wise to use a different harvest weed seed control tactic in your cereal crop and consider paraquat as a better choice to crop top pulses.

“Both over the top and under the windrow applications are equally effective as weed seed set control measures,” he says. “Efficacy is reduced in hot, dry weather conditions so an over the top crop topping application offers some extra flexibility provided growers have access to a self-propelled boom with sufficient clearance. In some situations this will make direct harvesting a more practical option too.”



**Nufarm’s weedmaster DST is the only glyphosate product registered for pre-harvest weed control in canola, providing another tool to reduce weed seed set.**

**Research suggests hybrid canolas are generally more profitable only in higher rainfall areas.**

canola was profitable only when the gains from the higher yield outweighed the cost,” he said.

Heping said the greater yield advantage of hybrids meant they were generally more profitable than OPs in favourable environments where rainfall was relatively high and the growing season was relatively long.

“But in areas of low rainfall coupled with high temperatures during the seed filling period, hybrids showed no or only small yield advantages over OPs,” he said.

“Hybrids were less profitable than OP triazine tolerant canola in these less favourable environments because the cost associated with seed usually outweighed any small yield benefits.”

ConsultAg agronomist Garren Knell said the research showed that hybrid varieties were generally more profitable only in areas where canola yields regularly exceeded 1.3 tonnes per hectare.

“In most areas of the WA grainbelt, the question for growers becomes – do I use hybrids simply as a weed control tool due to their greater vigour, even if they’re not necessarily making me more money in the short-term,” he said.

“A big issue for growers in these areas is that hybrids are riskier because of the higher upfront costs associated with seed costs – and growers take on that risk.”

Meanwhile, Garren said research under the project comparing different canola herbicide tolerance groups confirmed that while Roundup Ready canola provided a valuable, alternative weed control option, growers in medium to low yielding areas in particular needed to weigh up this longer-term benefit against the system’s short-term higher cost and risk.

“In the short-term at least, the Roundup Ready system is generally more profitable only in higher rainfall zones, while the triazine tolerant system using grower-retained seed is significantly cheaper and a much lower risk for growers in most other areas,” he said.

CSIRO research under the project ‘Achieving stable and high canola yield across the rainfall zones of WA’ is continuing in 2015.

It will further investigate genetic traits associated with yield variations between the herbicide tolerant groups and between varieties within the same herbicide tolerant group.

The project complements the ‘Tactical break crop agronomy in WA’ project, led by the Department of Agriculture and Food WA (DAFWA) and also funded by the GRDC.

Varietal information for canola growers is available in the Canola Variety Guide for WA 2015 at [www.agric.wa.gov.au/canola/canola-varieties-2015](http://www.agric.wa.gov.au/canola/canola-varieties-2015)



A harvest weed seed operation, such as narrow windrow burning, will also assist to remove any survivors and help prolong the efficacy of glyphosate across the rotation.

### Expanded registration

Nufarm field development manager (broadacre) at Horsham, Mark Slatter says the expanded registration of weedmaster DST for harvest aid and weed control applies to triazine tolerant (TT), Clearfield, Roundup Ready and conventional canola varieties.

"Label rates for applications of weedmaster DST to standing canola – or under the cutterbar at windrowing – are 1.4 to 4.1 litres per hectare, but Nufarm trials showed best results were achieved at rates of 2.8 to 4.0 litres per hectare with an adjuvant (LI 700) to increase penetration into the crop canopy and for drift management," says Mark. "The recommended water rate for ground application is at least 80 litres per hectare applied to standing canola."

The product is also registered for aerial application at a maximum rate 3.1 litres per hectare.

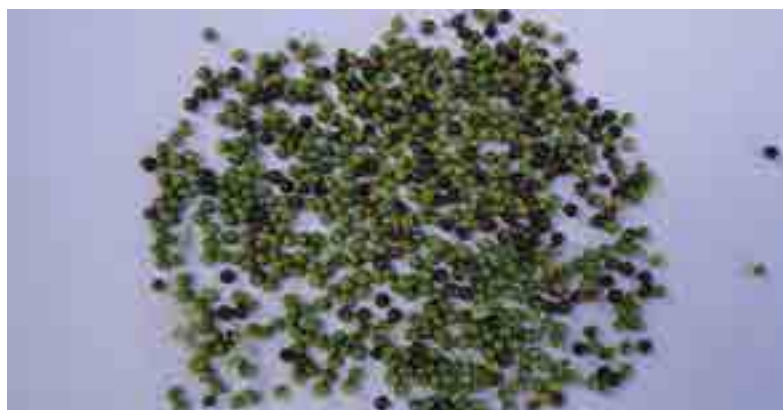
### Timing is critical

Mark says the timing of the application is critical and must not occur before there has been a minimum of 20 per cent grain colour change across the paddock as going in too early will cause yield reductions.

"No withholding period applies when the product is applied under the windrow but direct harvest must not occur until five days after application to a standing crop," he says.

While annual ryegrass is a key target weed for this use pattern, other key target weeds controlled include wild radish, sow thistle and many other annual grass and broadleaf weeds.

Mark says that Nufarm has developed this new pre-harvest



**For optimal ryegrass control and no impact on yield, wait until at least 20 per cent of the canola seed has changed to dark brown or black before a pre-harvest application of glyphosate in a standing crop.**

registration as an additional tool for reducing weed seed set of annual weeds because a 'zero tolerance' approach to weed seed set is one way of reducing the risk of herbicide resistance developing. "It is very important to use a pre-harvest application of weedmaster DST as part of a broader integrated weed management (IWM) strategy to minimise the risk of glyphosate resistance," he says.

"Crop safety trials proved that this use pattern has no negative effects on yield or oil content in canola, but it must not be used on crops intended for seed because germination and vigour is affected," he says. "Nufarm's extensive MRL trials also showed residues are well below maximum levels for all canola systems so there will be no impact on product export suitability." ■



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# Model your nitrogen to account for in-crop mineralisation

**G**ROWERS should use models to determine their nitrogen budget to take into account the complicated factor of in-crop nitrogen mineralisation, according to CSIRO Research Fellow Dr John Angus.

"Mineralisation can provide somewhere up to 120 kilograms of N per season, depending on a number of conditions, with the rate varying across the season, so it isn't something that's easy to calculate. Overestimating mineralisation or not taking it into account can result in either too much or not enough fertiliser N being applied," he said.

Mineralisation depends strongly on temperature, moisture and soil organic matter. During winter, mineralisation is low because of cool temperatures, with the rate picking up in spring as the temperature increases. But the highest crop demand is generally at the end of winter.

The rate of mineralisation cannot be effectively measured in the field for two reasons:

- The crop is taking up nitrogen as soon as it mineralises, so it is challenging to measure the input of plant available nitrogen through mineralisation; and,
- The process of sampling to take measurements disturbs the soil and stimulates microbes, which changes the result.

"A practical maximum for mineralisation in a moist soil containing one per cent organic carbon in spring is around 1 kg per hectare per day, while a really strong crop will be using up

to 5 kg per hectare per day at the same time. Because of this, it is easy to write-off in-crop mineralisation, as it doesn't provide enough N to provide the entire nutritional requirements for the plant," John said.

But there are potentially negative consequences for both under and over-application of nitrogen.

"If there's not enough nitrogen applied to the crop, obviously the growth will not meet the yield potential. But applying too much nitrogen can also reduce crop yield and quality, as well as costing more. Excess nitrogen reduces soluble carbohydrate in the stem at flowering, as the two have an inverse relationship," he said.

"This means that if there is moisture stress late in the season, the plant won't have adequate soluble carbohydrates to fall back on for grain filling and can start haying off. This is a risk for farms in the path of an El Niño, as forecast for 2015."

Using the models provided by CSIRO take into account soil test results, crop conditions and weather forecasts to provide recommendations on optimal nitrogen application rates.

## Can in-crop mineralisation be improved?

Cultivation does not significantly affect mineralisation in Australian soils, unlike North American soils.

"In Australia we cultivate much shallower than they do in North America, so there's very little difference in our soils between cultivating and no-till, in this aspect. The one thing that should theoretically help is stubble retention, which increases soil moisture, so should increase mineralisation, but we have so far been unable to find a measurable effect," he said.

Break crops can help. Legume crops fix nitrogen to give a higher mineral N at the time of sowing in the following year and during crop growth and perennial pasture residues have been shown to lead to higher rates of N mineralisation in the crop following the break.

**More Information:** Dr John Angus, CSIRO, [john.angus@csiro.au](mailto:john.angus@csiro.au)

**Useful resources:**

- CSIRO Yield and N calculators
- Where to get your N
- Plant Available Nitrogen GRDC Fact Sheet



**CSIRO research fellow John Angus says nitrogen budgets should take in-crop mineralisation into account.**

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# Tissue testing a health check-up for micronutrients

**G**ROWERS are urged to consider tissue testing to diagnose micronutrient deficiencies. Trace elements can be depleted by high yielding cropping, resulting in the potential for deficiencies to become more common.

Incitec Pivot technical and development manager Charlie Walker (pictured), who is a member of the GRDC trace elements project advisory committee, says tissue testing can be compared to blood testing in humans.

“When someone isn’t feeling 100 per cent they may get a blood test so their doctor can assess if there’s anything going on. In a similar fashion, growers who are seeing something that doesn’t look right in their crop can use tissue testing to diagnose micronutrient deficiencies,” he said.

Unlike macronutrients such as nitrogen and phosphorus, micronutrients – or trace elements – cannot be reliably assessed using soil tests alone due to their low concentration in the soil. Because of this, tissue testing is the best way to confirm a suspected micronutrient deficiency.

The micronutrients most likely to limit production in Australian soils are zinc (Zn), copper (Cu), manganese (Mn), molybdenum (Mo) and boron (B).

## Updating the rules

The four-year GRDC project is aiming to test and update the rules and advice given to growers on micronutrient management.

“The current rules were set around 30 to 40 years ago, and in the meantime a lot of things have changed, including a move to more intensive cropping, no-till and stubble retention and significant improvements in yield. This has potentially changed the situation enough that the old rules need to be updated,” Charlie said.

One example of how practice change has altered the presentation of deficiencies is controlled traffic farming, where deficiency symptoms sometimes appear in bands between windrows.

“In this example, a grower may see stunted or off-colour growth in bands. They could then perform a tissue test from where the crop looks good and one where it doesn’t look so good, and the comparison may diagnose a deficiency. Depending

on the nutrient, they may be able to correct the deficiency in the same season, such as copper, but even if it can’t be treated in that year, they will be ready to take action in the following season,” he said.

## Test at the right crop stage

When performing tissue testing, it is important to sample at the right crop development stage, the correct plant part and sample size. Hygiene is also important in sampling as contamination with soil or sweat may give misleading results. An example of one laboratory’s instructions for tissue testing are shown in Table 1.

“Growers should remember that soil conditions can affect chemistry and micronutrient availability. Just because certain soils have never had deficiencies in the past doesn’t mean it won’t happen now. In some cases growers have been improving acid soils with liming. But with this comes decreased availability of zinc at the higher pH,” he said.

While zinc deficiencies have historically been a challenge with alkaline soils, Charlie says he has seen isolated pockets of deficiencies in the slopes of New South Wales, where increased yields and liming practices have reduced zinc availability.

**More Information:** Charlie Walker, 0413 018 547, [charlie.walker@incitecpivot.com.au](mailto:charlie.walker@incitecpivot.com.au)



**Charlie Walker says tissue testing plants is like a blood test for humans.**

**TABLE 1: Example tissue testing sampling instructions**

Crop type	Growth stage	Plant part	Number
Cereals	Early to late tillering	Youngest expanded leaf blade	100 leaves
Lupins	Early vegetative stage and before flowering	Youngest open leaves	100 leaves
Faba beans	Early vegetative stage and before flowering	Youngest open leaves	50–100 leaves
Field peas	Early vegetative stage and before flowering	Youngest open leaves	100 leaves
Oilseeds	Early vegetative stage and before flowering	Youngest open leaves	100 leaves

Source: Nutrient Advantage Lab Services (<http://www.nutrientadvantage.com.au/>)

# CBRE NATIONAL ROUNDUP

## National overview

Confidence levels in the national grain property market are currently considered firm on the back of strong commodity prices and low interest rates. But the regions where adverse climatic conditions have prevailed for extended periods, there is reduced buyer confidence. Northern New South Wales and Queensland have generally experienced below average production levels for an extended period. These regions are not expected to witness any change until the conclusion of the 2015 season when producers have a better understanding of their financial position.

After a period of stagnant growth, Western Australia has experienced a run of average to above average seasons and with a promising start to the 2015 winter crop, this has resulted in increased purchaser confidence throughout the state with a number of transactions occurring in the past 12 months.

Large scale properties that meet the criteria required by the corporate and institutional investors are still generally selling at stronger values than that of the smaller or lesser quality grain properties. In some regions, this has created a two-tiered market. Whilst there has been limited large scale transactions by corporate or institutional investors in the past 12 months, they are still consolidating their existing aggregations with the acquisitions of smaller neighbouring properties.

In summary, whilst the depreciating Australian dollar, declining fuel costs, low interest rates and ongoing foreign interest in Australian farmland are all positive market drivers, we believe that with the forecast of El-Niño climatic conditions for the majority of the eastern states in the latter half of 2015, there will be minimal change in land values until operators have a sound gauge of the 2015 season.

### Yield bands:

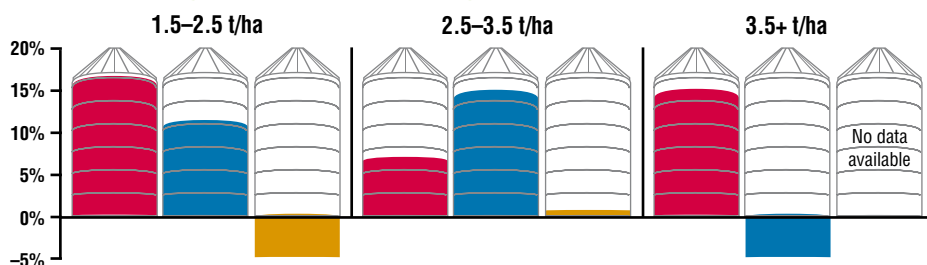
Farm sales are categorised into Northern, Southern and Western Cropping Regions of Australia. Individual farm sales are further categorised into 'yield bands' reflecting the average yield history for wheat production on that farm.

**1.5–2.5 t/ha wheat = 7–12 bags/ac**  
**2.5–3.5 t/ha wheat = 12–17 bags/ac**  
**3.5+ t/ha wheat = 17+ bags/ac**

With this feature, *Australian Grain* – in conjunction with CBRE – presents a national and unique overview of grain farm sales. Indicative selections of individual farm sales over the past 12 months are categorised into the three major agro-economic cropping regions and further categorised into average wheat 'yield bands'. Trends in the value of grain farms since 2008, according to these categories, are also presented.

For the first time, prospective buyers and sellers (or just interested observers) have a national insight into the current and recent trends in the value of cropping farms across Australia according to region and production capability.

## % change in value of grain farms since 2008

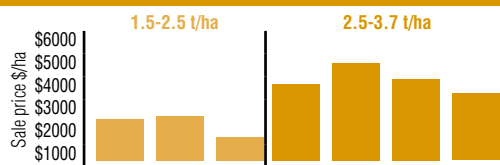


The three yield bands above – 1.5–2.5 t/ha; 2.5–3.5 t/ha; and, 3.5+ t/ha – are used to categorise grain farms according to the average yield history for the production of wheat on that farm.

**Red** = Northern Cropping Region. **Blue** = Southern Cropping Region. **Gold** = Western Cropping Region.

Source: CBRE national farm sales data, 2008–2014.

## Indicative Farms Sales Western Region, 2014/15



- Farm No:** 1 2 3 4 5 6 7  
**Av. price:** \$1933/ha \$3825/ha
- Farm 1** Central Wheatbelt, WA – Small parcel purchased by adjoining owner (2015).
  - Farm 2** Northern Wheatbelt, WA – Medium sized holding purchased by adjoining owner (2015).
  - Farm 3** Central Wheatbelt, WA – Small parcel not of a commercial scale (2015).
  - Farm 4** Central Wheatbelt, WA – Small parcel purchased by adjoining owner (2015).
  - Farm 5** Central Wheatbelt, WA – Formed part of a larger aggregation that was split for sale (2015).
  - Farm 6** Southern Wheatbelt, WA – Small scale cropping property (2015).
  - Farm 7** Wongan Hills, WA – Large scale aggregation situated in well regarded cropping region.

There were no indicative farm sales by CBRE in the 3.7+ t/ha yield band.



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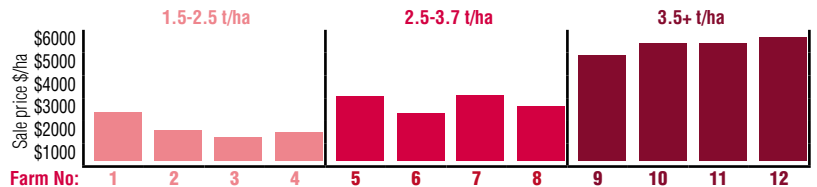


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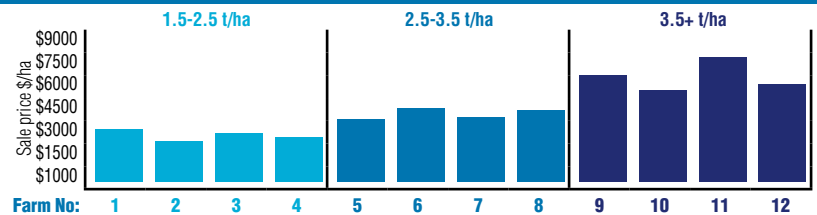
# UP OF GRAIN FARM SALES

## Indicative Farms Sales Northern Region, 2014/15



- Farm No:** 1 2 3 4 5 6 7 8 9 10 11 12
- Av. price:** \$1712/ha \$2806/ha \$5343/ha
- Farm 1** Condamine, Qld – Brigalow/belah flats, dark soils transitioning to soft red loams (2015).  
**Farm 2** The Gums, Qld – Features brigalow with melonholes, sold under distressed circumstances.  
**Farm 3** Inglestone, Qld – Comprises brigalow and belah land types.  
**Farm 4** Toobeah, Qld – On the flood plain of the Macintyre and Weir Rivers and features self-mulching alluvial clays.  
**Farm 5** Moree, NSW – Mid-scale dryland farming, black/grey soils (2015).  
**Farm 6** Rowena, NSW – Good level myall soils.  
**Farm 7** West Moree, NSW – Good quality black/chocolate soils on edge of watercourse.  
**Farm 8** Burren Junction, NSW – Mix of black and red soils.  
**Farm 9** Darling Downs, Qld – Well-developed self-mulching black soils with the majority arable (2015).  
**Farm 10** Darling Downs, Qld – Well-developed self-mulching black soils with the majority arable (2015).  
**Farm 11** Warra, Qld – A non-contiguous aggregation with high quality self-mulching brigalow belah soils.  
**Farm 12** Warra, Qld – Features high quality self-mulching brigalow belah soils.

## Indicative Farms Sales Southern Region, 2014/15



- Farm No:** 1 2 3 4 5 6 7 8 9 10 11 12
- Av. price:** \$2025/ha \$3334/ha \$5693/ha
- Farm 1** Northern Wimmera, Vic – Two non-contiguous allotments not of a commercial scale (2015).  
**Farm 2** Ultima, Vic – Comprises approximately 1,100 hectares of cropping land with strong Mallee soil types and a high arable percentage.  
**Farm 3** Hopetoun, Vic – Small scale farming property with a high percentage of strong red sandy loam soil types.  
**Farm 4** Lock, SA – Predominately arable land of relatively heavy soil types for the district. Strong management and production history.  
**Farm 5** Southern Riverina, NSW – Small local allotment (2015).  
**Farm 6** Minyip, Vic – Features approximately 680 hectares of heavy black clay soil types and associated rural infrastructure.  
**Farm 7** Gerang Gerang, Vic – Small scale property comprising approximately 410 hectares of good quality black clay soils.  
**Farm 8** Rand, NSW – This is a large scale property previously operated as a mixed cropping & grazing enterprise and was purchased by the adjoining owners.  
**Farm 9** Western Districts, Vic – Two non-contiguous allotments not of a commercial scale (2015).  
**Farm 10** Western Districts, Vic – Large scale mixed farm (2015).  
**Farm 11** Lake Bolac, Vic – This is a well regarded cropping property situated north of Lake Bolac.  
**Farm 12** Penshurst, Vic – Prestige property with a significant homestead complex that was purchased by Chinese interests.

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# Fuel for thought

■ By Ian M. Johnston

**Can you imagine pulling into a service station and filling up your vehicle's fuel tank with gunpowder? Or how about filling the tractor tank with coal dust? Sounds a bit bizarre certainly. But away back in the days of yore (had there been cars and tractors then) it would not have seemed so weird.**

## In the beginning

The very first internal combustion powered engine was, in fact, devised in the 17th Century and remarkably was fuelled with gunpowder! It was a fairly rudimentary affair invented by a Dutchman named Huygens. Apparently the guy who designed the gardens at the Palace of Versailles had not considered how he was going to obtain the 3000 cubic metres of water required each day to water the lawns, trees, shrubs, flowers and things. Along came Huygens with his gunpowder engine capable of driving a network of pumps. Voila, the problem was solved.

For the record, the gunpowder (invented by the Chinese over 2000 years ago) consisted of a mixture of charcoal, potassium nitrate and sulphur. Apparently Huygens had designed a method of feeding this parlous brew into a combustion chamber without blowing himself to smithereens! Quite an achievement, one would be inclined to think!

We all know that coal dust is a nasty dirty stuff, but when it is suspended in the atmosphere, it becomes one of the most explosive substances known to mankind. Countless appalling coal mine tragedies have occurred due to the spontaneous combustion of coal dust, including the death of 1549 miners in a single explosion in 1942.

The introduction of miners' safety lamps, designed by Scotsman George Stephenson in 1815, and later improved by Humphrey Davy (ie. Davey lamps) proved to be substantially safer than the open flame lamps used hitherto.

Back in 1807 the Emperor Napoleon Bonaparte (no less)

awarded a patent to a fellow citizen named Nicéphore Niépce for the design of a coal dust engine. Rather courageously Niépce had installed this somewhat volatile power plant in a launch, in which he regularly chugged up and down the river Saône.

It comes as a surprise to many, when they learn that the celebrated German engineer Rudolph Diesel actually commenced his design of a compression engine using coal dust as a fuel. The dust was injected into the combustion chamber by compressed air. But unlike liquid fuel, it was impossible to pre-determine the energy capacity of each charge. This resulted in erratic running and the very real danger of a particularly potent charge blowing the engine apart.

Following a number of calamitous accidents, Doctor Rudolph Diesel wisely re-directed his focus onto oil fuelled compression engines. As a result of his perseverance in solving the initial design problems, today the diesel engine is simply accepted and taken for granted.

## Black Gold

For the record, it should be pointed out that in around 300 AD the Chinese were drilling oil wells to a depth of 250 metres, using bamboo poles with bits fashioned from iron. But at that time the oil was used mainly as a heating agent for the production of salt from seawater.

The most important development in the realm of internal combustion engine fuel occurred in 1859 in a quiet rural corner of Pennsylvania, when Colonel Edwin Drake sank the world's first commercial oil well. The massive amount of oil which gushed to the surface created a furore and thus began an international search for the 'black gold' which for ever changed the way of life of modern man.

History also tells us that during the middle of the 19th



**An early graphic of Colonel Edwin Drake sitting in front of his Pennsylvania oil well.**



**The Froelich was the world's first tractor, that is, powered by an internal combustion engine.**



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\*Based on 2013 revenue



# CBRE



**An early Rumely Oil Pull dragging an eight furrow mouldboard plough. (It is to be hoped that the ploughman hangs on tight)!**

Century, wells were sunk in Romania and Poland using teams of unfortunate peasant labourers armed with only picks and shovels. This therefore goes to prove that the Chinese were much smarter, when one considers that 2000 years previously they had learnt how to drill for oil!

In 1848 a young Scottish chemist named James Young pioneered the process of refining crude oil. Initially his distillations produced a form of paraffin lamp oil. But the lack of availability of the crude presented a major problem. His meagre source of oil was obtained from oil seepage from mine shafts in Derbyshire.

Four years later in 1852 a Polish scientist Ignacy Lukasiewicz



**The Rumely Model E was rated at 60 brake hp and 30 belt hp at 375 rpm. The two cylinders had a bore and stroke of 10 x 12 inches. The overall width (with wheel extensions as shown) was 15 feet 8 inches and the height 11 feet. Weight was around 12 tonnes. It featured only one forward gear with a speed of 1.9 mph. Capacities: petrol three gallons; kerosene 70 gallons; and oil cooling system 70 gallons. It also had a water reservoir of 80 gallons. The water was injected into the carburettor along with the kerosene.**



**This magnificently restored single cylinder Rumely Model F (18-35) is owned by a Queensland collector. Note the size of the flywheel.**

devised a means of refining kerosene from a plentiful supply of shale oil, which oozed from a rock formation at a place named Krosno near the Polish Ukraine border. But it was not until the following year that the method of fractionating oil by the process of distillation, was discovered by Benjamin Silliman, an American science professor. Thus the production of petroleum spirit commenced.

Interestingly, the very first modern oil refinery was constructed at the oil fields near Baku in Russia in 1861. Over the next decade 90 per cent of the world's oil was produced at Baku.

It should be noted that the foregoing is a much abbreviated and simplistic account of the evolution of fuel for the powering of internal combustion engines. To produce a detailed and accurate historical record would require the space of many volumes.

## Early tractor fuel

Thankfully, gunpowder and coal dust fuels had been relegated to the history books by the time the first tractors arrived on the scene, at around the beginning of the 20th Century. Petrol was the common fuel for which the early tractors had a rapacious thirst. But when compared with the efficiency of modern engines, the trifling amount of power produced in relation to the quantity of petrol consumed, is hard to imagine!

Take for example the Froelich, the very first tractor produced in 1892. This amazing contraption was powered by a Van Duzen single cylinder petrol engine, with a capacity of 2155 cu. inches. For the record – that is a whopping 35.314 litres! Yet it only managed to produce 16 brake horse power.

The carburettor (if you could call it that) was about the size of a 20 litre oil drum and the quantity of petrol fed to the engine was nearly the equivalent of turning on a garden hose!

The tractors that evolved in the early 1900s were powered mainly by engines of either one or two cylinders. But there were notable exceptions, including the Wallis Tractor Company's Bear, the Transit Thresher Company's Big Four and the Australian built Caldwell Vale, all of which featured four cylinder engines.

But all tractor engines of the period, irrespective of the number of cylinders, shared that common denominator



mentioned earlier – their thirst for fuel. So allowing for the fact that over a century ago, petrol only cost a fraction of what we modern folk are accustomed to forking out, for many the cost of running these tractors was proving prohibitive.

## Kerosene

Kerosene, a less volatile fuel, was cheaper to refine and consequently a farmer could purchase it for around half the price of petrol. But there was a downside. Kerosene needs to be heated in order to vaporise.

Accordingly, a kerosene fuelled engine has first to be started using petrol. A normal water cooled engine could be fitted with a hot box system located in the exhaust manifold, through which the kerosene was channelled, enabling an engine first started with petrol, to be switched over to kerosene that had been pre-heated by the hot exhaust gasses.

Once running on kerosene, the engine developed a slight loss of power due to the lesser octane rating and an inability of the combustion chamber to totally burn all the fuel. A percentage of the unburnt residue escaped into the engine sump, which could

seriously pollute the lubricating oil. So each morning, following an overnight cooling and resting of the sump oil, the upper layer of the oil had to be drained off through a level plug in order to remove the polluting kerosene, which had risen to the surface. This was important not only from a lubricating point of view, but also because kerosene is an abrasive substance.

## The Rumely oil pull

In 1909 the M. Rumely Company of La Porte, Indiana, USA, released for public comment a giant experimental tractor. It featured a twin cylinder engine designed specifically to run on kerosene. But what rendered the Rumely different from other petrol/kerosene engines was the fact that the Rumely utilised oil as a coolant, as distinct from water. This was a clever initiative on behalf of the design boffins, as the engine could be operated at a significantly higher temperature than if being cooled by water, which of course boils at 100 degrees centigrade. The oil coolant in the Rumely would rise to around 132 degrees.

The huge benefit of this was that the kerosene fuel could be heated to a much higher temperature enabling it to be vaporised to a level where it was totally burnt and performed as efficiently as petrol – but for half the cost. Plus of course there was no kerosene pollutant in the sump oil.

## Finally

When next a farmer pulls his tractor alongside the fuel tank, perhaps he should spare a thought for the tractor men of yesteryear coping with the hassles of petrol/kerosene. He may also contemplate how fortunate he is, that Doctor Rudolph Diesel did not continue to pursue his research into gunpowder as a suitable engine fuel!

## IAN'S CLASSIC TRACTOR QUIZ

A score of 8 or above would be considered excellent and reveal an indepth knowledge of classic tractors. Five or over is still a good result. If in doubt, by applying logic, quite possibly the answer will become obvious. Or maybe even an educated guess? (Consulting Google would be cheating!) Good luck and have fun – *Ian M Johnston*.

1. Which of these German tractor firms also produced a range of pre-war motor cars –  
**Lanz, Deutz or Hanomag?**
2. The very first Ferguson tractors were manufactured by –  
**David Brown, Standard Cars or Weeks Dungey?**
3. The Massey Harris 745 was powered by which engine –  
**Perkins 6 cylinder diesel, Continental 6 cylinder petrol or Perkins 4 cylinder diesel?**
4. The 4430 was a model of –  
**Case, White or John Deere?**
5. Unimog 4 wd tractors are a product of –  
**Volvo, Mercedes Benz or Ursus?**
6. Big Four tractors imported into Australia in the 1920s were manufactured by –  
**Rumley, International Harvester or Emerson Brantingham?**
7. JCB are the initials of –  
**Jeremy Charles Benford, Joshua Carleton Bomford, or Joseph Cyril Bamford?**
8. Landini tractors have been produced since 1925 in which country –  
**Switzerland, Italy or Slovakia?**
9. The Turner Yeoman of England tractor imported into Australia in the late 1940s was powered by a V4 diesel engine originally designed for –  
**Cornish fishing trawlers, military generators or Turkish irrigation plants?**
10. Which of these International tractors had an offset engine –  
**Farmall A, Titan Type D or McCormick W4?**

See answers on page 48.



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# Antimicrobial enzyme examined for improved feed conversion

■ By Jan Suszkiw, Agricultural Research Service – USDA

## AT A GLANCE...

- An enzyme called 'lysozyme' could replace antibiotics in piglet feed;
- The enzyme is natural and used in many foods and beverages;
- It improves piglet feed efficiency and growth; and,
- Lysozyme is as effective as antibiotics when added to piglet feed.

**I**N 1921, Alexander Fleming discovered the antimicrobial powers of the enzyme lysozyme after observing diminished bacterial growth in a Petri dish where a drop from his runny nose had fallen. The famed Scottish bacteriologist published his findings a year later, but ultimately decided that the enzyme didn't meet his criteria for a useful antibiotic – unlike penicillin, a later discovery.

Lysozyme, Fleming showed, is produced naturally in mucus, saliva, tears, and other bodily fluids of humans and other animals. Today, lysozyme from chicken egg whites is used in many food and beverage applications, notably wine and cheese making processes. Now, findings by ARS scientists suggest that lysozyme can also serve as a natural alternative to antibiotics used to improve feed efficiency and growth in pigs.

Their research, published in the October 2014 *Journal of Animal Science*, coincides with ongoing debate over whether

using antibiotics in this manner contributes to the emergence of resistant strains of bacteria, threatening the compounds' availability and effectiveness as infection-fighters in both veterinary and human medicine.

## Non-traditional antibiotic options

"Pig producers are currently under pressure to eliminate subtherapeutic antibiotic use throughout the production cycle," notes William Oliver, a physiologist at ARS's US Meat Animal Research Center in Clay Center, Nebraska. "Finding safe and effective alternatives to traditional antibiotics will give swine producers viable options in the event that removal of traditional antibiotics is needed."

## Growth rates, weight gains and feed rations

William, together with ARS and university colleagues, began investigating lysozyme in 2010. In the most recently published trial, conducted at Clay Center, they compared growth rates and weight gains of two groups of 600 piglets placed on one of three diet regimens:

- A standard feed regimen of corn/soybean meal and specialty protein;
- A second regimen with lysozyme added; and,
- A third containing the antibiotics chlortetracycline and tiamulin hydrogen fumarate.

The groups were also kept in weaning pens that had either been disinfected or left uncleaned since the last group of animals had occupied them.

The latter was done to stimulate chronic, or long-term, immune activity, including the production of cytokines, which divert nutrients away from growth in pigs and result in slower weight gain.

"We wanted to compare the effects of lysozyme and antibiotics when pigs had a chronic immune response," explains William, who collaborated with ARS microbiologist Jim Wells and University of Arkansas professor Charles Maxwell.

## Faster growth rates

The results showed that piglets on lysozyme- or antibiotic-treated feeds grew approximately 12 per cent faster than untreated pigs – even in uncleaned pens, suggesting that the treatments successfully ameliorated the effects of indirect immune challenge in the animals.

Necropsies revealed intestinal differences between untreated and treated piglets. For example, lysozyme- or antibiotic-fed piglets had longer fingerlike projections called 'villi', which absorb nutrients from feed.

"The mechanism by which lysozyme and antibiotics increase growth and feed efficiency is not completely understood," says William. "We believe that a large part of it is due to improved gastrointestinal health. Changes in the animals' gastrointestinal bacteria are also likely to play a key role."

## Further information:

William Oliver, Nutrition and Environmental Management Research, Clay Center, NE. Ph: +1 402 762 4206; Email: [william.oliver@ars.usda.gov](mailto:william.oliver@ars.usda.gov)



ARS scientists are studying a natural antimicrobial enzyme as a possible alternative to antibiotics for promoting pig health and growth. (PHOTO: Gloria Solano-Aguilar)





# NORTHERN FOCUS

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## THE RESEARCH VIEW

# Late application of N in wheat struggles to create economic gain

### AT A GLANCE...

- Research suggests late foliar nitrogen (N) application to increase wheat protein is unlikely to be an effective management tool in areas where spring rainfall is highly erratic.
- This strategy would only be considered if N in grain recovery levels are consistently increased to more than 50 per cent, untreated protein levels are close to a receival grade threshold and the premium between receival grades is at least \$20 per tonne.
- Early applications of N increase the likelihood of attaining both a yield and protein boost.
- Growers should consider top-dressing crops when the opportunity arises rather than waiting for a specific growth stage.

**T**ARGETING higher protein grades with late foliar nitrogen (N) applications is unlikely to deliver an economic return to northern wheat growers, according to a detailed three year research project conducted by the Northern Grower Alliance (NGA).

NGA chief executive officer Richard Daniel said a more effective and less risky strategy would be to apply additional N earlier in-crop which provides potential benefits in both protein and yield.

Richard outlined the findings of the research activity to growers and advisors attending the recent Grains Research and Development Corporation (GRDC) Grains Research Updates in Goondiwindi and Talwood.

"Results from the project suggest that trying to increase wheat protein with late foliar N application is unlikely to be a very effective management tool in areas where spring rainfall is highly erratic," he said.

"Unless N in grain recovery levels can be consistently increased to more than 50 per cent, grain price differentials of \$20 to \$40 per tonne are probably necessary before even considering this type of approach.

"Supply of N requirements either prior to or at planting, or as a top up during crop vegetative growth stages would appear a much more reliable and effective strategy to provide both agronomic and economic benefits.

"By putting N on early, there is a good likelihood of getting both a yield as well as a protein boost. But if the application is

## Consultants' Corner

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Chief executive officer of the GRDC-funded grower group Northern Grower Alliance, Richard Daniel. (Photo supplied by GRDC)

left to the end of the season, there is little chance of any yield benefit.

“Any economic benefit is reliant on achieving both a significant protein benefit as well as requiring an increase in grain price.”

### Multiple trials, dates and locations

NGA, a grower solutions group funded by the GRDC, evaluated the impact of late N application on protein levels in wheat across 15 trials during 2012 to 2014.

During 2012 and 2013, 11 trials were conducted using urea at a rate of 40 kg N per hectare and evaluated methods of application and application timing. The rate of urea was deliberately high to ensure that protein differences could be reliably measured.

Additional work in 2012 looked at different nitrogen formulations and compared the 40 kg N per hectare rate with an application at 20 kg N per hectare.

Although significant increases in grain protein were generated when urea solution was applied through a conventional nozzle, no net benefit was recorded at any site during the 2012 and 2013 seasons.

In 2014 the focus shifted to investigating whether a lower rate of N, or multiple low rates of N, could generate improved efficiency of uptake and deliver economic benefits.

Four trials were established in 2014 to evaluate EGA Gregory responses – two in commercial crops near Yallaroi and Mullaley in northern NSW and a further two trials at Tummaville near Millmerran on Queensland’s southern Darling Downs in a ‘planted small plot’ design.

One of the Tummaville trials was on the site’s existing low N background while the second was on a high N background where 107 kg N per hectare was applied prior to planting.

Products used in the trials included Ranger – a 24 per cent N aqueous urea solution – and an experimental urea formulation with added macro and micronutrients.

Three foliar application timings were evaluated – targeting awn peep, early flowering and about 7–10 days after timing two. Single application treatments of 20 or 40 kg N per hectare were applied together with multiple applications totalling 40 kg N per hectare.

“As expected, the late application of nitrogen did not significantly impact on yield in any trial,” Richard said.

“Additionally, at three of the four sites, there was no significant difference in grain protein level between any treatment and the untreated grain.

“But at the highest yielding (5.9 tonnes per hectare) and lowest protein (9.2 per cent) site, at Mullaley there were significant increases in protein from nearly all treatments.

### Rate and timing

“The key factors that drove the protein responses at this site were rate of nitrogen and application timing. There wasn’t any measureable benefit from multiple low rate application of N compared to a single application of the equivalent rate.”

The significant increases in protein largely failed to translate into economic benefits though with only six of the 14 treatments improving the receival grade from ASW to APW, according to Richard.

Unfortunately there was no price difference between ASW and APW grades in 2014 and an economic analysis based on

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a grain price of \$267 per tonne, Ranger at \$1.80 per kg N and application cost of \$8 per hectare per application, found only four treatments had provided a net benefit compared to the untreated, with a range from \$9–\$33 per hectare.

### What the trials indicate

"There are some key conclusions that can be drawn from these trials. Firstly, although the late foliar application of N can deliver significant increases in protein, it is unlikely to deliver an economic benefit unless grain N recovery rates are high, untreated protein levels are close to a receival grade threshold and the premium between receival grades is at least \$20 per tonne," Richard said.

"Secondly, timing differences didn't prove to be consistent but generally supported application between late head emergence and early milk stages for maximising protein accumulation.

"In terms of application, multiple low rate application in the 2014 trials did not appear to improve the response compared to the same rate applied in one application. But single applications of low rates (20 kg N per hectare) tended to improve efficiency of grain N recovery and economic benefits compared to single applications of 40 kg N per hectare.

"Finally, the important take home messages for growers are – apply additional N earlier in-crop to improve yield and protein and top-dress crops when the opportunity arises rather than waiting for a specific growth stage."

## THE COMMERCIAL VIEW

### MUNGINDI GROWERS TAKE N RESEARCH TO THE Paddock

Practical research into the economic value of different nitrogen application strategies is equipping Mungindi wheat growers with valuable management guidelines to maximise crop profitability.

The ability to better match nitrogen demands with seasonal conditions would enable growers in the north western cropping belt to make more targeted management decisions based on potential costs/benefits to their business' bottom line.

A three year study funded through the GRDC's Grain and Graze project has assessed the application of nitrogen at various crop stages and the resulting impact on volatilisation, yield, protein and profitability.

Conducted by the Mungindi Cropping Group during the 2012, 2013 and 2014 seasons, the trials were established on local properties Bullawarrie and Collybidgelah as grower-run strip trials with results collected at harvest.

A standard rate of 55 kg per hectare of nitrogen was applied as urea and initially the treatments included control (no N), 55 kg applied pre-plant, 55 kg applied post-plant and pre-emergent and 55 kg N applied post-emergent.

These treatments were extended in 2013 to pre-plant N spread (80 kg/ha urea), pre-plant N incorporated by the planter (80 kg/ha urea), control (no N), post-plant and pre-emergent (80 kg/ha urea), half pre-plant half early tillered (90 kg/ha urea) and half pre-plant and half when a minimum of 10 mm of rain fell (90 kg/ha urea). Similar treatments were undertaken in 2014 and the Collybidgelah site was added to the project.

#### Post plant N applications

Results from the trials suggest that post plant applications of nitrogen could deliver yield benefits, particularly if applied early in the season according to trial coordinator and Department of Agriculture and Fisheries (DAF) extension agronomist Jo Weier.

"The 2012 trial at Bullawarrie, demonstrated that 55 kg of N applied either pre-plant or post-plant pre-emergent yielded about 1.2 tonnes per hectare more than the control," Jo said.

"Given that the most common practice for N fertiliser in the Mungindi area was to apply 80 kg per hectare of urea at planting, we amended the rates in 2013 and 2014 and added some additional treatments.

"In the 2013 Bullawarrie trial we saw the post-plant pre-emergent applications of N yield the highest while at the same time, we saw very little difference in grain protein which ranged from 11.6 per cent to 12.1 per cent across the treatments."

In 2014, the trials on Bullawarrie and Collybidgelah assessed



Department of Agriculture and Fisheries (DAF) extension agronomist, Jo Weier.

the N treatments for their impact on yield, protein and gross margin.

At Bullawarrie, the difference in yields between all treatments was marginal at only 46.3 kg per hectare with the highest yielding treatment being the control (no N) and the lowest yielding treatment half pre-plant half early-tillered.

Using figures of \$540 per tonne for urea and a wheat price of \$280 per tonne, this translated to the control treatment returning close to \$50 per hectare more than the other treatments.

At Collybidgelah, the yield results varied by 199.2 kg per hectare between the highest yielding treatment, half pre-plant half early tillered, and the lowest yielding treatment, the control (no N). On a profitability analysis the half pre-plant half early tillered treatment returned \$35.89 per hectare more than the control.

"The trial has outlined the potential value of splitting nitrogen applications in wheat," Jo said.

"Growers within the Mungindi Cropping Group have gained a clearer understanding of when to apply nitrogen to maximise yield as well as benefiting from increased flexibility to adjust to seasonal conditions."

# MANAGING HELICOVERPA

Controlling *Helicoverpa armigera* and *Helicoverpa punctigera* in pre-podding chickpeas is often considered unwarranted due to the plant's ability to compensate for *Helicoverpa* damage and the low likelihood of incurring yield or quality losses during vegetative and early flowering stages.

The economic threshold calculator developed by Queensland DAFF is based on this principle, with an emphasis on controlling the most damaging larval stages between pod set and maturity.

However, strategic use of nucleopolyhedrovirus (NPV) such as Vivus Max during chickpea flowering has been used for many years by many growers to manage *Helicoverpa* leading into the critical podding stage.

Using Vivus Max early shows significant value in certain crops (such as soybeans) when used during flowering against pre-threshold populations of *Helicoverpa*. This technique relies on larvae dying from NPV infection and releasing huge amounts of the virus. In this way a single, low rate Vivus Max application can be used to "inoculate the crop" with NPV, and establish a natural virus infection cycle for many weeks or months.

AgBiTech, in collaboration with consultants and growers throughout the northern grain belt, undertook a trial program over several seasons to evaluate the early (pre-podding, sub-threshold) use of Vivus Max in chickpeas. The key questions to answer about this use pattern were:

1. Can it provide useful suppression of *Helicoverpa* during pod-fill?
2. Does the suppression delay the onset of economic threshold populations of *Helicoverpa*?

3. Is this sufficient to delay the need for threshold applications of insecticides or reduce the likelihood of needing a clean-up spray close to harvest?
4. Can early NPV reduce the level of pod damage compared to a conventional management strategy (i.e. threshold application of insecticides)?
5. Does a half rate of Vivus Max (75 mL/ha) provide an effective "inoculation dose"?

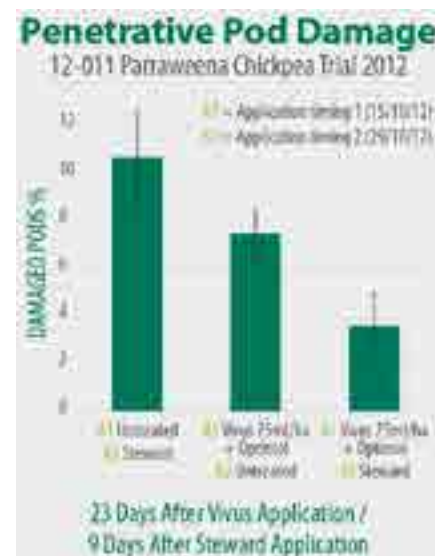
## Trial Program

Large-scale trials were conducted from Quirindi, NSW to Emerald, Qld using commercial / grower spray equipment. The trials were laid out in single fields that were initially split into two. One half was managed using the normal commercial insecticide regime and the other half was treated with a pre-threshold application of Vivus Max. Each section was managed individually, and in some cases each section was further split as the season progressed to allow for different treatment regimes.

## Damage Reduction

The key benefit of using NPV early is that the presence of the virus minimises the number of larvae that develop beyond 3rd instar and into the most damaging stages. This greatly reduces the "sub-threshold" damage that occurs prior to the application of a knockdown insecticide, and will also minimise damage from larvae that may survive an insecticide spray.

This graph shows that under high insect pressure, a single application of Vivus Max (applied two weeks before the crop reached economic threshold, when it was sprayed with Steward) provided greater damage reduction than the threshold spray of Steward. This





# IN CHICKPEAS WITH NPV

exceptional level of performance from NPV is not usual, but shows that when applied early and under good conditions, Vivus Max can be very effective in chickpeas. The combination of the early Vivus Max with a threshold Steward spray was the best performing treatment and provided over 60% damage reduction compared to Steward alone.

## Delayed/Fewer Insecticides

It is often reported that early applications of Vivus Max in chickpeas delays larval numbers reaching economic threshold. Results from the trial program confirmed this effect in the majority of situations – an example can be seen in the graph [below] where threshold levels were delayed by 10 days due to the use of Vivus Max. In addition, the number of 4th and 5th instar larvae remained low in the Vivus Max treated area. Depending on the season, delaying the first chemical insecticide can have the effect of eliminating the need for a “clean-up” spray close to harvest.

## Why Vivus Max instead of Synthetic Pyrethroids?

Under sub-threshold conditions, application of synthetic pyrethroids (SP's) for *Helicoverpa* control will have limited



NPV infected larva in chickpeas

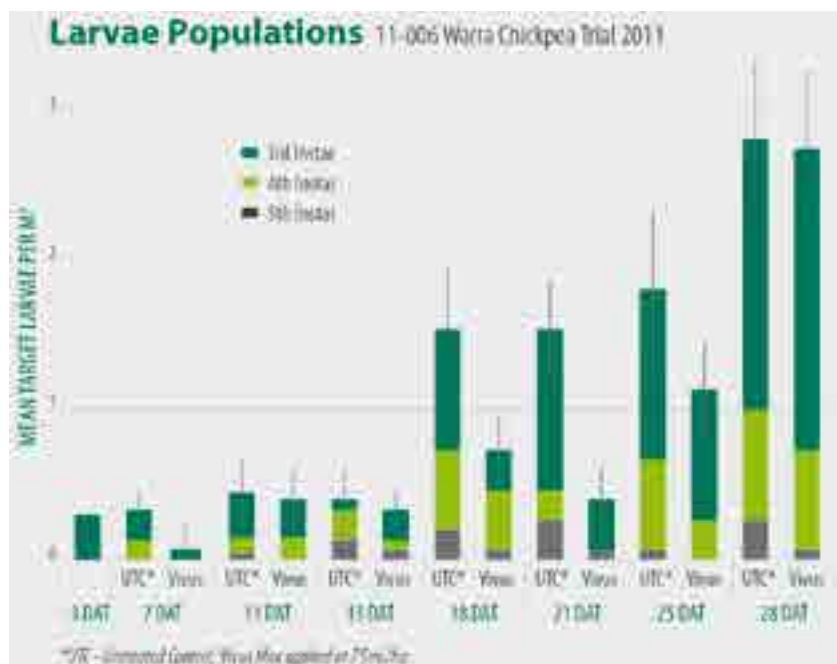
to no economic benefit. SP's usually offer good control of eggs and larvae that are present, but have short residual control. NPV inoculation using Vivus Max will provide ongoing suppression of *Helicoverpa* for many weeks, with no disruption to beneficial species that may be present (such as ants and spiders).

## The Recommendation

The trial program showed that early applications of Vivus Max at low rates gave a consistent economic benefit to chickpea farmers under both low and high pressure scenarios. AgBiTech's recommendation is as follows:

- Use Vivus Max at the registered rate of 75mL/ha (with or without Optimol);
- Apply after larvae first appear and before the presence of pods – larvae must be present to get the “NPV inoculation” benefit; and,
- If possible, time applications to be applied in mixture with other pesticides – Vivus Max is highly compatible in mixture.

For further information, call  
Sophie Gulliver (AgBiTech Technical Specialist) on  
0409 001 142 or visit [www.agbitech.com](http://www.agbitech.com)



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# The 2014-15 mungbean season

■ By Cindy Benjamin

**T**HERE were smiles all round at the end of the 2014–15 mungbean season. Many considered that the Australian mungbean industry came of age with strong market demand supporting new growers and new varieties withstanding a range of disease and climatic challenges across the growing regions.

Regal Seed & Grain's managing director Damien White said the area sown in Central Queensland was close to double the usual area in response to strong export demand for mungbean this season.

"We saw the first spring mungbean planting for many years and a large summer planting," he said. "Some crops under the eye of Cyclone Marcia had up to 1.5 metres of water over them and still achieved yields of 0.6 tonne per hectare of processing quality beans. This is a remarkable result and proves the plant breeding program is on the right track with resilient varieties."

"For most other growers the cyclone brought some very welcome in-crop rain for the summer crop.

"We have previously seen Crystal revolutionise demand for Australian mungbean and the new variety, Jade-AU, has been immediately accepted as the new high quality shiny green mungbean from Australia," he said. "Buyers are asking for Jade-AU by name and it has also performed very well in the field, having withstood significant weathering challenges this season."

Damien said tan spot was present this year but the good growing conditions and the strength of the Jade-AU plants fended off widespread infection.

"There was also patchy pressure from mirids in early crops due to the mild winter in 2014 enabling the insects to over-winter and attack young crops," he said. "Their numbers died down over summer though and did not present a problem for later planted crops."

"The biggest change I have seen in the past few years is in the number of growers talking about mungbean as being a permanent part of their summer farming system," Damien said. "Even five years ago mungbean was seen as an opportunity crop and the fluctuations in production presented Australia with some marketing difficulties. There is now real growth potential for the industry with reliable varieties, good agronomy, strong market demand and solid supply."

Dale Reeves, Peters Commodities said the Darling Downs and northern NSW districts also fared well, particularly with the summer-sown crop. "Several growers took advantage of an opportunity to plant in spring but heat wave conditions saw a loss in yield and quality," he said. "Although there was some disappointment in the result it is unlikely that any growers suffered financial loss. Demand was high and even beans sold as manufacturing grade provided solid returns per hectare."

Crops planted in late January benefitted from good in-crop rain, thanks in part to Cyclone Marcia, and even temperatures. These crops grew well and produced high yields although there was some weathering that has downgraded a portion of consignments to processing grade.

Like in CQ, there was extraordinary uptake of Jade-AU for planting with over 70 per cent of the area sown to the new variety. "We had anticipated a 30–40 per cent adoption rate of Jade-AU in its first fully commercial year so the supply of seed was tight," said Dale.

This year mungbean was also an attractive option for irrigators, providing good returns per megalitre. Dale said now is a good time to plan to include mungbean in the rotation while prices are high, giving first-time growers an excellent opportunity to learn how to best grow the crop.

## Excellent gross margins

"Returns of over \$1000 per tonne to growers has made mungbean very competitive in terms of gross margins," he said. "Once a grower has some experience with the crop and is achieving optimal yields then they can afford to plant even if the price eases."

"This is also a good time to start monitoring the market conditions and gaining an understanding of price drivers in relation to grain quality," he said.

The commitment of the Australian Mungbean Association (AMA) to quality assurance is also paying off with a high level of grower support for the vendor declaration system. AMA president, Rob Anderson said many buyers are asking to see the declarations and be assured of the quality and food safety of the product they are purchasing.

"In many countries mungbeans are consumed in the form they leave the country and buyers want to be certain that the product is safe to eat," he said. "Buyers recognise and value the clean, green and safe product available from Australia and it is in the industry's best interest to do everything possible to maintain that good image in the marketplace."

Growing demand from China is a positive sign for the Australian industry, which has previously supplied mainly to India and to countries in South-East Asia.

Pulse Australia national manager, Gordon Cumming said mungbean is recognised as part of the 'landscape' for many northern region growers and this has attracted ongoing funding and support from the Grains Research and Development Corporation, state governments and universities to minimise production risks through advanced plant breeding and agronomy research.

"Growers and advisors are also taking advantage of the industry support and extension activities, such as the Mungbean Best Management Practices training courses.

More information: [www.pulseaus.com.au](http://www.pulseaus.com.au)



Mark Schmidt, Bean Growers Australia (left), Gordon Cumming, Pulse Australia (centre) and Australian Mungbean Association President, Rob Anderson inspect mungbean trials at an industry field day at Hermitage Research Facility, Warwick earlier this year. (Photo: N. Lyon)



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## THE RESEARCH VIEW

# Wheels are moving on Controlled Traffic Farming

**R**ESearchers who are reporting heightened grower interest in Controlled Traffic Farming (CTF) advise that the transition to CTF need not be costly or difficult.

The implementation of CTF systems can significantly improve grain yields on compacted soils, which have been calculated as costing agriculture in Western Australia alone at least \$333 million annually.

Department of Agriculture and Food WA (DAFWA) economist James Hagan is involved with a Grains Research and Development Corporation (GRDC) funded project aimed at minimising the impact of soil compaction on crop yield.

Soil compaction is one of a range of soil constraints that cause significant production losses to growers each year.

To help meet this challenge in WA, the GRDC is investing with other research agencies in a \$33 million, five-year Soil Constraints – West initiative to develop and deliver practical management solutions to issues including compaction.

James said renewed grower interest in CTF could be attributed to a number of factors.

“These include the need to improve access to stored subsoil moisture; to minimise the need for costly ripping programs; and to protect investments made in amelioration techniques such as spading or mouldboard ploughing,” James said.

“While transitioning to CTF requires farm businesses to plan



Spraying tramlines on a 12 metre fully matched CTF system.

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**Growers discuss CTF machinery options at the 'Deeper Roots' workshop in Geraldton, WA, in February 2015. (Photo by Peter Newman, Planfarm)**

"As compaction moves deeper through the subsoil to depths of 60 cm and beyond, regular deep ripping programs, which may previously have been considered as an alternative to CTF, are no longer able to reach all the compacted layers.

"This is especially critical on deep sands where unrestricted root growth regularly needs to exceed two metres, as restricted root growth will limit plant available water and therefore yield potential."

James said average rainfall had declined over the past 15 years in many WA cropping areas, which was likely to worsen the impact of compaction and other soil constraints on crop yields.

"This decline in annual rainfall has often been accompanied by dry spells within the growing season, with periods of four to eight weeks of minimal rainfall and higher temperatures," he said.

"This period of minimal rainfall makes plant access to stored subsoil moisture a critical factor in the ability of crops to survive these periods of stress without incurring major yield penalties.

"The effect of this increasing reliance on access to stored moisture during the growing season means that addressing subsoil constraints such as compaction and acidity, which limit plant access to the soil profile, is going to be increasingly important in the future."

### Minimising the impact of soil compaction

James said numerous paddocks across the WA grainbelt had been measured for 'moist penetration resistance' in the past 15 years, providing a measure of the level of soil compaction.

"Data collected from these samples suggests that 80 per cent of sandplain paddocks had moist penetration resistance of 3MPa – which severely restricts root growth – at a depth of 30 cm," he said.

"More concerning is that 40 per cent of paddocks had resistance of greater than 3MPa at 50 cm.

"In the most extreme examples of this compaction at depth, a carry grader used for claying during a wet summer created a soil penetration resistance of greater than 3MPa to a depth of almost 70 cm.

James said it was possible for uncontrolled farm machinery traffic to cover a significant portion of a paddock in a single year, and more than 90 per cent in two years.

"This is especially likely to happen if traffic directions change," he said.

"A standard scenario with a 14 metre (45 foot header), 15 metre (50 foot seeding bar), a 36 metre (120 foot) boomspray and a chaser bin – not running on tramlines – can result in 46 per cent of a paddock carrying traffic in a season."

### CTF scenarios

James said the perfect scenario for minimising the impact of compaction was a fully matched CTF system, typically accomplished via a 1:3 ratio, where the header and seeder were one-third the width of the boomspray.

This system resulted in 10–12 per cent paddock wheel track coverage.

"But while a perfectly matching system is optimal for minimising the impact of compaction, there are often compromises that need to be made in order to work in with existing production systems," James said.

"Considerations include straw, spreading widths for fertiliser and lime, time constraints for spraying and even basic factors such as the size of seeding and harvest programs."

James said a current popular compromise, which accommodated the need of many growers for large seeding gear, was a 1:2:3 fit, with the harvester a third the size of the boom spray and the seeding bar half the width of the boom spray.

"For example, a 12 metre (40 foot), 18 metre (60 foot), 36 metre (120 foot) system on three metre centres, whilst not perfect, reduces the tracked percentage to approximately 18 per cent," he said.

Growers using 'compromised' CTF systems are often planning to move to either one 24 metre (79 foot) wide seeder or two, 12 metre (40 foot) seeders to replace their one 18 metre (60 foot) seeder, as part of their progression to a better matching system.

### Calculating the cost of compaction

James said that while it was useful to know the approximate percentage of traffic driving over a paddock, it was more important to understand the yield penalty that this caused.

"Various WA trials suggest that yield penalties on deep sands

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can range from 20–47 per cent, while penalties on deep duplex soils average 22 per cent,” he said.

James said the best way to calculate yield benefits that could be achieved by moving to CTF was to compare the area currently trafficked with the area that would be trafficked under a CTF system.

“Yield benefits can be calculated by multiplying the difference in tracked area by the identified yield penalty for the relevant soil type,” he said.

### Moving to CTF

James said moving to a CTF system required minimal effort if all gear was already at complementary widths and the only necessary changes were wheel spacing modifications.

“For others, it requires replacing machinery to create a system that works effectively,” he said.

“It is important in either scenario to forward plan carefully and consider long-term requirements.

“In the first, easy scenario, it is important to consider whether current operating widths are likely to fit in with your future plans.

“In the second more difficult scenario, it is important to recognise that while replacing all machinery to fit a system sounds expensive, it can be worked into your standard machinery replacement schedule.

“With purchases worked into a standard replacement program, the cost of moving to CTF can be minimised and some purchases may be brought forward once the farm business is close to reaching a full match.

“A proven method for creating a machinery investment plan is to note down current machinery, its age and when it is due to be replaced.

“This can help create a schedule for moving to CTF.

“In WA grower case studies conducted for a CTF technical manual, most businesses stated that their total cost of moving to a CTF system was less than \$20,000 – largely attributed to the cost of moving wheel widths.”

### Protect your investment in costly soil renovation

James said growing numbers of farms across WA were using mouldboard ploughs or rotary spaders to improve non-wetting soils, incorporate lime or bury resistant weeds, as well as remove compaction in the top 30 cm of the soil.

“These treatments are producing some excellent yield responses in the same season, with some mouldboard treatments still delivering benefits seven years on if traffic has been controlled,” he said.

“A driving factor behind the adoption of these amelioration techniques has been the strong early returns that they can generate.

“But a significant factor influencing the true value of costly subsoil amelioration strategies is the length of time for which the benefits persist.

“By protecting the benefits provided by costly subsoil amelioration, your return on this investment can be increased significantly.”

### CTF workshops

Soil compaction workshops, hosted by DAFWA and supported by the GRDC, were held in Geraldton and Bencubbin in WA in February, 2015, in order to provide information to growers interested in implementing CTF systems.

CTF information was also provided at a ‘Soils Masterclass’ workshop at Scaddan in March. This event was organised by the

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GRDC's Esperance Regional Cropping Solutions Network (RCSN) in conjunction with the South East Premium Wheat Growers Association (SEPWA) and DAFWA.

DAFWA researcher Paul Blackwell, who was involved with the events, said he was encouraged to see a positive shift in grower attitudes towards CTF.

"There is a big change in grower awareness of CTF and their commitment to move towards implementing this system," he said.

Paul said that once a farm business had decided on a CTF schedule, everyone involved in the business needed to 'own' that plan, which could take years to implement.

"I suggest making that plan visible – such as pinning it to the fridge door – so that everyone sticks to it," he said.

"This can help to discourage anyone from making 'bargain' purchases that don't fit in with the schedule.

"CTF doesn't have to cost the earth. Any business should be able to transition to this system fairly painlessly."

#### More Information:

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Paul Blackwell, DAFWA, 08 9956 8555, [paul.blackwell@agric.wa.gov.au](mailto:paul.blackwell@agric.wa.gov.au)

Useful resources on CTF and compaction include:

- May 2015 DAFWA Northern AgMemo article *Line up your machinery to reduce compaction* available at [www.agric.wa.gov.au](http://www.agric.wa.gov.au) by searching 'AgMemo' and 'compaction'
- *Controlled Traffic Farming Technical Manual*, including grower case studies, available on the Northern Agricultural Catchments Council (NACC) website [www.nacc.com.au](http://www.nacc.com.au) by searching 'Controlled Traffic Farming'
- DAFWA *Deep ripping for soil compaction* article available at [www.agric.wa.gov.au](http://www.agric.wa.gov.au) by searching 'deep ripping'
- DAFWA *Identifying soil compaction* article available at [www.agric.wa.gov.au](http://www.agric.wa.gov.au) by searching 'compaction'
- GRDC *Controlled Traffic Farming Fact Sheet* at [www.grdc.com.au/GRDC-FS-ControlledTraffic](http://www.grdc.com.au/GRDC-FS-ControlledTraffic)
- Wheeltrack Calculator (to estimate your wheeling percentage) at [www.precisionagriculture.com.au/apps-podcasts](http://www.precisionagriculture.com.au/apps-podcasts)

## THE COMMERCIAL VIEW

### CTF 'COMMODORES' AND COMPROMISES

■ By Peter Newman, Planfarm project consultant

Growers making the change to Controlled Traffic Farming (CTF) shouldn't feel they need to jump straight away to a 'Rolls Royce' system – a 'Commodore' can also make a massive difference to their bottom line.

The 'perfect' scenario for minimising the impact of soil compaction is described as a fully matched 3:1 ratio CTF system where the harvester and seeder are one-third the width of the boomspray – resulting in 10–12 per cent paddock wheel track coverage per year.

But many growers are significantly reducing wheel tracking to 20 per cent per year or less using 'compromised' CTF systems – typically involving a 12 metre (40 foot) harvester, an 18 metre (60 foot) seeder and a 36 metre (120 foot) boomspray.

Many growers without CTF systems taking part in recent Western Australian soil compaction workshops discovered they currently have wheel tracking of more than 50 per cent.

But they could fairly painlessly get that figure down to 20 per cent – simply by adjusting their steering and making minor modifications such as adjusting axle widths or making minor changes to existing equipment.

Most growers attending the workshops – conducted by the Department of Agriculture and Food WA (DAFWA) with support from the GRDC – were convinced of the benefits of CTF but didn't know where to start in implementing it.

#### Start with a 'compromised system'

I think it helps to make a plan, and that a good first step of the plan is to start with a 'compromised system'.

Step one of the plan is to reduce wheel tracking with little or no expense at all.

Growers can then either stay with this second-tier system – which still delivers significant benefits – or gradually progress towards a fully matched system.

The second option involves choosing operating widths suitable for their farm business over a long period of time, typically as existing machinery becomes due for replacement.

It's important to remember that even relatively small percentage changes in key areas can equate to big percentage changes in overall profitability.



Peter Newman.

This was starkly illustrated in recent years by a GRDC-supported Planfarm study which analysed the top performing growers in WA's eastern grainbelt, and compared them with average performers in the Planfarm Bankwest Benchmarks for the region.

The study showed that an extra 0.1 tonne per hectare in wheat yields, combined with five per cent lower costs across the farm business and a small increase in grain prices, resulted in additional profitability of \$143,000 per year.

Implementing even a 'compromised' CTF system may be a way to have a big impact on farm profitability through a small increase in yield and a small decrease in cost.

The higher yields are the result not only of less compaction but reduced damage to crop plants.

Lower costs come from reduced fuel usage and less need for costly practices such as regular deep ripping – to help ameliorate compaction.

Why not start with a reliable second-hand Holden Commodore now (ie. compromised CTF system) and buy the Rolls Royce later with the extra profit made from higher yield at a lower cost?



# Break crops can deliver spectacular impacts in low rainfall regions

■ By Rebecca Barr

A MAJOR GRDC-funded project has assessed the profitability of many different break options in five different low rainfall sites across southern Australia over the past four years.

Low Rainfall Crop Sequencing Project leader Nigel Wilhelm says a common finding across all trial sites is that incorporating break crops provided a more profitable outcome over four years than continuous wheat.

The project ran trials from 2011 to 2014 at Condobolin, NSW with Central West Farming Systems; Chinkapook, Vic, with Birchip Cropping Group; Mildura, Vic, with Mallee Sustainable Farming; Appila, SA with Upper North Farming Systems and Minnipa, SA, with the Eyre Peninsula Agricultural Research Foundation.

At each site, about 15 different break options were used for a one or two-year break in 2011. From 2012, wheat was sown on the one year break sites, and then in 2013 and 2014 wheat was sown at all sites. A control plot of continuous wheat was planted at each site so that direct comparisons could be made.

Nigel, who is a research scientist at the South Australian Research and Development Institute (SARDI) – the research arm of PIRSA – said the break options were selected based on the local region.

"Some breaks we used at every site, including canola, peas, pasture, fallow, and some were tailored to the location. For example at the Central West trial we planted lupins (both narrow leafed and white), which growers use in that region. We also used some crops in different ways, for instance peas were either cut for hay or harvested, to check the different profitability outcomes," he said.

## Spectacular impact on tired paddocks

The key agronomic outcome from the trials was that the break crops had a 'spectacular' impact on subsequent cereal performance.

"We chose sites which had a long history of cereals. Many growers in the low rainfall zone are reluctant to stray away from wheat, which was served them so well in the past, and so it is fairly common for paddocks to have this long history of cereals," Nigel said.

"What we found was that a break crop brought a completely new lease of life to these 'tired' paddocks, with the yield in the first year of cereals up to one tonne per hectare higher than the continuous wheat control plot."



**SARDI researcher Nigel Wilhelm has found that break crops can increase profitability in low rainfall farming systems. (Photo: Nigel Wilhelm)**

## Cereal benefit

Nigel suggests the major reason growers should consider a break crop is for the benefit it delivers in following wheat yields.

Figure 1 shows the benefit in yield from a one or two year break in the first and second years of wheat following a break, incorporating the average of all break options.

"After a one year-break, there was a median increase of around 0.25 tonnes per hectare, and that benefit flowed through into the second year with a 0.1 tonnes per hectare benefit compared to the control. The real winner though was after a two-year break where the median benefit was 0.75 tonnes per hectare, and in 25 per cent of cases, the benefit was over one tonne per hectare. The second year wasn't quite so dramatic, but there was still a 0.2 tonnes per hectare improvement," he said.

The cumulative benefit of a two-year break over two years of wheat was on average 1.2 tonnes per hectare, compared to growing continuous wheat. This benefit is in addition to any profit obtained from growing the break crop.

## Breaks as a cash crop

One key finding from the trials was the effectiveness of some break options as a cash-crop.

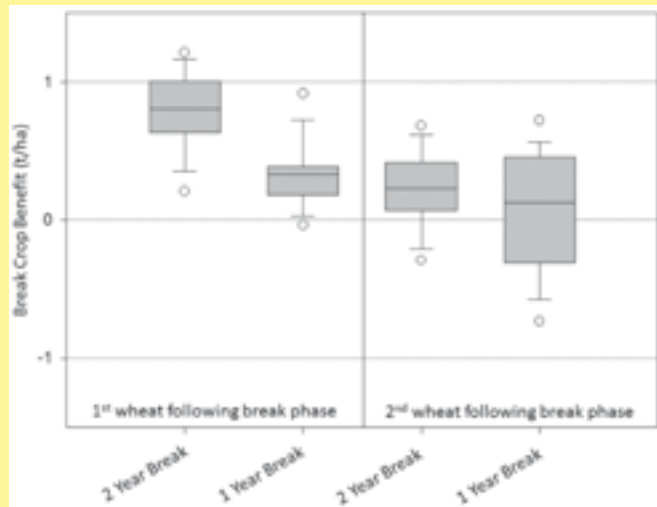
"A finding that we believe would surprise a lot of growers was that some of the break options were not much more expensive to grow than a wheat crop. Where wheat has been grown continuously, the cost of maintaining yield has been gradually increasing due to higher fertiliser rates and herbicides. Combined with improved management practices around break crops, this meant that despite perceptions that breaks are expensive, there wasn't necessarily much difference in cost," Nigel said.

Changes to management practices include recommendations for reduced sowing rate in many break crops compared to guidelines in higher rainfall areas. For example, seed for hybrid



**Trial plots at Minnipa in 2012 comparing a range of break options compared to wheat. (Photo: Nigel Wilhelm)**

**FIGURE 1: Benefit of break options on subsequent wheat yields across experiments at four locations in the low rainfall zone of south-eastern Australia, compared to continuous wheat**



The plot displays the median (—), 25th to 75th percentiles (■), 10th (L) and 90th (T) percentiles and the <10th and >90th percentiles (O). The median is the middle value in the range of outcomes. (Source: Nigel Wilhelm)

Clearfield canola varieties can cost up to \$80 per hectare when sown at rates suitable for higher rainfall, and as such reducing sowing rates to a rate more suitable to the LRZ can significantly reduce costs, especially if combined with retained seed from open pollinated varieties. Growers are advised to see their local agronomist for the most up-to-date agronomic recommendations for particular crops in their region.

“The performance of some of the break crops was also better than a lot of the local growers expected. For instance peas occasionally yielding almost as much as the wheat, because of the low baseline wheat performance as well as new pea varieties having improved adaption to the lower rainfall environments,” he said.

### Profitability

The research team has put together gross margin outcomes for each of the scenarios tested. At all sites, there was always at least one break option which increased the overall gross margin over four years. In some cases two year breaks were even more profitable.

The study found that providing at least one of the break years resulted in a profit, then the overall outcome of a two-year break could be more profitable than wheat alone. For example, a failed canola crop, followed by a profitable pea crop and then two years of wheat was more profitable than four years of wheat.

“This is fantastic news for growers. It is a mitigating factor to some of the risks of break crops,” Nigel said.

“For instance, canola had some real challenges in 2014. But growers who put in a canola crop last year, and who get a profitable break this year, could still be better off in the long run than if they’d stuck with wheat over the past two years.”

The analyses conducted in the trial do not include the costs of development of herbicide and pesticide resistance. It’s well understood that use of the same modes of action year after year lead to selection for resistance. So a further significant benefit of break crops, which cannot be easily quantified, is the opportunity to rotate chemicals and open up new options for weed and insect control, which will delay the onset of resistance.

### Break crop choice?

After studying 15 different break options, what is Nigel’s advice in selecting a break type?

“The key is to choose a break that will address the cause of a



Field day participants inspecting various break options at Minnipa in 2012. (Photo: Nigel Wilhelm)



tired paddock. In many low rainfall environments, grassy weeds are a key cause of declining wheat yields. In this case, we found canola had a strong effect on the weed seedbank for multiple years, because not only can grass selective herbicides be used, canola also competes very strongly with any escape weeds from grass control operations. But vetch tends to be a poor competitor early in the season and a few grassy seed escapes can still set a lot of seed," he said.

Where nutrients are the limiting factor, canola is less likely to be beneficial compared to crops such as pulses, which fix their own N from the atmosphere and can build soil reserves.

The options available after a crop has been planted are also a consideration.

"Seasonal conditions are always a risk factor. If a grower chooses a crop that can be cut for hay or harvested for grain, this might reduce the risk level. For instance if a grower plants peas

## PROFITS HIGHER AT MINNIPA

Minnipa, in the north of the Eyre Peninsula, was one of the five sites selected for the trial. With 324 mm annual rainfall and sandy loam over light clay, the average yield of wheat at the site is historically around 1.7 tonnes per hectare.

Prior to the trials, at least five consecutive seasons of wheat had been grown, with key challenges developing in control of the grassy weeds barley grass, brome grass and annual ryegrass, as well as high levels of rhizoctonia inoculum levels.

Seasons 2011 and 2012 were mostly sown to breaks, with the exception of the one-year break plots which were sown to a break in 2011 but back to wheat in 2012. These two years, but particularly 2011, were mild, with relatively high rainfall.

"The results were strong from the break years at Minnipa," Nigel said. "In particular, a medic pasture grew three to four tonnes of dry matter per hectare, which was great. Because we had a control plot of continuous wheat, it didn't matter to the results of the trial that the break years were good, as the control plot had a couple of good years too."

The effect of the first two years' crop choice on the third

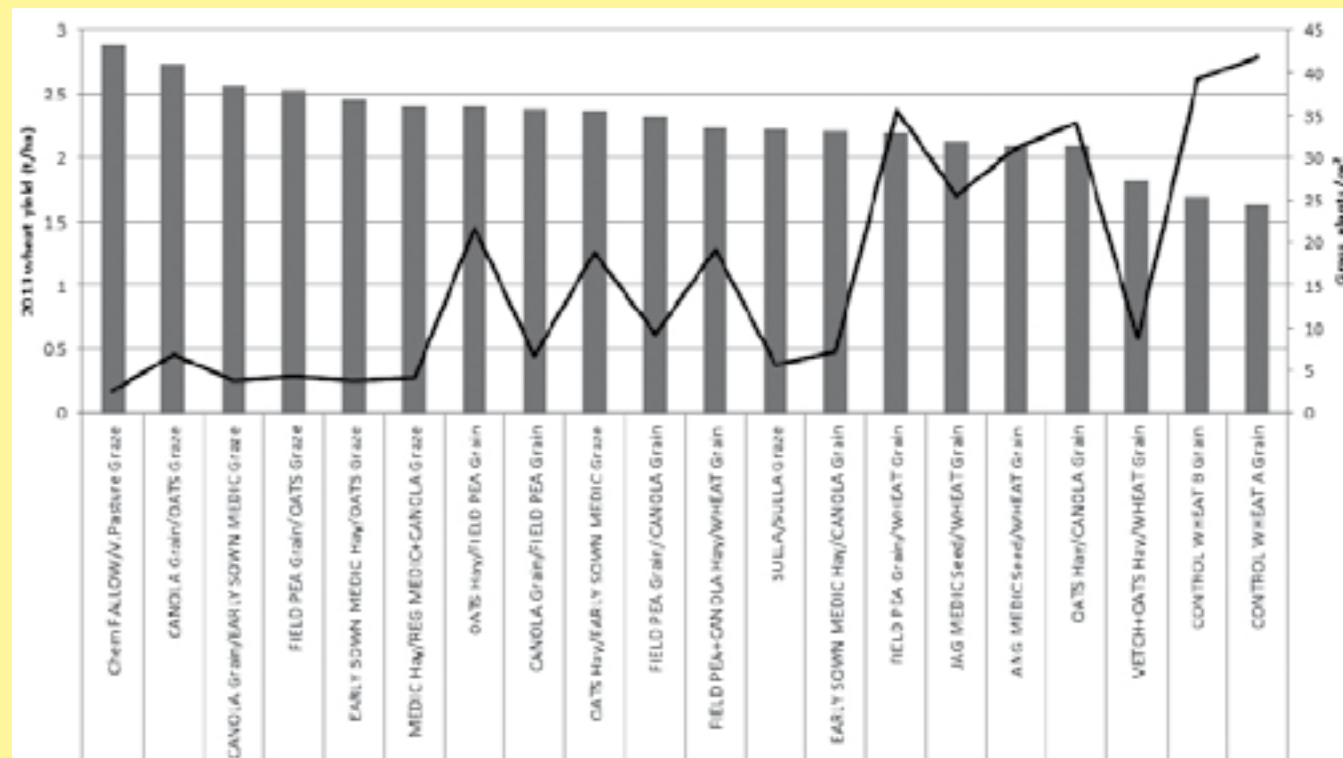
year wheat performance is shown in Figure 2. The wheat yield (depicted as grey bars) was lowest for the control (wheat/wheat) option, with grazing options giving the highest yields. Grassy weed control followed a similar trend, though it should be noted that while a one year vetch hay break appeared to give strong weed control (third point from the right), this effect was short lived, and did not persist into 2014.

Rhizoctonia levels were similarly beneficially affected by break crops.

"In 2013 roots were collected and scored for rhizoctonia wheat root damage. The continuous cereal treatments had significantly higher root disease incidence compared to all other treatments. At these levels nutrient uptake can be reduced and could help explain the poor yields recorded in these treatments," Nigel said.

In terms of profitability over four years, the most profitable sequences were two years of fallow and two years of wheat, or canola cut for hay, peas harvested for grain and two years of wheat.

**FIGURE 2: 2013 wheat yields (grey bars, tonnes per hectare) and grass weed counts (black line, plants/m<sup>2</sup>) in August 2013, following treatments imposed in 2011 and 2012**



(Source: Nigel Wilhelm)

they can choose to go through for grain – or if the season turns dry and its unlikely to get through to a strong yield – they can cut it for hay and still make a reasonable return,” Nigel said.

The low rainfall zone crop sequencing project has been extended by one year for 2015 so that the effect of break crops on wheat yield can be assessed three years following the break.

**More Information:**

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## BREAK CROP ADOPTION IN THE MALLEE

When the crop sequencing project started in 2011, less than five per cent of Mallee cropping land was sown to break crops, with intensive cereal cropping dominant in the region.

Mallee Sustainable Farming’s Michael Moodie says five years ago, there might have been “the odd paddock of canola”.

“The crop sequencing project has really changed perspectives, especially in the northern Mallee. The trials have given confidence to growers of the long-term profitability of break crops. They can rely on the four years of regionally specific data from the project to show the benefit, reducing the risk they have to take on,” Michael said.

The MSF trial, located in Mildura, trialled nine different break options in 2011, as well as a baseline wheat. In 2012 the break was either continued for a second year, or sown back to wheat. Wheat was grown on all plots in 2013 and 2014.

The site experienced below average growing season rainfall in 2011 and 2012 (108 mm and 92 mm respectively compared to a long-term average of 173 mm), and average rainfall in 2013 and 2014.

A one-year break of field peas led to an increase of 0.3 tonnes per hectare in the subsequent wheat crop, or 0.1 tonnes per hectare for a canola break. But these benefits only lasted one year. After a two-year break, wheat yields increased by 0.5-1.25 tonnes per hectare, with a benefit of up to 0.4 tonnes per hectare observed in the second year of wheat.

### Less brome grass a big factor

The key driver for improved performance was brome grass reduction, which accounted for 39 per cent of the total increase in yield in 2013 and 80 per cent in 2014. Increased nitrogen, at 38 per cent and 18 per cent in 2013 and 2014, and less rhizoctonia at 19 per cent in 2013 were the other significant causes of improved wheat performance.

In terms of profitability, 15 of the 19 rotations were more profitable than continuous wheat. On average, the top five rotations increased profit by \$90 per hectare per year. Four out of the five top performers included a two-year break.

As a result of the project findings, growers in the Mallee are starting to embrace break crops.

“Coming from a situation where there was over 95 per cent cereals five years ago, now there’s wide ranging plantings of field peas, and vetch – for manuring or livestock. Here and there you can see chickpeas, lentils, and lupins. Growers are really expanding their horizons, using a wider range of crops in their farming system which, as the trials show, is a really positive move not only for soil health and weed control but also profitability,” Michael said.

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# Scholarship recipient takes to the skies

USING drones to capture high resolution images of trial sites to enable breeders to analyse plant characteristics will be the focus of a new research project at the University of Adelaide’s Waite campus – thanks to the Peter Waite Centenary Scholarship for Excellence in Agriculture.

New PhD student James Walter is the inaugural recipient of the scholarship which was launched to mark the centenary of Peter Waite’s generous donation enabling the establishment of the Waite campus.

The first scholarship has been funded to \$30,000 a year by the South Australian Grain Industry Trust (SAGIT).

James’ project aims to improve the speed and accuracy in phenotyping, which is observing external plant characteristics created by a plant’s genes, or genotype, interacting with its environment.

James said he would use drones and other technology to capture images to characterise wheat breeding yield plots to assess biomass, head density, maturity, nitrogen and other phenotyping traits.

“The data extracted from these images will then be used to develop statistical models that more accurately describe the performance of wheat varieties for breeders,” he said.

“Although DNA-based selection is now common place, field-based phenotyping is still the main method used to make genetic gain for traits such as flowering time, grain yield and disease resistance.

“I’ve been interested in technology for quite a while and wanted to find a way to incorporate technology and agriculture, so when this project came up, it seemed like a great opportunity.”

James is currently completing a SAGIT and Grains Research and Development Corporation (GRDC) funded internship at the South Australian Research and Development Institute (SARDI), as the inaugural recipient of the Applied Grains R&D Internship. He is working primarily in cereal and pulse pathology and is managing a project on white grain disorder. He has previously completed a Bachelor of Agricultural Sciences and Honours in Plant Nutrition, both at the University of Adelaide.

James will commence his PhD with the University of Adelaide in July and will be based primarily at the Waite campus. His research will be in collaboration with Australian Grain Technologies.

The Peter Waite Centenary Scholarship aims to support an outstanding future leader in agriculture through their PhD studies in the area of plants or soil science.



**James Walter is the inaugural recipient of the scholarship.**



# International grain scene



## AT A GLANCE...

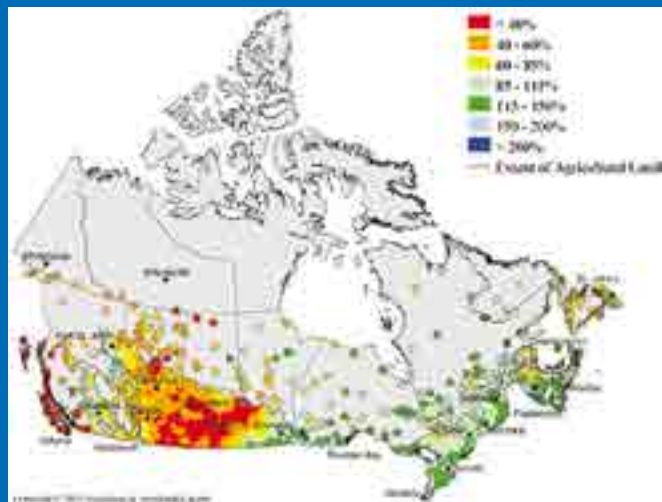
- Canadian production concerns continue to provide support to global canola markets.
- Downgrades of Canadian wheat are weighing on global wheat quality.
- Greek debt crisis putting downward pressure on \$A.

## Is it getting too late for Canadian grain crops?

Canadian production concerns continue to prop up offshore wheat and canola markets as dry conditions in early July persisted across the Canadian agricultural regions.

As the map below highlights, much of the Canadian production regions have suffered below average rain over May and June with the red area highlighting 40 per cent or less of average rainfall. Those rains which have fallen have been patchy at best and insufficient to make up for the growing deficit of soil moisture.

### Canada's 60 days per cent of average rain (May 1 to June 29, 2015)



These same regions continued to face high temperatures in early July which exacerbated the impact of the dry conditions.

Whilst some are saying the crops are hanging in there (early July), in the coming weeks the moisture requirements of the crop will increase as they enter the reproductive phase. So there is a growing urgency around the need for decent falls.

### So what does this mean for Aussie growers?

Last year, Canada was the world's second largest producer of canola, and the largest exporter. In 2014 Canada produced 15.6 million tonnes (mt) of canola but this year CWB (Canadian Wheat Board) is forecasting a crop of only 12.7 mt – an 18.6 per cent reduction year on year.

### ICE canola November 2015



Whilst canola plantings are down year on year, recent StatCan data showed a reduction of 2.5 per cent in planted area year on year. This suggests the rest of the production losses are expected to be due to seasonal conditions.

At 12.7 mt, against USDA data this would be the smallest crop since 2008–09. So if the CWB estimate eventuates, production – and in turn supply of canola – will be tight in 2015.

The USDA currently has 2015 canola production from Canada pegged at 14.8 mt, based on ongoing strong export



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demand, this results in a final carry out number of 1.63 mt. But this production number is 2.1 mt higher than the current CWB estimate.

If we were to plug the CWB estimate into the USDA model Canada would run out of canola and run in to negative balances (clearly not possible) before the end of the season.

The reality is, if the CWB production estimates eventuate, exports are going to have to slow in order to rationalise Canadian stocks.

This is where the opportunity may be for Aussie canola growers.

A smaller crop in the European Union this season is already expected to see EU imports increase year on year. Being our largest export market, stronger EU imports should bode well for Aussie exports. But a smaller Canadian crop may also see Aussie canola sought out to fill the gap in Asian markets.

At this stage, many feel that a significant rain event in Canada could yet turn this ship around. But if that doesn't eventuate, it may create more opportunity for Aussie canola growers.

Despite this uncertainty in canola markets, canola is unlikely to be completely exempt from weakness in the broader oilseed complex if it were to eventuate, particularly soybeans. Soybean markets have been buoyed recently by overly wet conditions in the US and uncertainty around US planting progress and crop condition ratings.

## Global wheat market also a bit jittery

Ongoing weather challenges in Canada are also impacting on the global wheat outlook. In 2014–15 Canada was the sixth largest wheat producer at 29.3 mt and the fourth largest exporter in the world.

Whilst globally, production is still expected to exceed consumption in the coming season, downgrades to Canadian production impacts the quantity of wheat available this season and this uncertainty has been supporting values.

Canadian spring wheat is renowned for its high protein milling wheat characteristics – it's nearest competitor on the Australian scene is APH.

Last season, harvest rains weighed on crop quality in Europe, Canada and the US whilst ongoing dry conditions in the eastern states of Australia saw limited APH wheat make its way to the export market.

On top of this, harvest rains in India saw their crops downgraded, resulting in increased import appetite by India for Australian product.

All these factors resulted in tight global supplies of milling quality wheats, despite a surplus of global production over consumption.

So with already tight supplies of milling quality wheats, these production concerns in Canada now play further into the quality story this season.

Combined with harvest rains across the US as well as China (which have reportedly caused serious damage to crop quality), these factors are supportive to the global price of milling quality wheats in 2015.

## World attention on our APH crop

For Aussie growers, particularly in northern NSW and southern Qld, it is currently translating into heightened global attention on the APH wheat crop.

If the Canadian crop continues to deteriorate, this could see heightened export appetite for APH wheats and – subject to any ongoing developments in local markets – could also see premiums for these wheat grades widen over APW.

The other factor which is supporting wheat values, particularly domestically, is El Niño. As dry conditions prevail in Europe, Canada and Argentina, the market is becoming increasingly worried about the potential negative impacts of an El Niño event on wheat production from Australia and India.

It will not be the severity of the El Niño rating per se but rather the timeliness and volume of rainfall received across key growing regions this season which matters most. No two El Niño events are the same.

For Australian growers, strong quality premiums in local new crop pricing mean forward cash values appear attractive. But with potential for heightened production risk on our door step this spring, we continue to assess production risk first when monitoring the merit of new crop values.

## Greek gift of a lower Aussie dollar

The Aussie dollar was volatile in early July as the Greek debt crisis continued to unfold. Basically, Greece has reached a 'default' situation with its creditors which include the International Monetary Fund, World Bank and the European Central Bank.

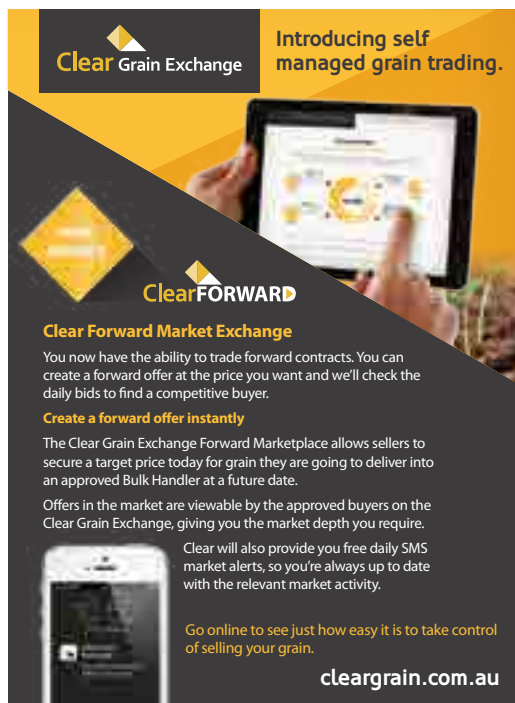
Greece has been trying to make up its mind whether or not to accept the bail out conditions put forward. In the meantime, fund money has moved out of Greek investments in favour of the safe haven US dollar.

This movement of money has supported the US dollar at the expense of other commodities, in turn seeing the relative value of the A\$ fall.

The A\$ has also been pushed lower by falling iron ore prices on the back of Chinese market wobbles as well as some lacklustre economic performance data for Australia.

As this uncertainty continues, it remains likely that the US dollar will remain supported – at least until Greece comes to an arrangement to repay their debts.

This A\$ weakness has extended gains observed in futures markets in A\$ terms – this is good for commodity values. ■



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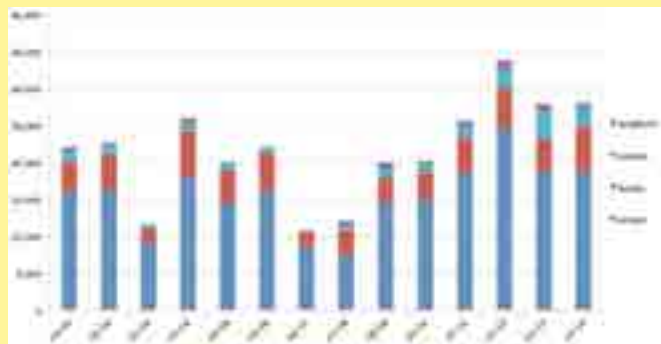


# Exporting our grain more efficiently

■ By Rosemary Richards, Australian Grain Exporters Association

**T**HE Australian wheat industry has seen significant evolution since deregulation in 2008 and with this increased competition for port access and port terminal services. In the period following deregulation, the industry has become more vibrant with increased export activity; more customers buying Australian wheat and continued export growth in both bulk and containers (Figures 1 and 2).

**FIGURE 1: Australian exports (000 tonnes) by major grain**



At the farm level, growers today have more marketing options and there has been rapid growth in farmer adviser support and information services.

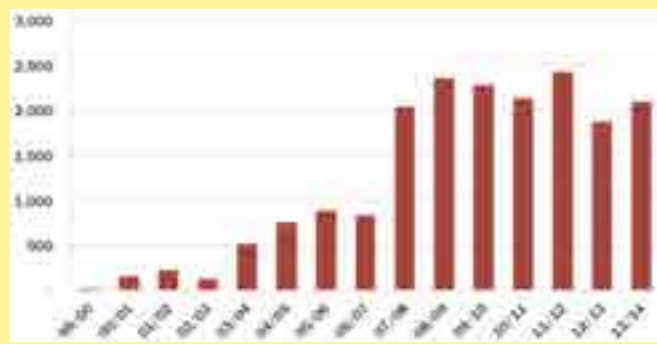
There has also been increased investment across the supply chain and new entrants to the Australian grains industry. In particular, there has been considerable investment at port including investments at Bunbury in Western Australia and Newcastle in New South Wales. In addition, the Melbourne Port Terminal has announced its intention to double its capacity to 3 million tonnes; a joint venture has been announced at Port Kembla, expected to begin operations in mid-2016; and Bunge has begun work on an investment in Geelong.

Australian wheat has an enviable quality reputation in global markets. But some supply chain challenges remain and for exporters port access and execution are critical.

Port access arrangements are now under the *Port Terminal Access (Bulk Wheat) Code of Conduct* that is aimed at giving exporters of bulk wheat fair and transparent access to port terminal services. AGEA is seeking full deregulation of the port access arrangements over time.

AGEA continues to seek ways to

**FIGURE 2: Australian wheat exports (000 tonnes) by container**



improve the efficiency of the export supply chain. One area that has been identified for improvement is vessels failing survey.

## Ships failing survey

The protocols to export prescribed goods from Australia represent an ongoing challenge to industry and to help address this, AGEA has developed the Australian Grain Vessel Protocol. This is available to anyone chartering ships to load grain at Australian ports.

A number of ships continue to fail survey when they present in Australia. All ships must obtain:

- Marine surveyor approval ie. vessel inspected and found to be suitable for carrying the goods.

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- Authorised Officer (AO) approval ie. vessel inspected and found it to be free from pests and contaminant.

Ships failing survey are resulting in cost imposts and operational inefficiencies for Australian exporters and port terminals. These costs fall not just on the exporter whose ship fails survey, but also on others in the queue. AGEA has estimated that the failure rate is around 10-15 per cent on average on a national basis, but can be higher in some years.

Australian requirements are among some of the most stringent in the world and the difficulties in predicting grain suitability in an Australian shipping context is further complicated by the variability in knowledge of the requirements and tolerances of the Department of Agriculture.

### What is the Australian Grain Vessel Protocol?

The protocol is a voluntary tool that includes a combination of questionnaire responses, survey outcomes and performance history to construct a predictive model which identifies the likelihood of a vessel passing grain survey without incident.

The protocol provides the exporter/charterer with a tool to assess the ships suitability ahead of its arrival at the Australian port and to take corrective action if required to avoid delays when the ship arrives to load grain.

AGEA has partnered with Rightship to develop and implement this initiative. Rightship is an independent company formed in 2001 to deliver ship vetting and risk management services globally. It is the largest global provider of third party vetting services.

The Protocol requires the exporter to request ships to complete the Australian Grain Vessel Questionnaire that will be analysed and assessed by an independent party (Rightship).

The Vessel Protocol has been designed to be a simple and user friendly tool for exporters.

AGEA has developed this protocol to deliver benefits for all in the grain supply chain (growers, exporters, ship owners, port terminals, customers) through fewer days lost, lower costs and higher throughput as well as broader industry benefits.

### Some of the Protocol benefits

- For charters/shipowners – It provides an improved understanding of requirements for Australian ports.
- For exporters the Protocol provides:
  - Likelihood of vessel passing survey upon arrival at the Australian load port;
  - Information to determine suitability of a vessel;
  - Opportunity to take action at lower cost; and,
  - Opportunity to substitute a vessel well in advance.
- For AGEA/Rightship – The Protocol provides analytics to underpin best practice guidance.

Over time, as data is collected, the Protocol will improve the ability to predict likelihood of future failure and will provide the analytics and insight to assist in promoting increased efficiency in the export supply chain.

The Protocol will have broader industry benefits by reducing supply chain interruptions, provide a framework to quantify emerging risk areas, deliver improved port throughput without incurring capital expenditure and enabling benchmarking of industry performance.

For more information or to access to the Protocol contact Rosemary Richards at AGEA on 02 9427 6999 or [agea@agea.com.au](mailto:agea@agea.com.au)

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# Productivity growth must be 'unlocked' to drive profitability

**D**ECLINING growth in public research and development (R&D) spending, access to technology and an 'enabling' policy environment are three of the critical factors which must be addressed in order to 'unlock' future productivity growth in the Australian food and agribusiness sector, according to a newly-released report.

In its flagship 2015 research report – *Unlocking Productivity Growth in the Australian and New Zealand Food and Agribusiness Sector* – agri banking specialist Rabobank says it is crucial that productivity growth be reignited to both drive farmer profitability and ensure Australian agriculture remains globally competitive over the coming decades.

The report says the rising cost of production over recent years has eroded the competitive position of Australian agriculture in the world market and turned a spotlight on the slowing productivity growth in the Australian ag sector.

Reviving this growth is a 'particularly pressing issue', the report warns, given the rise of emerging low-cost food and agricultural export competitors from regions such as South America and the Black Sea.

At an individual enterprise level, productivity gains will also be critical to drive future profitability and sustainability for farmers and other businesses throughout the food and agriculture supply chain, the report says.

## Slow down

Report co-author Rabobank analyst Georgia Twomey says, similar to many other high-income nations, Australia has seen a slow-down in agricultural productivity growth in recent years – going from an average per annum growth of 2.9 per cent in 1991–2000 to 1.4 per cent in the decade 2002–11 – and below the world average of 1.7 per cent.

"This trend has typified productivity growth in many other high-income nations, while low to middle-income nations have seen an acceleration in productivity growth," Georgia says.

"Brazil for example – one of Australia's major competitors in export markets in beef and sugar and a country with abundant untapped natural resources – has dramatically lifted agricultural productivity, particularly since the turn of the millennium, as R&D has grown rapidly and the scale of industry has expanded. The USDA reports productivity growth in Brazil has increased from an annual average of 2.6 per cent from 1991 through 2000 to 3.4 per cent in the decade 2002–11.

"Australia's challenge will be making the most of any under-utilised land and water resources that exist, while driving productivity growth through the entire supply chain."

## Increase R&D spending

The Rabobank report – which examines the challenge of agricultural productivity growth at a global, national and individual farm level – says, to address the slowdown in Australia, steps must be taken to reverse the decline in R&D spending, provide access to technology and ensure an enabling policy environment for innovation.

The slow-down in public R&D spending may have particularly negative competitive implications for Australia's agricultural industries, the report says, due to this country's relatively unique agricultural production systems.



Georgia Twomey.

"The risk is the slow-down in our own R&D spending puts Australian producers at a disadvantage to international competitors," says Georgia, "R&D in the northern hemisphere, undertaken by both public and private institutions, is for the most part based around production systems that differ from what is prevalent in Australia, so developments to improve productivity overseas are usually not applicable here."

The challenge is for Australia to ensure a policy environment that is as attractive as possible for private sector investment in agriculture, while also maintaining public sector investment, in order to ensure productivity gains in its production systems do not fall behind.

"And while boosting research and development is essential, it needs to be focused on generating a competitive advantage relative to other food and agriculture exporters," Georgia says.

## Access to technology

Also imperative is ensuring farm businesses have the needed 'access paths' to adopt existing technological innovations.

"Digital agriculture – in its many forms such as precision farming, big data, sensor technology and drones – presents uncharted potential for productivity gains and improved management practices," Georgia says.

"But for the most part, the adoption of these technologies requires connectivity, particularly as they provide real-time information in a mobile format. The challenge in adopting these technologies for the agricultural community will be ensuring that regional areas have adequate connectivity, making the opportunity to improve productivity through the use of these technologies a viable business option."

## Policy environment

The report – which examines a number of real-life business case studies of agricultural productivity growth – says it is at the individual farm and business enterprise level where the 'rubber hits the road' in terms of innovation.

It is essential that governments and industry bodies create an enabling policy environment encouraging innovation to harness productivity-enhancing opportunities from the adoption of new technologies, management practices and business models. ■

# Wheat yield gap maps show where gains can be made

**P**OTENTIAL exists for Australian grain growers to collectively almost double the nation's dryland wheat production. The gap between growers' current wheat yields and what they could be achieving has been illustrated for the first time via a new interactive online tool.

The Yield Gap Australia interactive website ([www.yieldgapaustralia.com.au](http://www.yieldgapaustralia.com.au)) quantifies the difference between actual and potential rain-fed wheat yields across the nation.

Developed by CSIRO and the Grains Research and Development Corporation (GRDC), Yield Gap Australia will help:

- Benchmark individual farm yields against their water-limited potential and local average yields;
- Prioritise research to regions with the largest unexploited yield gaps and greatest potential to close them; and,
- Identify regions where new technologies or technology packages have greatest potential impact.

This new map-based tool is expected to be of use to growers, agronomists, research funders and policy makers.

CSIRO Senior Principal Research Scientist Dr Zvi Hochman says the current yield gap needs to be known so it can be determined just how much more productivity can be realistically achieved by grain growers.

"While average yield data has been well documented at local to regional scales, until recently there was very little reliable data on the potential water-limited yield of dryland crops in Australia," Zvi said.



**CSIRO Senior Principal Research Scientist Dr Zvi Hochman viewing the Yield Gap Australia interactive website which quantifies the difference between actual and potential rain-fed wheat yields across the nation. (Photo: CSIRO)**

## Achieving about half our potential yield

"We found that overall, Australian wheat producers are achieving just over half of the environmentally-constrained yields that can be achieved with best management practice.

"Related research shows that the most productive farmers can consistently achieve 80 per cent of their water limited yield potential. Realistically, the last 20 per cent cannot be exploited so it is more helpful to think about the exploitable yield gap – that is, the difference between the actual yield and 80 per cent of the water limited yield. The exploitable wheat yield gap in Australia is estimated to be 0.98 tonnes per hectare nationally," Zvi said.

The gap varies between regions and seasons, but on average over the past 15 years the gap has been:

- 1.4 tonnes per hectare in the western cropping region;
- 1.7 tonnes per hectare in the southern cropping region (Victoria, South Australia, Tasmania and southern and central New South Wales); and,
- 1.9 tonnes per hectare in the northern cropping region (Queensland and northern NSW).

Based on these estimates, closing the wheat yield gap by 30 per cent would increase Australian wheat production by more than 13 million tonnes annually.

## How to close the gap?

"The challenge now is to understand how to close the gap," Zvi said.

GRDC Program Manager Jan Edwards says Yield Gap Australia is an interactive, simple-to-use tool that provides a clear indication of productivity potential at a shire scale.

"The website gives growers and industry an indication of how much yield potential exists. It's an innovative resource that we've never before had at our disposal, so it's a very exciting development," Jan said.

The Yield Gap Australia website is currently focused on production of wheat – Australia's biggest crop – but will soon expand to other crops, starting with canola.

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## Better risk management is the key to lifting farm-gate returns

■ By Jay Horton, Strategis Partners



Jay Horton.

### AT A GLANCE...

- The Australian Government's White Paper on Agricultural Competitiveness highlights the importance of improving agricultural risk management.
- The Government is to put up \$29.9 million over four years for farm insurance advice and risk assessment grants.
- Recent evidence points to the fact that farmers operating without risk solutions do not make the best business decisions.
- Farm managers wanting to develop a farm risk assessment and management plan can apply the value and risk management template described in this article.

**S**TRENGTHENING drought and risk management is one of five priorities underpinning the Australian Government's White Paper on Agricultural Competitiveness released in July 2015.

The Government's new drought and risk management package contain specific initiatives to help build preparedness. These cover:

- Facilitating the uptake of crop insurance and other risk management advice;
- Introducing accelerated depreciation incentives for building on-farm fodder storage assets and water facilities;
- Improving climate forecasting; and
- Making Farm Management Deposits more beneficial and attractive to support good business management.

This third article in my series on Agricultural Risk Management examines why risk management can boost farm-gate returns, and what farmers can do to benefit from the White Paper incentives.

### Farmers operating without risk solutions do not make the best farm business decisions

New research from CSIRO highlights how farmers' risk aversion is holding grain productivity back. The July 2015 paper by Marta Monjardino and her colleagues at Waite Campus in Adelaide highlights that farmers in low-rainfall regions – in other words, pretty much all of the Australian wheatbelt – are known to adopt low rates of nitrogen. As a result they are likely to miss out on greater returns from more intense cropping in more favourable production years.

The paper points out that:

Nitrogen is the most limiting nutrient in cereal crop production and is an important requirement in closing the gap between

potential and achieved water limited yield. But N fertiliser management in broadacre cereal cropping can be risky for farmers operating in dryland regions because of variability of rainfall and price. Farmers typically respond to this situation by making risk-averse decisions that are neither yield- nor profit-maximising.

Marta's paper indicates a yield gain of more than half a tonne per hectare in moving from current N practice to profit-maximising N practice in several regions, assuming other constraints are well managed. In some areas the yield gain is more.

Across Australia's 14 million hectares of wheat fields, let's assume that on half the crop area (seven million hectares), 0.5 tonnes per hectare increase in yield can be achieved. At the farm gate this would create:

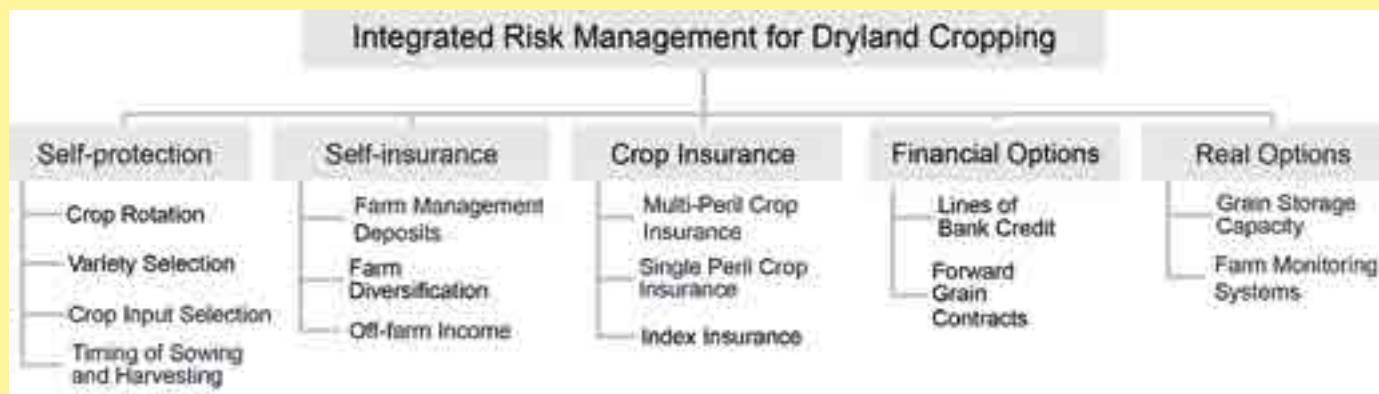
- An increase in grower revenue of \$735 million per year; and,
- An increase of some \$300 million per annum in additional profit (after paying the extra nitrogen costs), or \$43 additional profit per hectare.

In contrast, the cost of Multi-Peril Crop Insurance – the key tool to overcome risk-averse decision-making – averaged \$21 per hectare in 2014.



Developing a farm risk assessment and management plan can help prepare for natural disasters.

## An integrated approach to value and risk management for dryland cropping combines a range of toolsets



### Risk management requires an accurate picture of farm financial performance

Not enough farm businesses have a tight grip on farm financials, and fewer still have an understanding of how the business has performed over the past five or 10 years.

A key problem is that financial year reporting at June 30 does not give an accurate picture of grain farm profitability.

What is required is to align season costs with season revenue, by converting June 30 tax returns to production year results, such as April through to March.

### How farmers can benefit from the White Paper initiatives

The White Paper explains that farmers will be able to access a grant to help evaluate insurance options and to obtain risk management advice:

*Insurance can significantly reduce the financial risk that a farmer faces from production loss... To help farmers select the best insurance product for their needs in this developing market, the Government is providing \$29.9 million for farm insurance advice and assessment grants. The Government will partner with State and Territory governments to allow eligible farm businesses to access up to \$2500 as a one-off grant based on a dollar-for-dollar matching of funds provided by the farmer.*

### Integrated approach to value and risk management

From the experience of Strategis Partners, an integrated approach to value and risk management is what farm business managers need (see the chart above).

This approach ensures that the right mix of solutions is selected from the following toolsets:

- Self-protection such as crop rotation, variety selection, timing of planting, crop input management, land management, sowing and harvesting scheduling;
- Self-insurance such as Farm Management Deposits, farm diversification and off-farm income;
- Crop insurance including multi-peril crop insurance, single multi-peril crop insurance and index insurance;
- Financial options including lines of credit and forward grain contracts; and,
- Real option investments that provide flexibility advantages such as grain storage capacity, and farm monitoring systems to detect early signs of changes ahead.

As decision-makers look across this spectrum of risk management options, it is vital to find the right balance between

risk prevention and mitigation, and risk transfer measures.

Successful value and risk management is not just about limiting the downside. It requires optimising the use of crop inputs in the face of good seasonal conditions, while taking advantage of higher prices early in the season by forward selling grain.

In conclusion, follow this template when you set about developing a farm risk assessment and management plan. It will ensure that farm returns can be maximised for the level of risk you are prepared to run with.

Further information: Jay Horton, Strategis Partners, Ph: 02 9238 6886, E: [jay.horton@strategispartners.com.au](mailto:jay.horton@strategispartners.com.au); [www.strategispartners.com.au](http://www.strategispartners.com.au)

## THE AGRICULTURAL WHITE PAPER

The Federal Government is committed to five key priorities to achieve better returns at the farm gate:

- A fairer go for farm businesses, to keep families on the farm as the cornerstone of agriculture, by creating a stronger business environment with better regulation, healthier market competition, more competitive supply chains and an improved tax system.
- Building 21st century water, transport and communications infrastructure that supports efficient movement of our produce, access to suppliers and markets, and production growth.
- Strengthening our approach to drought and risk management, including providing the tools to facilitate more effective risk management by farmers and a long-term approach to drought that incorporates provision of enhanced social and community support for farming families and rural communities, and business initiatives for preparedness and in-drought support.
- A smarter approach to farming based on a strong research and development system that underpins future productivity growth; and effective natural resource policy that achieves a cleaner environment as part of a stronger Australia.
- Access to premium markets through the availability of a large number of premium export markets open to our produce and a strong biosecurity system that maintains our favourable plant and animal health status.

The White Paper can be downloaded at  
<<http://agwhitepaper.agriculture.gov.au>>



# In-crop weed control in pulses



■ By Tim Weaver, Pulse Australia, Industry Development Manager (NSW)

**S**OME growers are facing a challenge to manage high density, herbicide resistant annual ryegrass populations in chickpea this year, potentially limiting yield.

Grain Orana Alliance (GOA) surveys have shown over 90 per cent of samples having resistance to Group B herbicides such as Logran and Glean, and over 70 per cent of samples resistant to Group A herbicides such as Axial (a den) and Hoegrass (a fop).



Tim Weaver.

This level of resistance has led to high density populations of annual ryegrass surviving in-crop control in cereal crops and placing significant pressure on the limited herbicide options in chickpea.

Where pre-emergent (residual) chemistries have been successfully applied in chickpea crops there should be a noticeable level of control, but chickpea is not a strong competitor with weeds so any survivors need to be controlled to prevent seed set.

## In-crop grass weed control options

The in-crop post-emergence grass-selective herbicide options for use in chickpea crops include:

- Haloxyfop (eg. Verdict) apply two-leaf stage to flowering;
- Fluazifop-p (eg. Fusilade Forte) apply up to seven weeks before harvest;
- Quizalofop-p-ethyl (eg. Elantra) apply after five-leaf stage and up to 12 weeks before harvest;
- Clethodim (eg. Status or Select) apply up to full flower; and,
- Propaquizafop (eg. Shogun) up to 12 weeks before harvest.

All these options are Group A fops and so may already be challenged if the annual ryegrass is resistant to Hoegrass.

Weeds present in the crop can be tested for susceptibility using a 'quick test'. This involves digging out seedlings and sending them to the testing service. The weeds are then trimmed, potted, regrown and sprayed providing results in four to six weeks. Testing early for susceptibility will identify what products could be applied during the season and provide adequate control (contact Peter Boutsalis at Plant Science Consulting for details. <http://www.plantscienceconsulting.com>)

## Chickpea not suited to croptopping

Chickpea is not a good candidate for croptopping because it generally matures too late and too much yield would be lost.

Other harvest weed seed control

options such as narrow windrow burning can drive down seed numbers and improve the chance of success with fallow treatments and pre-emergent herbicides going into the next cropping season.

Using other chemistries in cereal crops will also help preserve efficacy of the Group A herbicides registered for chickpea.

Contact Tim Weaver – P: 0427 255 086, E: [timw@pulseaus.com.au](mailto:timw@pulseaus.com.au)

For more information check the Pulse Australia website [www.pulseaus.com.au](http://www.pulseaus.com.au) or the GRDC website [www.grdc.com.au](http://www.grdc.com.au)



**In-crop control of high density weed populations following poor in-crop control in cereals is a challenge for chickpea growers. Success requires careful planning of herbicide use across the rotation and implementation of harvest weed seed controls, fallow treatments and pre-emergent herbicide use.**



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## Wild oat – always the bridesmaid



**W**ILD oat is the Yohan Blake of weeds. Yohan is an amazing sprinter, but unfortunately for him, his Jamaican training partner, Usain Bolt, is faster.

Wild oat is a significant resistant weed – but it is no annual ryegrass.

AHRI researcher, Dr Roberto Busi recently showed that repeated use of low doses of Hoegrass caused only a minor (two fold) shift towards resistance in wild oat. When Dr Paul Neve did a similar study in 2005, three low doses of Hoegrass caused 40 fold resistance in annual ryegrass. Annual ryegrass is the world champ of herbicide resistance, and while weeds such as wild oat are a threat, they simply do not evolve resistance as fast as ryegrass.

It is the self-pollinating and hexaploid (six copies of each gene) nature of wild oat that leads to slow resistance evolution.

Evolving resistance in wild oat takes considerable effort. Often, grain growers with resistant wild oat have repeatedly used a single herbicide over and over 'until it broke'. In a weed like wild oat which evolves resistance slowly, simple strategies such as herbicide rotation will go a long way towards delaying the onset of resistance.

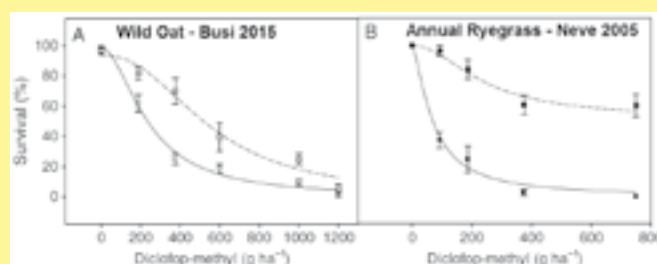
### How does self-pollination and polyploidy affect resistance evolution?

Walk into Dr Roberto Busi's office at AHRI and you are likely to see on his computer screen graphs like in Figure 1. He loves low dose research as it keeps providing interesting insights into resistance evolution.

In this research, Roberto exposed two leaf wild oat to 1 L per hectare Hoegrass (375 g per litre Diclofop-methyl) for three generations in a row. This is called recurrent selection. The label rate for Hoegrass (375) for wild oat is 1.5 to 2 L per hectare so

this represents a half to two thirds rate. After three recurrent selections, the LD50 of wild oat moved from 238 to 546 g per hectare of Hoegrass, roughly a two fold shift (see Figure 1A).

**FIGURE 1: Recurrent selection research – wild oat and annual ryegrass**



Dr Paul Neve published a similar experiment using annual ryegrass in 2005. Paul used 100 mL per hectare Hoegrass in the first selection, 500 mL per hectare in the second and 2 L per hectare in the third. After these three selections the LD50 of ryegrass moved from 61 to 2462 g per hectare Hoegrass, a 40 fold shift (see Figure 1B above).

OK, so the experiments were not identical, but you get the picture – there is a big difference between ryegrass and wild oat.

### Why?

Why is ryegrass the world champion of resistance evolution, and why will wild oat always be the bridesmaid?

### Ryegrass

Let's consider ryegrass first. When we expose ryegrass to a

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Annual ryegrass	Wild oat
Diploid (2 copies of each gene, like humans)	Hexaploid (six copies of each gene, like wheat)
Obligate out-crosser (must cross pollinate)	99 per cent self-pollinating
Highly genetically diverse	Lower genetic diversity
Sown for sheep feed across Australia and nurtured for 100 years	Never sown

low dose of Hoegrass we are left with a few surviving plants. These individuals have slightly higher P450 activity and are able to metabolise the herbicide. These survivors then cross pollinate with one another and the minor genes accumulate in the progeny.

With more crossing, future generations accumulate more minor genes leading to high level resistance after just a few selections.

### Wild oat

Now, let's consider how wild oat is different. Once again, when we spray a low dose of Hoegrass, we have a few survivors that naturally have slightly elevated P450 levels. These survivors self-pollinate so we do not get the accumulation of minor genes. With repeated selections at low dose we remove more individuals with low P450 level, but without the build-up of minor genes, the survivors maintain only slightly elevated P450 activity.

Also, wild oat is hexaploid, meaning it has six copies of each gene. If a mutation for elevated P450 happens on one gene, the

effect of the gene mutation is diluted, and only a small increase in P450 activity results.

The starting LD50 of susceptible wild oat was 238 g per hectare, which is much higher than that of susceptible ryegrass, 61 g per hectare Hoegrass. Given that wild oat is naturally more tolerant of Hoegrass than ryegrass, we may have speculated that wild oat evolves resistance quickly But that is not the case.

## What can we do with this info?

### Mix and rotate wild oat herbicides

You only need to open a drum of herbicide in the corner of a paddock and ryegrass will start evolving resistance to it.

Wild oat is different and finds it much harder to evolve resistance. The good news? Simple strategies will go a long way.

- Use two distinct groups of herbicide for wild oat control in the same year eg. Avadex pre-sowing and a 'fop' post sowing.
- Rotate herbicides from one year to the next. Don't use 'fops' every year – you will break them. Mix it up. Be strategic. Sit down with your agronomist and make a plan that gives you good herbicide rotation.

## Summary

There are thousands of fields around Australia where annual ryegrass has evolved resistance to herbicides years ago and wild oat in the same paddock have not. Roberto and other researchers are now telling us why this is so. It's not too late to learn from this research and protect wild oat herbicides for years to come. ■

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# Stop the Spot unlocks clues for tackling crop disease

**R**ESULTS from the first year of the *Stop the Spot* campaign have shown that increased national monitoring of yellow spot is essential, with preliminary analysis suggesting there may be an increase in the severity of the disease.

Yellow spot – known overseas as tan spot – causes national wheat crop losses of \$212 million, plus control costs of \$463 million per annum. In hard hits areas, losses can exceed \$30 per hectare.

The Curtin University and Grains Research and Development Corporation (GRDC) *Stop the Spot* initiative will continue in 2015, with the aim of significantly reducing the economic impact of yellow spot.

To assist the campaign, growers are urged to send in leaf samples of yellow spot, which will enable researchers at the Centre for Crop and Disease Management (CCDM) to develop

genetic tools for breeders, monitor biosecurity risks and have an understanding of how the pathogen may be changing in the paddock.

Caroline Moffat, leader of CCDM's yellow spot program, said from the 189 samples received in 2014, it was clear that yellow spot was a national problem.

She hoped for increased involvement from growers in 2015, especially from the eastern states, as there was increased evidence of a change in virulence between Australia's western and eastern cropping areas.

## Changes in pathogen population

Caroline said one of the more interesting findings from 2014 was that yellow spot isolates were recovered even from moderately resistant varieties.

"This just shows how vital it is that we continually monitor yellow spot across the country so that we are best placed to respond to any changes in the pathogen population – the more samples we receive, the better we can keep track of new strains and stay vigilant," she said.

"Our ultimate goal is to develop tools and markers for wheat breeders which are tailored to current yellow spot strains, to help them release more resistant varieties for growers."

## Undiscovered toxins

Caroline said the 2014 findings showed evidence of undiscovered effectors – toxins secreted by the fungal pathogen that kill wheat cells and cause disease symptoms – which her team will focus on identifying for breeding programs.

She said of the three effectors identified for yellow spot – ToxA, ToxB and ToxC – molecular analysis revealed ToxB was not found in any of the Australian yellow spot samples.

But ToxB remained a profound biosecurity threat.

"If ToxB-containing strains invaded Australia, yellow spot disease virulence would increase," Caroline said.

"On the other hand, ToxA was found in all yellow spot samples received, reiterating the importance of using ToxA insensitive varieties, such as Mace and Magenta, in areas under high disease pressure."

Caroline said most infected samples submitted to the *Stop the Spot* campaign in 2014 came from wheat-on-wheat paddocks, followed by wheat-on-canola then wheat-on-lupin. Most samples were collected at the stem elongation growth stage.

For a full copy of the report on 2014 results from *Stop the Spot*, or for information on how to submit samples for this year's campaign, visit <http://stopthespot.com.au>



Caroline Moffat, leader of CCDM's yellow spot program, encourages growers to submit leaf samples of yellow spot as part of the *Stop the Spot* initiative, which aims to significantly reduce the economic impact of the disease.

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## CUTTING EDGE RESEARCH

The Centre for Crop and Disease Management was set up at Curtin University in 2014 to conduct cutting-edge crop disease research into genetics, breeding and fungicides, and to improve agronomy and farm management practices.

The GRDC has committed \$30 million over five years to the \$100 million CCDM as part of its long-term bilateral agreement with Curtin University signed in April 2014.



# Timely septoria control boosts oat profitability

■ By GRDC western regional panel member Shauna Stone

**R**ESearch has shown that foliar fungicides can significantly reduce the severity of the disease septoria blotch in Bannister oats and applications around the time of flag leaf emergence appear to be most effective.

In a high rainfall environment, yield responses of up to 0.6 tonnes per hectare were achieved in this newer variety after tactical fungicide use.

The field trials also showed that septoria staining on the leaf was not strongly linked to grain staining in this variety.

ConsultAg conducted the 2014 trials as part of a project funded by the Grains Research and Development Corporation (GRDC) through the Kwinana West Regional Cropping Solutions Network (RCSN).

Bannister, bred for Western Australian conditions through the GRDC-supported National Oat Breeding Program, has higher stem rust and leaf rust resistance than the other main oat varieties grown in the state, but it still rated as susceptible (S) to septoria.

In its first commercial growing season in 2013, which saw a wet spring in many WA oat growing areas, significant septoria infection was observed in this variety and many oats delivered for grain were rejected due to grain discolouration.

To help assess the impact of septoria on Bannister yield and grain quality, the GRDC RCSN trials were conducted at a high rainfall site at Highbury and a medium rainfall site at Wagin in the Great Southern region.

The trials were set up in Bannister crops sown on oat stubbles to increase disease pressure and assessed single and double propiconazole applications at different timings.

Ashton Gray, of ConsultAg, says fungicide timing had a significant impact on the severity of leaf blotching caused by septoria at both sites.

ConsultAg's economic analysis indicated either a single spray at flag leaf emergence, or a two-spray approach – at stem

elongation and again at flag leaf emergence – could be economic in years with a wet finish and heavier disease pressure when infection occurred at/after stem extension.

The two-spray treatment increased yields by 0.6 tonne per hectare at Highbury, and the higher yields and better quality grain at this high yielding site increased returns by \$140–\$215 per hectare across all treatments compared with the untreated control.

## Single spray when disease pressure low

Ashton says that in lower disease situations, where infection hits the canopy later in the season, a single application at or around flag leaf emergence is likely to be able to protect crop leaves, help prevent infection developing in the mid and upper canopy and provide a yield benefit.

The trials showed that seasonal conditions from the grain fill stage to harvest appeared to have a significant impact on fungal grain staining, but applying late fungicides after head emergence seemed to be an unreliable method to reduce overall grain staining.

The GRDC RCSN project complements oat agronomy research conducted by DAFWA under the GRDC funded project 'Tactical break crop agronomy for the western region'.

This five-year project aims to ensure WA's valuable oat grain and hay industries are provided with the latest variety, agronomy and management information.

More information about oat agronomy is available at [www.agric.wa.gov.au/oats](http://www.agric.wa.gov.au/oats)



GRDC western regional panel member Shauna Stone says GRDC RCSN trials conducted in 2014 helped assess the impact of septoria on Bannister oats yields and grain quality.



Leaf blotching in Bannister oats caused by septoria.

# Farming in Foreign Fields...



## Continuous wheat puts a premium on combine selection

**W**HEN your entire 1200 acre (485 hectares) UK farm is into continuous winter wheat, and a single premium milling variety at that, being able to complete harvest quickly is paramount and the choice of combine critical.

"The key to growing continuous milling wheat is to have enough capacity to harvest the crop within a very short space of time. In 2012 when we bought a neighbouring 260 acre (105 hectares) farm, we upgraded to the latest Case IH 8120 Axial Flow combine," explains Henry Siggers, the fourth generation to farm at Leapingwells Farm, Kelvedon.

"What makes our situation different is that we have grown wheat here continuously for the last 45 years – although its role has changed significantly.

"Although the milling premium has varied from £5 to £35 per tonne (\$10 to \$70 per tonne) since I started in 2004 it has provided a reliable source of additional income. Cordiale, the variety we have grown since then, is well suited to the farm, performs well under all conditions, from very wet to very dry, has good standing power, always meets a milling standard and produces a premium. None of the other varieties we have evaluated in on-farm trials has matched Cordiale, which has averaged around 9 to 10 tonnes per hectare," said Henry.

### Premium on reliability

"To maximise yield, quality and premiums we have to be able to harvest the crop at exactly the right time, so I am acutely aware of the pressure on the combine," Henry states. "In 2008 our milling wheat produced a record yield but harvest coincided with exceptionally wet weather.

**Challenging weather conditions during recent harvests prompted Essex, UK, farmer Henry Siggers to invest in a larger combine to get the most out of his continuous wheat crops.**

"Our combine didn't have the capacity to cope, so I enlisted help from a neighbour with a Case IH Axial Flow and a contractor with a Claas Lexion. At one time all three combines were working in the same field, the straw was wet and the grain moisture was 22 per cent – hardly ideal but we had to push on.

"My father always liked the Axial Flow for its simplicity, but like many other farmers we'd assumed that it would not work well in wet conditions. Our neighbour had told us how his Axial Flow performed, but only when I saw all three combines working in the same field, under the same difficult conditions did I realise what it could do. It left our old combine standing in terms of output and I realised that if it would work there it would work anywhere.

"Being much lighter it also had much less impact on the soil."

### Better than a grain dryer

"We were so impressed that we ordered a new Case IH 8120 for the 2009 harvest and operated it for three years. We upgraded to the new 8120 model in 2012 when we bought additional land. The new combine allows us to harvest more when the weather is favourable and saves on drying.

"We spent considerable time looking at the economics of installing a new drier but decided the money would be better spent on the larger combine.

"The 8120 provides high output, which is really important,"



Henry explains. "Once harvest starts we are out there at every available opportunity. We can easily cover 100 acres (40 hectares) a day and having the larger combine means we can afford to wait until conditions are right with grain moisture at 17 per cent or less.

"The new machine benefits from new technologies that allow us to operate faster and more efficiently, including automatic guidance and yield mapping. The heavy-duty 30 Series header has a larger cross auger which does a better job of feeding the crop into the rotor, and the central skids keep the header level on uneven headlands or across tramlines.

"The grain tank is also significantly larger, the AFS screens are very easy to use and the cab is very comfortable.

"The fact that the Case IH Axial-Flow is the only combine you can unblock from inside the cab is a real bonus, and you have the confidence to use it to its full capacity. With any other combine clearing a blockage could take half a day, and with that risk, any operator would throttle back."

### **Simple and reliable**

"The other thing I like about the Axial Flow is its simplicity. There's none of the complexity you see on other machines that have numerous belts, pulleys and multiple drums, so there's much less to go wrong and less to repair."

Henry Siggers has been impressed by the quality of the sample from the 8120. This, he says, is because grain is gently separated from the straw mat over the entire length of the single, longitudinal rotor, rather than being rapidly compressed between a conventional drum and concave.

"Grain quality is very important to us because we grow for milling markets and save our own seed to produce next year's crop. The quality of the sample is excellent, with very few broken grains or tailings.

"The Case IH 8120 is the right combine for our acreage and type of farming system. It allows us to grow a large acreage of milling wheat yet know that we have the capacity to get it in, even during a difficult wet harvest year and without outside help. Its performance has been exceptional and because it does 140 – 150 hours a year we will probably keep it for around eight years, unless even more new technology comes along."



**Henry Siggers is a fourth generation farmer at Leapingwells Farm.**



**Preparing for the next crop at Leapingwells Farm. Wheat has been grown continuously on the farm for the past 45 years.**



## ASK AN EXPERT – WHAT CAN MAKE HARVEST WEED SEED CONTROL MORE EFFICIENT?

■ With Michael Walsh, UWA Senior Research Fellow, Australian Herbicide Resistance Initiative

**K**EEPING paddocks weed-free is far easier and cheaper than doing battle with high density weed populations. Harvest weed seed control (HWSC) measures have proven their worth in reducing the amount of seed that returns to the seed bank each year and can quickly reverse a weed-density trend.

AHRI researcher Dr Michael Walsh specialises in studying the effectiveness of HWSC tactics such as chaff carts, narrow windrow burning, Harrington Seed Destructor and the like. He says all these tactics can achieve very similar results and the choice of tactic used will depend on factors such as crop type, location and markets.

"Something that we have looked at recently is the effect of crop competition on practical aspects of implementing HWSC," says Michael. "In a nutshell, increased crop competition via crop density forces weeds to grow taller as they compete for light."

"The result is that shade intolerant annual weeds produce less seed and the seed is located higher in the crop canopy where they are more easily captured using HWSC tactics."

Michael says this GRDC supported research adds more weight to the benefits of implementing crop competition as a weed management strategy to achieve higher yields, support herbicide



**Dr Michael Walsh, UWA Senior Research Fellow, AHRI says growing the most competitive crop possible will increase the efficiency of your chosen harvest weed seed control method.**

applications and ensure HWSC measures are as effective as possible.

This may mean that growers who effectively use crop competition to support their chosen HWSC tactic can potentially lift the harvest height a little and still be confident that they are capturing more than 90 per cent of the weed seed present at harvest.

### What effect does crop competition have on weed plant structure?

**Short answer:** Weeds tend to grow taller.

**Longer answer:** Where crop biomass is low and there is a sparse, open crop canopy, annual ryegrass populations tend to adopt a prostrate growth habit where seed is retained at low heights and more difficult to capture at harvest. In high biomass crops the combination of reduced seed production and elevated seed retention greatly reduces the amount of annual ryegrass, wild radish, brome grass and wild oats seed that potentially avoids HWSC.

### How do seasonal conditions affect HWSC efficiency?

**Short answer:** In low rainfall years, it is important to harvest as low as possible.

**Longer answer:** In years that do not support robust crop growth the majority of annual ryegrass seedheads are likely to be located below a 20 cm harvest height. To capture more of this seed at harvest will require a lower harvest height. In more favourable years, over 75 per cent of the ryegrass seedheads are likely to be above 30 cm.

### Can crop density influence weed seed production?

**Short answer:** Yes, weeds growing in high density crops produce less seed.

**Longer answer:** In a pot trial, wheat sown at the highest density (400 plants per square metre) reduced seed production in annual ryegrass, wild radish, brome grass and wild oats by 80, 93, 97 and 96 per cent respectively. Even at a crop density of 60 plants per square metre, weed seed production was reduced by more than 50 per cent.



**In highly competitive crops annual weeds are forced to grow taller and tend to produce less seed.**

## HOW TO ASK A WEEDSMART QUESTION

Ask your questions about genetic research that is helping to manage herbicide resistant weeds using WeedSmart Innovations Facebook page <https://www.facebook.com/pages/WeedSmart-Innovations/354441941389122>, Twitter @WeedSmartAU or the WeedSmart website <http://www.weedsmart.org.au/category/ask-a-weedsmart-expert/>

'Weedsmart' is an industry-led initiative that aims to enhance on-farm practices and promote the long term, sustainable use of herbicides in Australian agriculture.



# Formulating fungal biopesticides

■ By Jan Suszkiw, Agricultural Research Service – USDA

## AT A GLANCE

- *Beauveria bassiana* fungi can control aphids;
- *Trichoderma harzianum* fungi can control diseases;
- Liquid culture fermentation useful for mass production;
- Stable, effective forms of each biocontrol developed; and,
- Production time and costs reduced.

**T**ECHNOLOGICAL advances by USDA Agricultural Research Service scientists are continuing to improve the way beneficial fungi are formulated for use as biopesticides.

More than a decade ago, ARS microbiologist Mark Jackson and colleagues successfully demonstrated the use of liquid culture fermentation (LCF) in mass-producing spores of the fungus *Isaria fumosorosea*, which infects whiteflies, root weevils, psyllids, and other insect pests.

They've also developed liquid culture methods for producing resting structures, called 'microsclerotia', of two biocontrol fungi: *Mycleptodiscus terrestris*, which infects aquatic weeds such as hydrilla and Eurasian water milfoil; and *Metarhizium brunneum*, which infects and kills beetle grubs, wireworm, and corn root worms.

Studies have shown that microsclerotia are especially durable, long-lasting during storage, and effective as bioinsecticides and bioherbicides. Microsclerotia can be applied to soil, grass, or weedy plants and produce infective spores when environmental conditions are right.

In 2014, the researchers added two more commonly used fungal biocontrol agents to their list of LCF successes:

- *Beauveria bassiana*, which targets aphids, thrips and whiteflies; and,
- *Trichoderma harzianum*, which has been used to control plant diseases and enhance overall plant health.

Traditionally, biopesticide makers have cultured *Trichoderma* and *Beauveria* on moistened grains, such as rice, or other solid



**Microbiologist Mark Jackson (left) and Brazilian collaborators, seed physiologist Nilce Kobori (centre) and entomologist Gabriel Mascarin (right), discuss the progress of their fermentor run on the production of the biocontrol fungus *Trichoderma*. (PHOTO: Nilce Naomi Kobori)**

substrates, coaxing them into forming specialised spores called 'conidia'. The conidia are then harvested and formulated into biopesticide products that can be applied to field- or greenhouse-grown crops as alternatives to synthetic chemical pesticides.

Over the past decade, Mark Jackson and colleagues at ARS's National Center for Agricultural Utilization Research in Peoria, Illinois, and elsewhere have experimented with LCF methods to produce stable, effective spore forms called 'blastospores,' as well as microsclerotia.

## Reduce costs by 80–90 per cent

LCF has proven economical to use, yielding blastospores or microsclerotia in 2–3 days versus 10–14 days for conidia using traditional solid-substrate culture methods, says Mark. Replacing expensive nitrogen sources such as hydrolysed casein with low-cost cottonseed flour has reduced production media costs by 80–90 per cent, he adds.

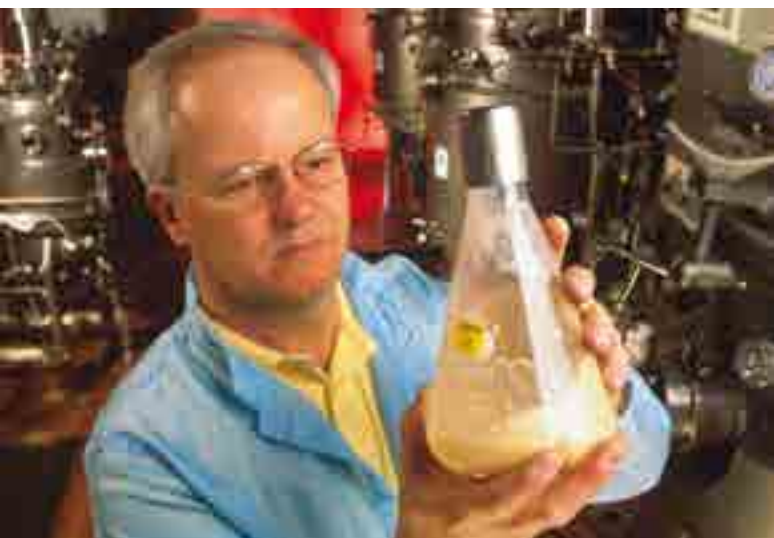
Two visiting Brazilian scientists – Gabriel Mascarin, an employee with the Brazilian Corporation of Agricultural Research (EMBRAPA), and Nilce Kobori, a National Council for Scientific and Technological Development research fellow – collaborated with Mark to investigate the use of LCF for the cost-effective production of the spores of US and Brazilian strains of *Beauveria*, *Isaria* and *Trichoderma*.

The researchers discovered that they could produce stable, effective blastospores of *Beauveria* and *Isaria* in two to three days under appropriate LCF conditions with cottonseed flour medium. In addition, the *Beauveria* blastospores killed silverleaf whitefly nymphs 25 per cent faster and with just one quarter the number of spores than conidia produced with current commercial production methods.

Their studies also demonstrated, for the first time, that under appropriate LCF conditions, *Trichoderma* can form microsclerotia suitable for use as a seed coating or soil-incorporated granules.

Patent applications have been submitted for both LCF technologies, and Mark is actively seeking commercial partners.

Scientific contact: Mark Jackson, Crop Bioprotection Research Unit, Peoria, IL  
Ph: +1 309 6816283; Email: mark.jackson@ars.usda.gov



**ARS microbiologist Mark Jackson examines a fungal culture being produced for a biopesticide against silverleaf whitefly. (PHOTO: Keith Weller)**

# Maximising yield and disease control with new fungicide

**N**OW with its first year of commercial sales under its belt, the new cereal fungicide Radial from Adama, launched last year, has proved a great success in helping growers maximise yield and control disease according to senior product manager with Adama, Jock Leys.

"We have had very positive feedback on Radial from those that tried it last year and with a new lower price point for 2015, demand for Radial is



Jock Leys.

expected to be strong again this year," Jock says.

The key to Radial's success according to Jock is that unlike other strob/DMI combinations sold in Australia for cereal diseases (Radial is a combination of azoxystrobin and epoxiconazole), Adama didn't simply take a European formulation off the shelf and start selling it.

"At Adama we looked at the unique growing conditions in Australia combined with our mix of cereal diseases and began to understand that the typical ratios of these actives sold in other countries are not necessarily optimised for Australian conditions.

"We ascertained that the ideal ratio of the two actives in Australia would be a 1:1 ratio and formulations with a higher strobilurin loading would essentially be adding additional active ingredient for no real benefit," Jock says.

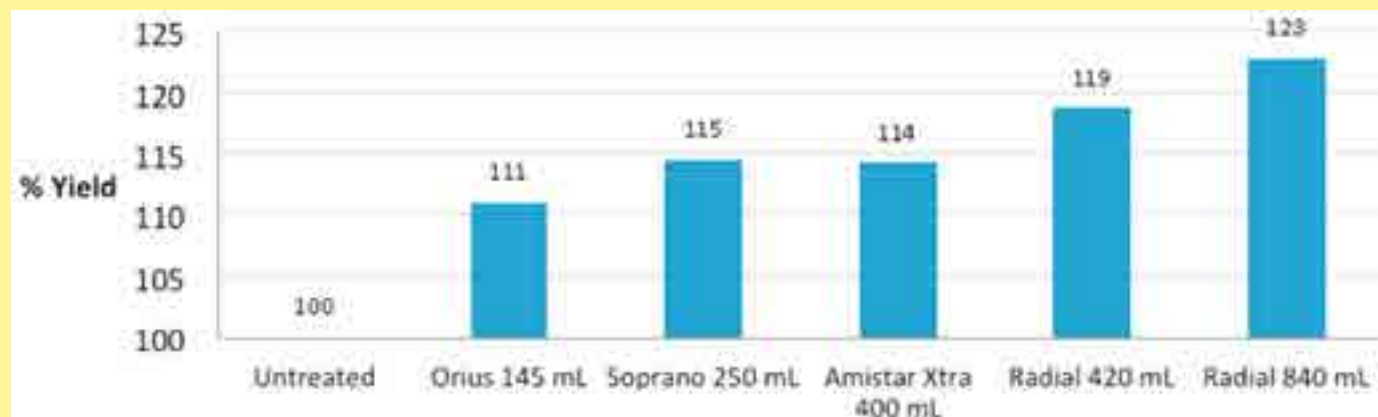
## EC formulation performed better

"We also found that by formulating Radial as an EC (emulsifiable concentrate) gave us by far and away the best

**TABLE 1: Summary of various fungicide treatment trials on barley**

Barley (calculations use a grain price of \$200/t on-farm)	Radial 420 mL vs Amistar Xtra 400 mL 9 trials		Radial 420 mL & 840 mL vs Prosaro 150 mL 6 trials		Radial 420 mL vs Radial 840 mL 8 Trials	
	Average % yield increase vs untreated	Income \$/ha	Average % yield increase vs untreated	Income \$/ha	Average % yield increase vs untreated	Income \$/ha
Untreated	3.16 t/ha	\$632	3.55 t/ha	\$710	3.19 t/ha	\$638
Amistar Xtra 400 mL	+28%	+\$174				
Prosaro 150 mL + Hasten 1%			+23%	+\$159		
Radial 420 mL	+28%	+\$178	+25%	+\$180	+26%	+\$166
Radial 840 mL			+30%	+\$209	+28%	+\$178

**FIGURE 1: Percentage increase in wheat yield (over untreated plots) from various fungicide treatments – average of 6 trials over the 2012–14 seasons**





# New scholarship breeds star student

UNIVERSITY student Albert Gorman has been named the inaugural recipient of a new scholarship that awards a 12 week placement with Dow AgroSciences, as well as \$10,000.

The scholarship is a new initiative between Charles Sturt University and Dow AgroSciences that aims to mentor and prepare university students for a dynamic career in the world of agriculture.

Albert has recently completed the first six weeks of his placement at the Dow AgroSciences' field research station in Breeza NSW, where he assisted in planning, packing and planting wheat breeding trials, and spent time visiting rural resellers to experience the business heart of the industry.

"I'm a hands on learner, so it has been really beneficial for me to see what's required to bring out new wheat varieties and take them to market," says Albert. "It's been an eye opener to get this practical experience and discover first-hand the processes that are required for things to work in a commercial sense."

"On the farm we work with data on a regular basis to plan our operations, and what's been really exciting for me with this placement was to see the tests and trials where some of this data is generated," explains Albert.

Albert's interest in the agricultural sector dates back to an early age. Growing up on property in Euston and graduating from Yanco Agricultural High School, Albert has worked in his family's cereal, horticultural and livestock based enterprise for many years, and is currently in his final year studying agricultural science at Charles Sturt University.

During Albert's time at Breeza, he worked as part of the Dow AgroScience's Northern Wheat Breeding team, led by Nicholas Willey. "Scholarships such as this are important as they allow university students to experience the research and commercial aspect of the seeds industry in Australia, gain valuable insight into the industry and focus their early career directions," says Nick.

"When entering the workforce – especially in a technical field like agricultural science – it's important for university students to have practical experience. It's encouraging to see bright students like Albert, who are so enthusiastic about learning and progressing our industry."

After graduating in December, Albert hopes to secure a career in an agronomic related field.

"Working with Dow AgroSciences will definitely give me good exposure to the industry, it will arm me with practical experience, and provide a good grounding in R&D to help further my career." ■



Revenue wheat leaf samples from fungicide treatment trials at Warncoort, Victoria in 2013. Excellent control of septoria leaf blotch was achieved with Radial fungicide.

performance, without compromising on crop safety and tank mix compatibility."

This is in stark contrast to the default formulation type for this segment, which is to formulate as an SC (suspension concentrate).

Jock attributes a large part of Radial's outstanding performance to the fact that the active ingredients are fully dissolved in the EC formulation and more readily available for uptake by the crop when compared to the SC formulations of Radial Adama tested or when compared with competitor SC formulations.

Table 1 summarises field trial results testing the improvement in barley yield and grower returns that can be achieved with Radial.

"The trial summary shows Radial at 420 mL per hectare performs at least equivalent to Amistar Xtra at 400 mL but shows an improvement versus Prosaro at 150 mL. Also the 840 mL per hectare rate of Radial shows a superior return on investment (ROI) versus all other treatments," Jock says.

## Wheat trials

When looking at Radial's performance in wheat it arguably makes an even stronger case than in barley. Both active ingredients in Radial are recognised as strong performers on wheat plus the fungicide has the advantage of the highly active EC formulation.

Epoxiconazole is known for its outstanding curative performance on key wheat diseases like rusts and septoria while azoxystrobin is known for providing the highest levels of preventative protection against key wheat diseases.

The average yield increase across six trials (2012–14, see Figure 1) was combined to evaluate Radial's performance in wheat. With wheat at \$250 per tonne Radial achieved the highest ROI versus key alternatives, providing a \$176 per hectare return at 420 mL per hectare and \$204 per hectare at 840 mL.

With early sightings in the 2015 winter crop season of key diseases – and generally positive growing conditions – Jock highlights that there is a great opportunity now for agronomists and growers to upgrade to a high performing fungicide like Radial and take advantage of the superior disease protection and improved yields that can be achieved. ■



Charles Sturt University student Albert Gorman (pictured right with Hamish Graham from Dow Agro Sciences) is pursuing a career in agriculture through a 12-week work placement with Dow AgroSciences.

# District Reports...

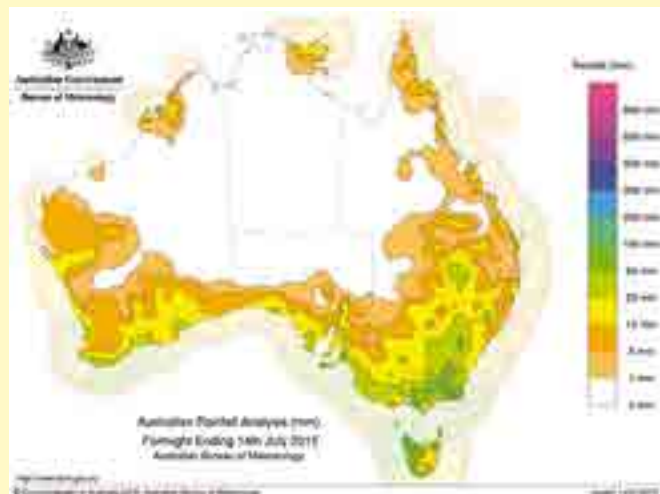
July–August 2015

## Australia in summary

- Maximum temperatures were mostly average over much of Australia during early July. Western Australia recorded above average temperatures, while isolated areas of New South Wales recorded slightly below average temperatures.
- Relative upper layer soil moisture for June 2015 was average or above average across parts of central and eastern Australia, while below average over much of Western Australia and coastal Queensland.
- The Bureau of Meteorology has advised that the 2015 El Niño is likely to strengthen further in the coming weeks, largely due to recent tropical cyclone activity.
- On July 8, water storage levels in the Murray–Darling Basin (MDB) were at 42 per cent of total capacity. This is 18 per cent less than this time last year.
- The world wheat indicator price (US No. 2 hard red winter, free on board Gulf ports) averaged US\$254 a tonne in the week ending July 7, 2015, compared with US\$246 a tonne in the previous week.
- The Australian grain sorghum indicator price (Sydney) was \$346 a tonne in the week ending July 8, 2015, two per cent higher than the previous week.

### National rainfall

- On top of reasonable falls in most areas during June, the national grainbelt received timely rainfall in the first two weeks of July (see map). This has given many grain growers throughout the nation optimism for an average or better winter crop season.



Source: ABARES and BOM Australia

## Western region



### STATE WIDE SUMMARY

Overall, growers in Western Australia are optimistic that the 2015 season can deliver at least average yields. Early crop establishment with little or no in-crop weed burden is the basis for this optimism, provided there is a return to an average season with well spaced rainfall events through winter.

Widespread early rains across the WA grainbelt in April provided an early sowing opportunity and planting programs finished with slightly more total crop area planted than in 2014. But these good opening rains were followed by a month of dry warm weather across most of the grainbelt.

Fortunately, late June and early July delivered timely rain to most of the WA grain belt.

Crop establishment has been generally good in all zones. On difficult soil types, non-wetting sands, pale sands, and heavy textured soils, establishment has been poor due to the lack of soil moisture from the drier than average May.

Where there is a good level of deep soil moisture from Cyclone Olwyn and the early April rains, crops have established well and have good yield potential.

On the negative side, these crops had to use the deeper soil moisture which should be the reserve for spring growth and grain development. Additionally, the warm May temperatures accelerated growth in wheat to the point where some wheat crops in the Geraldton and Kwinana east zones were in ear by late June.

On the positive side, crops in all zones are mostly free of weed competition due to the extensive pre-sowing weed control enabled by the autumn rain. Growers do not need to control weeds as they normally might be, and the available soil moisture is wholly available to the crop.

Due to the dry May, some wheat area was not planted in the



Widespread early rains across the WA grainbelt in April provided an early planting opportunity.



# District Reports...

July–August 2015

Kwinana east zone, as growers reached decisions on planting the final paddocks in their programs. In the Albany zone, particularly in the northern districts, some pasture paddocks planned for canola or wheat remained in pasture to provide stockfeed, or because they were too dry to sow and their yield potential had declined.

Grain Industry Association of WA (GIWA)

## NORTH

The 2015 season is away to a patchy start in the WA Northern Grain region. We started with very good prospects and they have faded with dry conditions through May and June. Year to date rainfall ranges from about 100 mm in the driest south west parts to 350 mm in the north east. Most areas are around 200 mm.

**The best:** Loam soils in the north and east of the region are very good. Sand soils in many areas have run up with low biomass due to the warm and dry conditions.

**The worst:** The south west of the region from around the Irwin town site and south has missed out on much of the summer rain and has had well below average winter rain. This area also sustained severe damage due to wind erosion with 90+ km per hour wind on June 17. Some exposed paddocks were resown after this wind event.

Insects are generally quiet but aphids in canola are starting to do damage in the west. Some cutworm are still active in later sown wheat on lighter sand.

**Crop stages:** Wheat ranges from very early grain fill to three leaf! Some crops were in very early and warm conditions have pushed their development along. Some crops were in the ground for the best part of a month before the mid June rain event germinated them. Some sand soil paddocks have struggled and are running up with low crop biomass.

Canola is generally starting to flower with the earliest crops almost finished flowering.

Lupins are from 10 leaf to 2nd order flowering.

Winter rain has been very light on and it has growers disappointed in what could have been given the very good March and April rain in most areas. Warm conditions in May have really pushed development in the early sown crops and harvest is likely to start in September for some.

We still have reasonable potential but we need a good soaking rain to get us to average yields. I hope the next two months can deliver.

Peter Norris

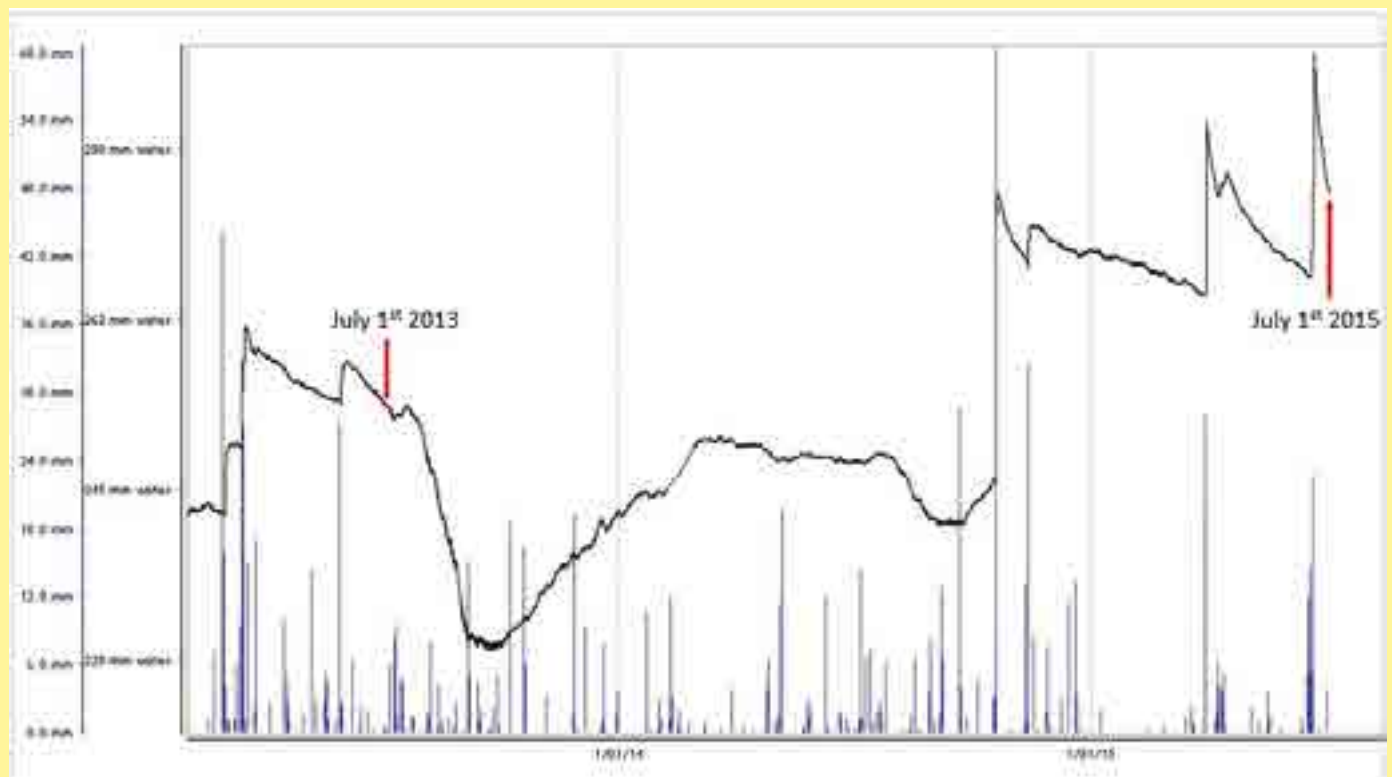
Agronomy For Profit and Synergy Consulting, Geraldton  
July 8, 2015

## SOUTH COAST

Seasonal conditions on the South Coast over the past two months have been extremely variable with May and the first two weeks of June being very dry. Most growers had finished seeding by the end of May with generally good crop establishment. With the dry conditions the only post emergent spraying has been grass selectives in canola, often in sub optimal conditions.

All other post emergent spraying and nitrogen top ups were

**FIGURE 1: Soil moisture probe 2013 data from Grass Patch in WA's South Coast region. This was a very good year. At this stage 2015 is looking even better.**



# District Reports...

July–August 2015

The season is now back on track for very good yields. Growers have been busy spraying broadleaf weeds and applying top up nitrogen in line with better yield prospects with a full stored soil moisture profile.

**Quenten Knight,**  
Agronomist, Precision Agronomics Australia  
July 4, 2015

put on hold while we waited patiently for rain! Finally the dry spell was broken on June 18, with the whole region receiving falls between 35 to 75 mm.



Ricky Dorante and farm manager Martin Brooks are happy with their Fighter TT canola at Jacup located between Albany and Esperance in WA's South Coast region.

## Southern region



### SOUTH AUSTRALIA

#### Crop planting and establishment

Most cropping districts of SA received adequate rainfall during early April to allow seeding to commence mid-April.

The Upper South East had not received the good opening rains experienced in most of the state. Some farmers in this district

### Seasonal rainfall across the grain regions – 25 year averages and year to date

Brought to you in association with  JOHN DEERE	25yr Annual Average (mm)		2015 rainfall to date (mm)		Summer 25yr Annual Average (mm) 2014–15		Autumn 25yr Annual Average (mm) 2015		Winter 25yr Annual Average (mm) 2015 to date		Spring 25yr Annual Average (mm) 2014	
Emerald Qld	549	169	242	283	112	20	60	13	122	161		
Toowoomba Qld	662	319	272	339	130	212	82	19	121	85		
Roma Qld	578	235	247	286	128	54	72	65	126	43		
Goondiwindi Qld	608	409	251	308	124	158	66	61	135	30		
Narrabri NSW	633	393	227	148	119	252	126	61	160	36		
Gunnedah NSW	660	308	234	178	118	163	129	62	177	74		
Dubbo NSW	609	398	197	239	132	138	128	97	152	38		
West Wyalong NSW	444	237	113	166	86	33	118	82	126	54		
Wagga Wagga NSW	537	316	130	133	114	85	151	124	143	103		
Swan Hill Vic	322	111	73	20	65	37	89	59	95	45		
Bendigo Vic	514	212	109	77	102	84	167	61	136	108		
Horsham Vic	384	154	75	84	70	38	132	43	107	36		
Lake Bolac Vic	529	206	117	78	100	82	160	66	152	74		
Murray Bridge SA	369	223	66	65	76	129	128	36	99	46		
Kadina SA	343	118	58	31	77	54	120	46	88	26		
Cummins SA	395	195	51	47	87	104	175	62	82	26		
Esperance WA	615	233	80	30	142	155	249	70	144	163		
Wagin WA	402	155	46	16	95	97	171	43	89	88		
Northam WA	404	139	42	19	85	81	192	39	86	101		
Mingenew WA	366	86	31	1	92	56	176	26	68	99		
Moora WA	384	178	43	51	86	77	183	50	72	37		
Mullewa WA	309	307	48	40	90	230	131	39	50	74		

Last rainfall reading July 13, 2015.



commenced seeding with marginal soil moisture.

The amount of stubbles burnt prior to seeding has increased on Eyre Peninsula, unchanged in the Mid North and Yorke Peninsula, and decreased in the Lower North.

There has been an increase in the amount of stubble windrow burning and a decrease in burning of whole paddocks.

The early break in most of the state meant seeding progressed at a leisurely pace, enabling weeds to germinate and ensuring particular crops and varieties were not sown too early.

Good early July rainfall in most cropping regions has boosted SA winter crop prospects for the 2015 season.

### Cropping mix variations

Farmers have been steadily increasing the size and capacity of their seeding machinery so that large areas can now be sown relatively quickly.

The area sown to canola appears to have fallen dramatically in some districts. Across the state, it will be down by at least 30 per cent. This is due to canola's poor price outlook and poor yields in recent years.

Canola has been replaced by pulse crops, oaten hay and some barley.

The area sown to wheat has likely remained relatively stable with a slight increase in some districts and reduction in others.

There were high reported mice numbers in isolated spots on Western and Central Eyre Peninsula and Yorke Peninsula. Farmers in these areas baited immediately after seeding.

Despite good control of snails over the summer, there are still moderate to high numbers in some areas. Some farmers have baited soon after the opening rains but most only baited vulnerable crops after seeding.

PIRSA Crop and Pasture Report

## Northern region



## DARLING DOWNS

### Winter crop

The winter crop is off to a promising start with solid establishment over good stored soil moisture, and growers able to plant their planned area of winter crop.

There has been a significant planting of chickpeas right across the Downs, with the area close to double that of last winter. Most of the crop has been double cropped into sorghum ground, which after the April rain generally had a good 60 cm of stored moisture.

Emergence of chickpeas was very quick – nine days after planting in some cases – but growth has been reasonable, with slow nodulation holding some crops back. The past two weeks have seen good growth, but the current frosts will curb this.

July–August 2015

# District Reports...

July–August 2015



A cold and foggy winter's morning on Queensland's Eastern Darling Downs – lovely chickpea checking weather!



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# District Reports...

**July–August 2015**

All chickpea crops are still in the early to mid vegetative stage, and there have been no signs of disease so far. The main crop damage has come from wild pigs digging up the rows.

But the wheat and barley crops have grown almost too quickly, with some crops west of Dalby at GS32 to GS33 already, due to the mild weather. The majority of crops are zero tilled and have fairly good secondary roots, but crops in cultivated ground are struggling to get secondary roots started with the lack of in-crop rainfall.

Scarab beetles have caused some damage, and there is net blotch in the barley. More advanced barley crops have some aphid infestations, especially where not seed-treated with Emerge.

Faba beans are being grown west of Dalby and some of these crops are podding with aphids and heliothis already present.

Overall the winter crop potential looks good at this early stage.

## Summer crop outlook

The sorghum area is expected to be similar to last season's as growers look to back up the late planted sorghum crops with sorghum again in 2015. But the corn area may drop as a number of farmers are planning to switch to sorghum or cotton.

If a planting rain comes in time, there will be an increase in the dryland cotton area, whilst all irrigated crops have a good outlook with many water storages replenished by the April rain.

Growers will be looking for the opportunity to double crop mungbeans into their winter crop ground, especially if prices remain favourable – but as always this is dependent on good rain in what is an El Niño season.

**Hugh Reardon-Smith**  
Agronomist, Landmark Pittsworth  
July 4, 2015

## WESTERN DOWNS

The winter crop has got off to a good start with most of the area planted by the end of May. These crops were planted into a good moisture profile with even some double cropping occurring. The chickpea area is up on average due to the good prices and this is applying pressure to crop input supply.

## IAN'S CLASSIC TRACTOR QUIZ ANSWERS

- 1 – Hanomag.
- 2 – David Brown.
- 3 – Perkins four cylinder diesel.
- 4 – John Deere.
- 5 – Mercedes Benz.
- 6 – Emerson Brantingham.
- 7 – Joseph Cyril Bamford.
- 8 – Italy.
- 9 – Cornish fishing trawlers.
- 10 – Farmall A.

Warm, mild conditions has accelerated crop development and this may cause issues at head emergence and flowering for both cereal and chickpea crops, with an increased frost damage risk.

Foggy, dewy mornings have given good conditions for disease to form with net blotch in barley occurring throughout the cropping area.

Chickpeas will need to be closely monitored for ascochyta with ideal conditions occurring especially after some rainfall.

Paddocks that are particularly at risk are ones that have had chickpeas in the past two years.

Hopefully, we will now have some cooler conditions to slow down crops and reduce any risk of frost damage.

**Nikolaus Fritz**  
Agronomy – Landmark, Miles  
July 6, 2015



Warm and mild conditions in early July accelerated crop development on the Western Downs.

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