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**FRONT COVER**

Chris and Peter Radford of Radford Harvesting, checking if they're 'right to go'. The Radfords operate six Claas Lexion 760 with Terra Trac combine harvesters. They are about to start operations on a large-scale cropping operation at Rowena in northern



NSW. Their business harvests more than 40,000 hectares of cereals, sorghum, rice, corn, poppies and pyrethrum in Queensland, NSW, Victoria and Tasmania each year.

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**T**HE 2015–16 cropping season has been no less than a wild roller coaster ride across the entire Australian grain belt. In most regions, winter crops were planted into good soil moisture and were away to a flying start – the challenge for growers was to work out how to best manage this huge crop in the making. Then Mother Nature intervened. Heavy springtime frosts followed by record high temperatures and hot dry winds in early October, took a big toll on crops right across southern Australia. Fortunately, many northern region growers managed to dodge an 'El Niño bullet' with their farms getting under some crop saving storm rains – but that one general spring rainfall event across the national grainbelt, was not to eventuate.



It is a testament to our farmers' excellent agronomic skills, combined with tough new grain varieties and state of the art planting and tillage technology, that the nation is still forecast to produce an above average grain crop. For instance, we are on track to harvest around 23 million tonnes of wheat – the 10 year national average is 22.3 million tonnes.

## Local versus international investment interest

On the subject of healthy long term averages, it is baffling to many of us how large scale capital investment in Australian assets, including agriculture, appears more attractive to international rather than local cashed up equity funds. I've asked some people involved in the heady world of equity and super fund management to try and explain this to me. In admittedly sweeping generalisations, and by way of explaining the different investment ethos of the domestic and international players, they point to the lack of attractive and stable dividend yields particularly during the start up phase of major projects, as a major deterrent for our domestic fund managers.

Australian funds generally need to show good profits very early on – that is, create almost immediate and acceptable dividend yields from their assets under management – otherwise mum and dad and institutional investors find another fund manager who can. But for example, with Canadian superannuation fund managers, the investment drivers are different.

Canada has defined benefit superannuation funds meaning a specified amount of money must be delivered to the fund members well down the investment track in say 15, 20 or 30 years time. This means that investment into large-scale Australian assets, with their relatively higher long term capital growth and yields than that possible in many other countries, are what these Canadian funds are chasing.

Defined benefit funds – with their inherent encouragement of investment over the longer term – haven't been on the Australian superannuation scene for 20 years or more. Our fund managers are generally more focussed on attractive and reliable short to medium term returns. And it's the short term 'reliable' bit that Australian agriculture can often have problems with.

## WA South Coast bushfires

Mother Nature had one more very cruel card to play on the WA South Coast region. On November 18, bushfires tragically claimed the lives of four people. I know the thoughts of the entire Australian farming community are with their families and friends at this very sad time (see Editor's Note on page 44).

Let's hope Christmas and the New Year brings happier times.



# AUSTRALIAN GRAIN

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## In this issue...

### Delayed planting pays off

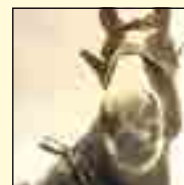
Badgingarra (WA) grain grower, Colin McAlpine, avoids dry seeding like the plague and reckons that this has been the key to his success in regaining control of herbicide resistant weeds on the 4000 hectares of land he crops.



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

### The harvest moon – Part 1

Today's Australian broadacre grain farmers think in terms of thousands of hectares. Therefore to imagine cultivating crops of a mere 60 or 50 acres, is possibly beyond their comprehension. But at the time of this story, Scottish hill farms consisted commonly of around 100 acres.



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### Japanese corn diet a Waygu winner

When it comes to feeding highly prized cattle, the world's biggest Wagyu producer, Australian Agricultural Company takes a leaf out of Japan's book by finishing Wagyu on a corn inclusion diet for up to 500 days.



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### Soil compaction and tyre inflation

Soil compaction from machinery or livestock is a major problem facing modern agriculture. Compaction decreases soil physical fertility through decreasing storage and supply of water and nutrients, leading to additional fertiliser requirements and increased production costs.



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### Landmark GM decision – court finds no case for zero tolerance

The WA Court of Appeals handed down its decision in the Marsh vs Baxter case, in which an organic farmer sued his genetically modified (GM) crop growing neighbour for allegedly contaminating the organic farm. The court found in favour of the GM canola grower and criticised the organic certifier.



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# Delayed planting pays off

**B**ADINGARRA (WA) grain grower, Colin McAlpine, avoids dry seeding like the plague and reckons that this has been the key to his success in regaining control of herbicide resistant weeds on the 4000 hectares of land he crops.



Colin McAlpine, Badgingarra WA, has proven the value of delayed sowing and the double knock tactic to reduce in-crop weed pressure.

Starting with a mainly-livestock enterprise with a high weed burden, Colin has greatly reduced the weed numbers in his now mainly-cropping enterprise in less than 10 years, by taking advantage of the fact that herbicide resistance levels were still quite low.

He has used a variety of tactics to protect the herbicide modes of action available, while hammering down the weed seed bank every year.

Twelve years ago Colin moved from the eastern wheatbelt to the Badgingarra district in the central-west wheatbelt where the incidence of frost is lower and the annual rainfall higher, averaging 550 mm. He soon found that the higher rainfall and non-wetting soils presented significant management challenges in the form of staggered germination of weeds.

Colin does no dry sowing, and believes that the practice puts too much pressure on pre-emergent herbicide, often leading to a blow-out in herbicide resistant weeds.

"It takes real determination to leave the seeder parked in the shed when other growers in the area are out seeding their paddocks," he says. "Instead, we wait for rain and the subsequent germination of weeds. We do a double knock of glyphosate followed with either Spray.Seed or paraquat – and always at full rates. The aim is to germinate and kill as many weeds as possible before we seed."

"I never use glyphosate on its own and always follow through with the double knock," he says. "In just eight years we brought resistant populations of radish, brome and silver grass under control on our home farm."

Resisting the urge to start planting earlier takes a high level of confidence in the value of the double knock to clean the paddocks up before sowing, reducing the number of weeds that the pre-emergent herbicides need to control at seeding.

## Less in-crop weed pressure

"We have seen the results and although the crops may sometimes seem a bit behind other crops in the district we have much less in-crop weed pressure," he says. "The profitability of our crops is higher because we have consistently solid yields and our costs of production are no greater than average."

Annual ryegrass and wild radish have been the main problem weeds on his farms and Colin has taken on the challenge of running down the weed seed bank without allowing herbicide resistance to evolve.

"We have thrown everything we have at weeds and have been testing weed seed for resistance every year so that we are always ahead of the game," he says. "We only have a small number of herbicide modes of action available so we can't afford to lose any of them."

Colin grows noodle and Prime Hard wheats and malt barley, as well as canola and lupins. He chooses sowing rates at the upper end of the range to achieve strong crop competition and finds barley is the best competitor against weeds.

To further favour the crop over weeds, Colin has moved from 30–33 cm (12–13 inch) row spacing to 25 cm (10 inches) on one seeder and the second seeder is set to sow paired rows at 23 cm (9 inch) spacing.

Colin has used narrow windrow burning in some years but has also had success using a 'cold burning' technique. "We cut the crop short and spread the residue, then after it rains we burn off the residue and find that we destroy a large portion of the weed



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**Colin has thrown everything he can at reducing the weed burden on his farm while taking all precautions to protect the available herbicide modes of action.**



**In recent years Colin has reduced the row spacing from 30–33 cm (12–13 inch) to 25 cm (10 inches) on one seeder and the second seeder is set to sow paired rows at 23 cm (9 inch) spacing. This increases crop competition while maintaining strong yields.**

seed present,” he says. “Having less crop residue allows better soil contact for the pre-emergent herbicides, improving their efficacy, and the weed seed numbers are less of a challenge.”

Colin’s overall weed management program has been so successful that he has not needed to do any burning in the past two years.

Sheep also feature in the weed management program with 2500 breeding ewes and their prime lambs graze on crop stubble over summer. “The adult sheep remove any weeds growing after harvest and also stir up the soil, helping to stimulate new germinations of weeds,” he says. “They also breakdown the stubble and improve the water penetration into these non-wetting soils.”

### **Manages the farm in blocks**

Colin manages the farms in 600–800 hectare blocks and once he has used a mode of action in the block he does not use it again in that block for three years.

In the 800 hectare canola block each year, Colin uses as many weed control strategies as possible to clean the block up ready for the cereal phase. At harvest Colin sprays glyphosate under the swathe and puts the ewes in straight after harvest. Roundup Ready canola is used just one in every four canola seasons to avoid the risk of glyphosate resistance.

On the sandier soils Colin grows lupins as the break crop, using crop topping as another tool to target late germinations of weeds and any survivors. He times the crop topping spray to suit the maturity of the weeds present and accepts any yield loss that might cause.

“Short term economics does not always support weed control strategies,” he says. “I believe we have to play the long game and do things now that will limit the cost of weed control in the future.”

Colin believes there are distinct advantages in owning and operating your own spray equipment to make sure herbicide is always applied at the best time.

“Getting good advice from an agronomist is also very beneficial,” he says. “Some herbicides have very specific requirements to meet when it comes to timing or optimal conditions. Having a technical advisor helps make the most of every application.”

He has invested heavily in liming to raise the soil pH and in

improving the soil nutrition and biological activity across the clay loam and sandy soil types. “Every four years we apply lime to keep the pH around 5.8 to 6.2,” he says. “This improves plant growth and also makes the pre-emergent herbicides more effective.”

### **Efficient application of sprays**

Completing a double knock within 10 days of rain and before seeding means Colin needs to cover a lot of ground very quickly with the sprayer. Using a nurse tank in the field he is able to cover an additional 30–50 per cent larger area than if he had to fold up the sprayer and return to the shed each time the sprayer needed refilling.

Using modern spray equipment he is also confident that he is applying the right droplet size at the right pressure for the particular herbicide. “High water rates are critical to achieve good results,” he says. “The aim is always to be treating actively growing weeds when the soil is moist. Dusty conditions are not good and it helps to have some crop residue on top of the soil.”

Colin usually has 1800 to 2000 hectares of wheat, 800 hectares barley, 800 hectares canola and 500 to 600 hectares of lupins in each year. He finds the longer rotation helps preserve herbicides and avoids using the same herbicide two years in a row.

“When we came here, the property had only a small area of cropping and the weed numbers were very high from the predominantly grazing use,” he says. “In our early years our wheat crops were yielding around 2.5 tonnes per hectare as they struggled under poor soil health and high weed conditions. Since then yields have steadily increased to average four to five tonnes per hectare and I can confidently market the wheat knowing that we can achieve the yields required.”

**For more information on the 10 Point Plan to keep herbicides working, visit the Weedsmart website: [www.weedsmart.org.au](http://www.weedsmart.org.au)**





# HARVEST TIMES

A CLAAS HARVEST CENTRE SPECIAL FEATURE



## NEW AUSTRALIAN HARVESTING BENCHMARK

**AN impressive fleet of nine super-capacity CLAAS LEXION combine harvesters made short work of harvesting operations on a large-scale cropping operation at Rowena in northern NSW.**

The line-up is believed to be the largest working group of LEXION combine harvesters, recognised as the world's most advanced harvesting platform, yet recorded in Australia.

Equipped with 13.5 metre variable cutterbars or 12 m draper fronts, the nine machines cut a 110 m swathe through the crop at an average speed of 10 km/h. Behind them, a fleet of four tractors and chaser bins moved grain back to two mother bins, which in turn, filled a fleet of semi-trailers on a day-long shuttle to and from Moree.

CLAAS LEXION Product Manager, Jonathon Ham, says the sheer numbers are impressive by anyone's scale. "In a 12 hour period, they

harvested nearly 4000 tonnes of wheat across 1300 ha," he says.

"The hourly throughput was more than enough to meet the daily bread requirements of Sydney, Melbourne or New Zealand. These figures become even more impressive if you consider there are about 550 LEXION combine harvesters operating in Australia."

Six of the machines belonged to Radford Harvesting, which harvests more than 40,000 ha of cereals, sorghum, rice, corn, poppies and pyrethrum in Queensland, NSW, Victoria and Tasmania each year.

Peter Radford has owned a number of different makes and models over the years, but has settled on the CLAAS LEXION 760 with TERRA TRAC for its high capacity, narrow 3.5 m transport width and 40 km/h road speed.

"The narrow-bodied 750 and 760 are probably over-specified for their

### 2016 MACHINE OF THE YEAR

CLAAS LEXION 700 combine harvester has been awarded the 2016 Machine of the Year at leading European trade fair, Agritechnica. The 'Machine of the Year' title is awarded each year by a jury of 19 technical journalists from eight European countries, alternately at Agritechnica in Germany and SIMA in France. The awards recognise agricultural innovations across 16 different categories. The jury made special mention of the many technical innovations incorporated into the LEXION 700 series, such as the 4D cleaning and automatic crop flow monitoring, both of which were recognised with a DLG Silver Medal at Agritechnica.

> Continued Page 12

CLAAS Harvest Centre

**CLAAS**



The wireless iCon controller provides easy control of all seeder and toolbar functions.



The patented Seed Hawk opener achieves precise seed and fertiliser placement.

## SEED HAWK NO. 1 DOWN UNDER

**NO-TILL precision seeding manufacturer, Seed Hawk, has announced the sale of its 500th unit in Australia, cementing its position as the undisputed market leader.**

Available in a selection of working widths from six to 26 metres with 25 cm (10") or 30 cm (12") row spacing, Seed Hawk now accounts for about 25 per cent of all new air seeders sold in Australia each year.

The XL series features five working widths from 19.8 m (65') to 25.6 m (84'). The five or seven section frame features a double-fold mechanism that folds to transport width of 8.6 metres.

The 45 series offers three working widths – 12 m (40'), 15.2 m (50') and 18.3 m (60') – that fold to a more compact transport width of 4.5 m.

XL and 45 toolbars can be paired with the all-new Seed Hawk 660 and 500 air carts, which incorporate

independent electronic metering for each section, load cells in each bin and an iPad-based controller for easy calibration, section control or variable rate application.

The 660 has an 18 tonne capacity across three primary bins, while the 500 has a capacity of 13 t across two primary bins. Both models incorporate an additional one tonne bin, which allows small seeds, granular inoculant and micronutrients to be fed directly to the seed or fertiliser lines.

Other standard features include easy access ladders and walkways, while optional high capacity augers, belt conveyors or bag lifting systems ensure fast and easy filling.

The Seed Hawk 30 series is available in 6 m and 8 m working widths. The three-section frame incorporates 4000 L on-board split seed and fertiliser tank and folds to a compact 3 m.

All three series feature the company's patented 'openers', which achieve precise seed and fertiliser placement, even over uneven ground, high trash conditions or at higher operating speeds.

The first complete Seed Hawk toolbar was imported into Australia in 2005 by Coonabarabran district farmers, Ambrose and Lisa Doolan, for use in their zero-till cropping system. The Doolans were invited to establish a distribution business and began exhibiting at field days in NSW.

Soon afterwards, Swedish farm machinery manufacturer, Väderstad, acquired the international marketing rights to Seed Hawk and commenced operations in Australia.

In 2011, Väderstad appointed Landpower – Australia's largest privately-owned farm machinery distributor and the franchisor of the CLAAS Harvest Centre network – as the Australian distributor for Seed Hawk.





## A LONG ROAD TO **SUCCESS**

**THE success of Seed Hawk in Australia is testimony to the perseverance of a team of enthusiasts who have conducted hundreds of on-farm demonstrations over the past decade.**

One of them is former Väderstad UK Managing Director (now

Landpower General Manager – Product), Tim Needham, who played a key role in Väderstad's acquisition of Seed Hawk and subsequent development of the XL and 30 series of toolbars.

In 2007, Tim moved to Brisbane to facilitate the development of the brand in Australia. Realising

the impracticality of transporting a full-scale unit around Australia, he set about building a unique demonstration rig that could be towed and operated by a 4WD.

Mounted on a standard trailer frame and couplings, the 2.5 metre wide unit featured 10 Seed Hawk openers, complete with on-board seed and fertiliser tanks, hydraulic metering and a 25 hp Honda engine.

"The whole thing was made in my garage – the neighbours wondered what on earth was going on," Tim says. "When we finished it, I had to take it down to the RTA to get it registered and their engineers didn't know what to make of it."

The rig has since traversed Australia several times, attracting keen interest from motorists, highway patrol officers, motel managers and service station attendants along the way.

## LUNCHTIME AT HARSEWINKEL

**IT'S not every day you get to have lunch with the man whose name is on the side of your combine harvester, but for one group of Australian farmers, that's exactly what happened during a recent visit to the CLAAS LEXION combine harvester factory in Germany.**

The group had just completed a tour of the massive 40-hectare site at Harsewinkel, when to everyone's surprise, Helmut and Erika Claas – whose family home is located within the complex – called in to have lunch with them.

South Australian farmers, Jeff and Julie Ayles of 'Willam Plain', Kadina, had the unexpected thrill



of seeing their new LEXION 760 with TERRA TRAC on the assembly line.

"We were standing beside a machine that was three-quarters built when one of our hosts checked the serial number and said, 'You're not going to believe this, but this is your machine'," Jeff says.

"Our son, Craig, made the decision to purchase the LEXION and Julie and I had the honour of going to Germany to see it being made."

Other highlights of the 12-day CLAAS Harvest Centre European Farming Innovation tour included attendance at Cereals 2015, the UK's leading field days for the cropping sector and numerous farm visits.

**Order your CLAAS LEXION before 31 January 2016 and join us on the 2016 European Farming Innovation Study Tour.**



## CAPACITY WITHOUT COMPACTION

**ANOTHER new addition to Radford Harvesting's line-up is a six-wheel Balzer Field Floater 6 chaser bin. Its 40 tonne capacity can be unloaded in less than 90 seconds.**

The 60 cm diameter unloading auger boasts a discharge rate of 30 t/min, a 4.2 m maximum reach and an adjustable bi-directional spout for fast, easy, accurate unloading operations.

"This bin is a great bit of gear," Peter Radford says. "We make a lot of our gear but there's no way we can make this sort of technology. The on-board load cells mean we can load exactly what each truck needs to fill it to capacity – and no more."

Paired with a CLAAS AXION 930 (350 hp) advanced technology tractor, Peter says the Balzer complements the capacity of his LEXION combine harvesters. "The tractor's got cabin suspension, front axle suspension and a CVT, while the bin has hydraulic suspension, so there's none of those bounces and jolts as you move across the

paddocks or along roads at speed," he says.

"The capacity means we can keep up with at least two of the harvesters, and the six wheels gives us extra flotation if the soil is a bit wet. I've got the AXION on demonstration and I'm really impressed with its simplicity, comfort and technology. I was perfectly happy with my current tractor but this has really changed my mind about CLAAS tractors."

Now distributed by the CLAAS Harvest Centre network, Balzer Field Floater chaser bins are available in 40, 46 and 60 t capacities and tandem or tridem axles or quad track configurations. Each incorporates three-metre spacings and a patented auto-trail steering system for optimal manoeuvrability and tracking.

Standard features include electronic weigh cells, hydraulic suspension, brakes and halogen lights on the grain tank and discharge auger. Options include a moisture sensor, roll tarp, hydraulically-operated clean-out doors, LED lights and turning signals.

### Continued from Page 9

capacity but that's why we like them," Peter says. "They have more or less the same running gear as the wide-bodied 770 and 780 so they are not under as much pressure."

"Any combine will do a good job in an average crop and conditions, but LEXION comes into its own when the going gets tough – heavy straw load, high yields and high humidity."

All four models in the LEXION 700 series feature the unique CLAAS HYBRID threshing technology, which combines an accelerated pre-separation (APS) threshing system and twin longitudinal rotors.

Approximately 70 per cent of the separation occurs before the crop reaches the rotors, which means the machine can operate more efficiently and longer in all conditions. Combined, these two technologies achieve up to 20 per cent more throughput with minimal grain loss and no increase in fuel consumption.

Three of Peter's 2015 delivery machines feature the CEMOS AUTOMATIC optimisation system. This award-winning technology continuously monitors and then automatically adjusts key settings to optimise throughput, sample quality or fuel efficiency according to the prevailing conditions.

"We have some very experienced drivers and some who are less experienced," Peter says. "CEMOS means we can achieve consistent performance and grain quality across all machines, regardless of who's driving it."

"Reducing grain loss in a light crop can be the difference between profit and loss for our customers."

## CLAAS Harvest Centre

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**CLAAS**

**AMAZONE**

**SEED HAWK**

**VERMOREL**



# Early sowing is key to reaping rewards from deep wheat roots

**U**NDER the right conditions deeper crop roots can increase crop yield by providing valuable extra water during grain filling. But should we breed for deeper roots, try to manage crops to achieve deeper rooting – or both?

Research from CSIRO Agriculture has shown that when deep roots extract more water they leave the soil in a drier state – a legacy that influences the value of deep roots on different soils and seasons.

Using the Agricultural Production Systems sIMulator (APSIM), CSIRO Agriculture's Dr Julianne Lilley has predicted the yield benefit and legacy effects of wheat varieties with deeper roots, early sowing systems and their interaction.

The results show that both early sowing and vigorous roots – although beneficial to the current crop – can leave the soil drier for the subsequent crop. Extra water can only be taken up when it is there – either because a previous crop left it behind, or because the season has been wet enough to re-wet the soil to depth.

In Australia many seasons are too dry for the water to penetrate to depth, especially at locations with low rainfall.

"Under these conditions deep roots are of little or no additional value," explains Julianne.

"Much of the Australian cropping zone has shallow soils where root growth is significantly restricted to less than one metre due to high levels of salinity, sodicity, boron toxicity, acidity, alkalinity or gravel layers. Deep roots in these regions are of little to no value in most years, as the accessible soil water is already fully exhausted."

But if you've got the right soil conditions and the seasons are

wet enough, deep roots can provide a significant yield advantage if the crop is managed appropriately. Effective management can take a number of directions depending on soil, season and cultivar.

Maximising root depth by sowing early, extends the period of root growth allowing the crop to access more and deeper water, leading to increased yield. Early sowing of longer season cultivars also provides a benefit in shallow soils as more rainfall is captured during the longer period of crop growth and a lower proportion is lost to soil evaporation. But it is important to realise the extended crop duration means a longer period of water extraction which leaves the soil in a drier state.

"Overall we found that early sowing was beneficial in most circumstances because it combines deeper roots with other advantages for shoot growth that lead to increased yield. Cultivars with deeper roots were beneficial only on deep soils in specific seasons, but in those cases, could add to the benefits of earlier sowing."

Growers should consider their crop sequence and seasonal conditions to take advantage of deep water when it is there. But in drier seasons, or following crops which exploit soil water to a greater degree, growers should consider appropriate cultivar choices or select species which perhaps extract less water to give the profile a chance to recharge. For example, late-sown cultivars or grain legumes may be a less risky choice. ■



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# Soil constraints and management options put to the test

■ By Derk Bakker (DAFWA) and the Ravensthorpe Agricultural Initiative Network (RAIN)

**P**RODUCTIVITY of broadacre crops is governed – amongst many other factors – by the ability of the soil to retain moisture and by the ability of the roots to access this moisture. In many instances this access is inhibited by poor and dense soil structure resulting from soil compaction usually caused by agricultural machinery.

This project, managed by local grower group RAIN and undertaken by Derk Bakker from the Department of Agriculture and Food WA (DAFWA), examined responses and results of various soil amelioration/disturbance methods used by local growers in the Ravensthorpe Shire on WA's South Coast.

In 2014, deep ripping trials were established at three sites testing different depths, spacings and machinery. Mouldboarding treatments were also examined.

## Project aims

Visual positive responses at existing non-wetting soils trials which are comparing and testing various soil amelioration/disturbance methods, raised an obvious question from local growers: If we are getting responses to sub-soil movement/penetration what is the best machine, how deep do we go and what is the economics behind it all?

## 'LOOK BEFORE YOU LEAP' INTO DEEP TILLAGE

The on-farm trials in Western Australia's South Coast region – and detailed in the accompanying article – have highlighted the importance of growers testing deep tillage treatments on small areas before deciding whether to apply them to larger areas.

The trials were initiated by the Esperance port zone's GRDC Regional Cropping Solutions Network (RCSN) and examined results from different soil disturbance methods.

The aim of the trials, conducted in the West River area near Ravensthorpe by the Department of Agriculture and Food (DAFWA) and Ravensthorpe Agricultural Initiative Network (RAIN), included providing local growers with a better understanding of subsoil constraints and management tools.

- Trials were undertaken at three sites using various types of rippers and configurations for depth and spacing, including machinery depths to 20, 30 and 40 cm and tyne spacings of 30 and 60 cm.
- GRDC RCSN coordinator Julianne Hill said that despite two of the three sites being located in adjacent paddocks, the results of the treatments varied significantly, with only some treatments at one site being economically viable.
- This reinforces the importance of doing small plot trials before applying invasive treatments across paddocks, as well as knowing the characteristics of the subsoil and using an experienced machinery operator – to minimise the risks of negative impacts such as bringing too much clay or rock to the surface.

So this project set out to:

- Provide local growers with a better understanding of sub-soil constraints and management tools available;
- Examine the responses and results of the various amelioration/disturbance methods used in the area;
- Link growers to researchers/soil experts to assist with the interpretation of results;
- Examine and value-add to the 2013 GRDC RCSN non-wetting soils trials and their yield responses for sub soil inversion;



Agrowplow ripper.



Mallee King ripper.





**Pederick Subsoil Ripper.**

- Provide economic analysis of the amelioration methods; and to,
- Extend these findings to growers.

### Trial locations and rainfall

All trial sites were in the West River area of Ravensthorpe Shire. The region has an average annual rainfall of around 430 mm. The rainfall tracked as average for most of 2014. It was not until late in 2014 that rainfall exceeded the average for that time of year. This created some issues with harvesting but the trial results were not influenced by abnormal weather conditions.

## How the trials were done

### Deep ripping trials

These trials were designed in large strip plots with two sets of unreplicated treatments alternated by a control plot. The width of each plot was at least twice the width of a header. They were farm-based trials and sown using GPS technology.

- Ripping depths were 20, 30 and 40 cm with tyne spacings of 30 and 60 cm;
- In mid-August 2014 high resolution aerial photos were taken with a UAV (drone);
- Predicta B tests were completed; and,
- Aerial photographs were taken in September 2014.

### Non-wetting soils trials

- Existing 2013 GRDC RCSN non-wetting soils' trials were monitored with some additional treatments added; and,
- The two non-wetting soils' trial sites were also designed in large strip plots (the same as the deep ripping trials).

## What we found

### Deep ripping trials

Three types of rippers were used: an Agrowplow, a Pederick Subsoil Ripper, and a Mallee King (see photos).

The operation and the soil loosening results of the rippers varied. Due to the narrow shanks and the angle of approach, the Agrowplow was more 'gentle' on the soil. While soil loosening at depth occurred the soil surface was left relatively intact.

The Mallee King had a much more aggressive mode of action. The shanks were thick and straight with a very wide point. Soil loosening occurred over the whole profile leaving behind a very loose and disturbed soil surface. There was about a 10 cm height difference between the ripped and unripped surfaces.

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**The untreated control soil profile at Kuiper's where the deep ripping was very effective.**

The ripping mode of action from the Pederick Ripper was somewhere in between. While the shanks were thick and the points wide, the angle of approach was smaller than the Mallee King.

#### **Kuiper's trial site**

There was little noticeable biomass difference between the treatments early in the 2014 season. Later in the season, particularly after the hot windy day of September 21, biomass differences became apparent.

The highest yield was achieved at the plot with a tyne spacing of 30 cm and a depth of 40 cm. This plot yielded higher than the control plots. It also out-yielded the 20 and 30 cm deep ripped plots.

The soil type at Kuiper's – where the biggest difference between the ripped and the control plot occurred – consisted of approximately 15 cm of loamy sand, then 55 per cent of gravel with clay at approximately 40 cm.

#### **Wisewould's trial site**

Clint Wisewould used his Agropow to deep rip down to 40 cm. It was sown to wheat in late May and ripped just before sowing. Again, little difference between the treatments in the crop was evident, but in this instance it continued until the end of the season. Even the hot windy day on September 21 did not induce any noticeable crop differences.

The depth to clay was similar to Kuiper's and the gravel content (56 per cent) and depth (10 to 30 cm) was also the same. The main difference between Kuiper's and Wisewould's was the shape of the gravel and the gravel size.

The gravel at Kuiper's was coarser and more angular with a pitted and rough surface while the gravel at Wisewould's was smaller with a more rounded and smooth surface.

By breaking up the more compacted configuration at Kuiper's, the ripping enabled the crop to explore a greater rooting depth and increase productivity.

Most likely the nature of the gravel at Wisewould's was already such that root exploration was not inhibited, hence ripping had no effect on productivity.



**Deep ripped site planted to barley at the Kuiper's site showing a visual response after the hot wind on September 21. On the left is a control strip – on the right is the ripped area (40 cm deep and a 30 cm row spacing).**

#### **Duncan's trial site**

At Duncan's the ripping was done with a Mallee King. Andy Duncan reported that he could not get enough horsepower on the ground to get to the required depth. He was aiming for 40 cm but did not reach that depth all the time. The ripping had such an effect on the soil that the surface was elevated by close to 10 cm. This has subsided somewhat but the differences in soil surface height are still evident.

This loose soil structure created problems with seeding (poor depth control) and rutting of the wheel tracks during seeding and spraying.

In mid-August, high resolution aerial photos were taken with a UAV (drone). In these photos the effect of ripping on rhizoctonia was evident as was the impact of traffic on the ripped plots.

The ripping eliminated rhizoctonia but was replaced by wheel tracks that were severely affecting the crop.

Following some measurements, it was found that the biomass depression in the rhizoctonia patches and the wheel tracks was about 30 to 50 per cent.

The ripped plots at Duncan's yielded significantly less than the control. Judging from the amount of biomass shown in the aerial photographs taken in mid August, this eventual yield difference was not expected at that time. This would suggest that yield differences developed after mid August which might indicate that the crop in the ripped plots did not have enough moisture to fill the grains properly.

If the soil structure was too open – indicated by the large surface lift – this could have occurred. Ripping with a different ripper, such as an Agropow, would provide an interesting comparison.

#### **Non-wetting trials**

##### **Burrell's and Ebert's**

At Lloyd and Cheryl Burrell's wheat was sown into the barley stubble of the previous year. One ripped and one newly mouldboarded plot were added to the southern end of the 2013 trial. Those two plots were located in the area outside the 2013 trial site which had peas growing on them in 2013, while the trial area had wheat.

The Pederick ripper struggled to reach the target depth of 40 cm. The mouldboard plough target depth was 30 cm. Irrigator wetter was reapplied at 2.5 litres per hectare.

At Rod and Tracey Ebert's the trial plots were also sown to wheat. Two ripped plots were added to the trial layout which had



canola in the previous year while the rest had wheat. A Pederick Ripper was used, aiming for a depth of 25–30 cm.

Even though the 'old' mouldboard plots yielded very well at Burrell's – considering the amount of clay that had been brought to the surface when first established – the yield difference was not significant compared to the control.

The reapplied wetting agent did not perform as impressively as it did in 2013.

At Ebert's, the deep ripped plot (next to the original trial site) yielded significantly more than the other plots. The high yielding mouldboard plough plots of 2013 did not perform much better than the other treatments in 2014.

The 2014 results of the non-wetting soil treatment did not show a repeat from 2013. At Burrell's the ploughed plots did well in 2014, while at Ebert's they didn't.

Ripping at Burrell's did not make a difference while at Ebert's the ripping performed very well.

Running these trials for multiple years will give a better indication of how robust the various results are.

## TO SUM UP

### Deep ripping

#### Kuiper's (Agroplow)

Biomass differences were visually apparent late in the 2014 season. The 40 cm depth with a tyne spacing of 30 cm yielded significantly more than the control yield and 20 and 30 cm ripping depths.

Any tillage – no matter what depth and spacing – out-yielded the control and showed a positive response. There was a visual reduction of rhizoctonia.

Kuiper's also reported improved non-wetting soils and reduced weed burden.

#### Wisewould's (Agroplow)

No significant difference in yield evident. Their soil type was similar to Kuiper's but the gravel shape and size were different (smaller and smoother). The existing loose soil structure at this site allowed root exploration so deep ripping was of no great benefit to plants accessing soil moisture.

#### Duncan's (Mallee King)

Ripping eliminated rhizoctonia but created compaction. Ripped plots yielded significantly less than the control, although there was no visual difference (suggests this was moisture related).

Duncan's aimed for 40 cm depth when ripping but couldn't get the horsepower on the ground to always get there. The loose soil structure created issues with seeding (poor depth control).

These varied results underline the importance of trialing tillage treatments before applying to large areas.

There doesn't appear to be a durable ripping boot on the market and this largely affects the economics of deep ripping.

### Non-wetting soils

#### Burrell's

The 2014 ploughed plots performed very well and had the highest yields of all treatments – ripping made little difference to yield. The reapplied wetting agent didn't appear to have a large influence on yields.

#### Ebert's

In 2014 the ploughed plots did not perform well (unlike 2013) but the ripping to a depth of 30 cm performed very well, out-yielding all other treatments.

### What about the economics?

The economics of deep ripping had to be seen in relation to the cost of the operation and the return in terms of an improvement in productivity.

The Agroplow showed significant wear during the ripping operations. After 10 hectares one set of nine points had to be replaced. At \$50 per point this is \$45 per hectare just in points.

The Mallee King and the Pederick ripper were considerably more durable with few reported costs (less frequent tyre replacement).

Machinery and labour costs would also need to be accounted for when comparing the economics of deep ripping. These costs need to be recovered by a productivity increase. It was only at the Kuiper's site (40 cm depth and 30 cm tyne spacing with an Agroplow), where the extra income exceeded the cost of ripping. Here the yield difference was 0.6 tonnes per hectare resulting in an extra \$180 per hectare (with wheat at \$300).

But it should also be noted that the cost of ripping can be spread out over three to five years which reduces the annual cost of ripping. Differing soils have differing responsive timeframes.

So in summary, the 2014 results of the non-wetting soil treatments did not show a repeat from 2013. In 2013 claying, mouldboarding, spading and use of a wetting agent showed strong yield improvements at Burrell's site.

In 2014 the added mouldboard and deep ripping plots did not perform as well as the 2013 mouldboard plots. Ripping results varied, with only one site economically viable (Kuiper's). The other ripping sites experienced slightly improved yields in some instances and reduced yields in others. At Duncan's site, rhizoctonia was reduced, but more compaction was a side-effect from the ripper.

Smaller scale trials give valuable insights as to how different amelioration methods may perform.

But before applying a disturbance method to a whole paddock, it is strongly recommended to undertake a small trial plot.

Continuing these trials for multiple years will give a better indication as to how robust the various results are.

**Acknowledgements:** GRDC's Esperance port zone RCSN, DAFWA, RAIN and the many local co-operators. ■



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# Heal thy soil, heal thy crops, kill thy weeds



■ By the Australian Herbicide Resistance Initiative

**H**AVE you ever played a game of competitive sport when you're sick? Then you'll know you simply can't compete at your best (except if you're cricketer Dean Jones, then you'd score 210 while violently ill during a test match in India in 1986 – legend).

Crops growing in unhealthy soil can't compete with weeds. To make matters worse, the unhealthy soil doesn't seem to affect the weeds as much as it affects the crop. This makes a lot of sense, but there's been limited research data to support this assumption. Until now.

We could bang on for hours with loads of detailed trial data, but nothing says it better than the photo below taken by Chris Gazey from a DAFWA trial at Kelleberrin. This photo was taken in 2009 after lime treatments were applied in 1991.

Acid soil is fine if you want to grow ryegrass, but you need healthy soil if you want to grow a crop!

## Weeds, crops and acid tolerance

Is annual ryegrass and wild radish more acid tolerant than our crops? Anecdotally we would all say yes, but there is surprisingly little data on the acid tolerance of weeds. If both crops and weeds suffered equally in acid soil, then soil acidity would have little impact on the weed seed bank.

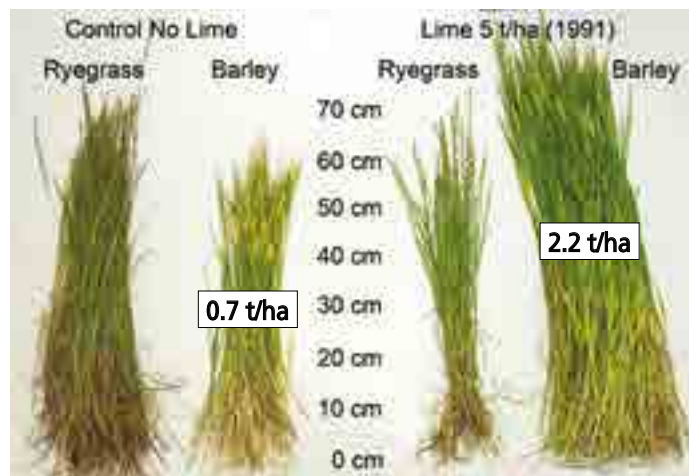
Lime trials by the Department of Agriculture and Food of Western Australia (DAFWA) give a clear indication that our crops suffer more than our weeds do in acid soil, and that this has considerable long-term implications.

### Trial 1: Kelleberrin WA – Chris Gazey (DAFWA and Precision Soiltech, funded by Caring for Country)

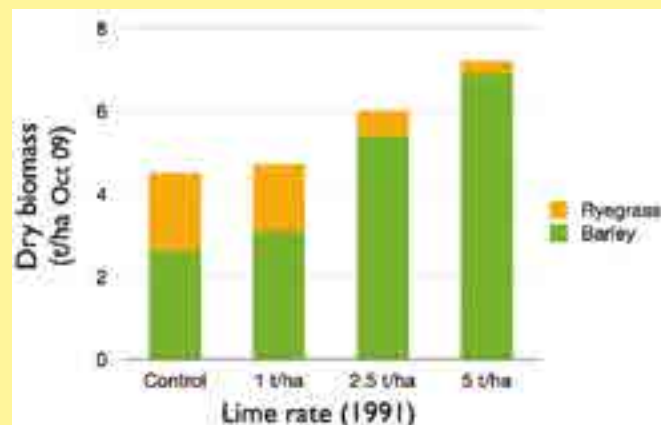
The starting pH in 1991 was 4.8 in the surface and 4.5 in the 10–20 cm layer. Limesand of 90 per cent neutralising value was applied at 0, 1, 2.5 and 5 tonnes per hectare in 1991. Whole site received additional 1 tonne per hectare limesand in 2000.

This extremely visual result (Figure 1) has occurred because:

- Many years of more competitive crops growing on the 2.5 and 5.0 tonnes per hectare lime treatments has suppressed the ryegrass seed set resulting in a lower ryegrass seed bank.
- Barley is very sensitive to acid soil.



**FIGURE 1: Lime rate, crop yields and ryegrass pressure**



### Trial 2: Casurina WA – Dr Steve Davies (DAFWA and Peter Newman, GRDC funded)

This trial was set up in 2007 to investigate the incorporation of limesand with a mouldboard plough. The 2014 season represents the eighth crop since the trial was established and it's still getting amazing results (Figure 2). Yield response to mouldboard plus lime was immediate. Soil pH testing in 2014 revealed that surface applied lime (nil mouldboard) had made its way into the sub-soil.

**FIGURE 2: Mouldboarding, liming and ryegrass biomass (2014)**

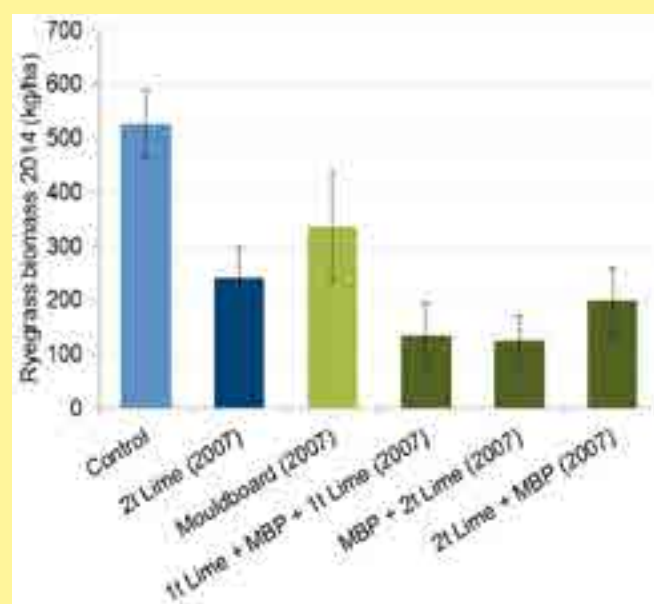


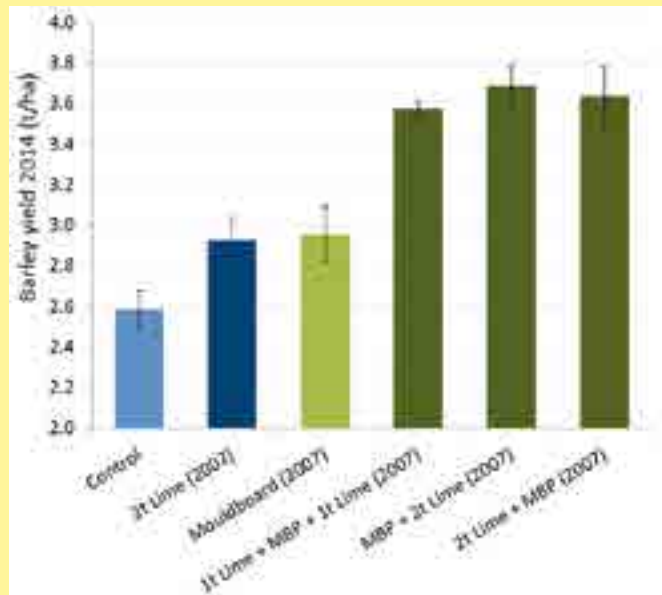
Figure 2 says it all. Wherever lime was applied, the ryegrass biomass in 2014 was significantly reduced. Mouldboard ploughing (MBP) on its own improved the soil and buried weeds



(which also reduced ryegrass biomass), but it doesn't compare to the mouldboard plus lime treatments. In 2014 the soil pH of the control was 5.1 in the top-soil and 4.3 in the sub-soil.

These treatments also improved barley yield as shown in Figure 3.

**FIGURE 3: Mouldboarding, liming and barley yield (2014)**

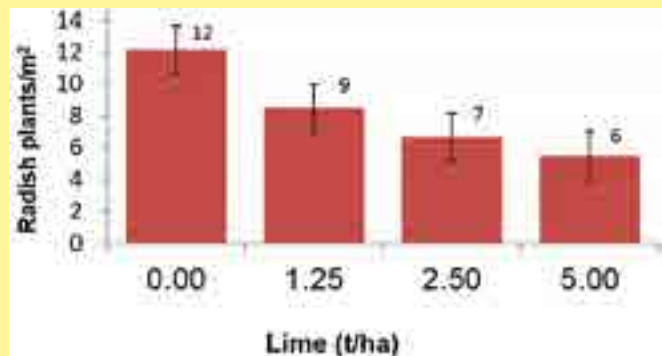


### Trial 3: Eradu WA – Dr Abul Hashem (DAFWA, GRDC funded)

This trial was established in 2010 to investigate the effect of soil pH on wild radish. Figure 4 shows wild radish density in 2014 after lime treatments were applied in 2010. Control plot soil pH was 5.0 in the top-soil and 4.3 in the sub-soil. Figure 4 is from the nil post-emergent herbicide treatment over the four years of the trial. Interestingly, a similar trend was observed where Velocity was applied to the three cereal crops in this rotation.

Previous research has shown that wild radish grows better in acid soil than alkaline. Perhaps wild radish germination is also influenced by soil pH.

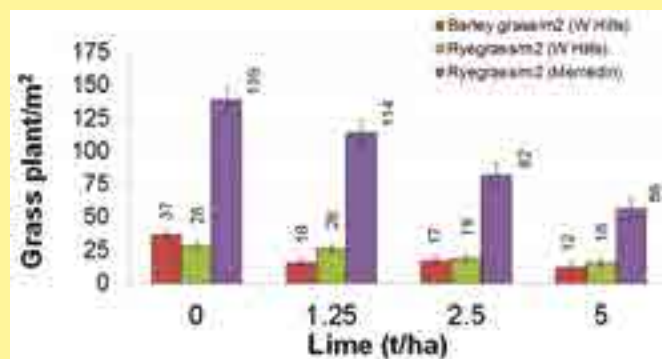
**FIGURE 4: Lime treatments and wild radish (2014)**



### Trials 4 and 5: Wongan Hills and Merredin WA – Dr Abul Hashem (DAFWA, GRDC funded)

OK, you get the picture. Figure 5 shows data of the effect of lime on ryegrass and barley grass. The Wongan Hills site is very acidic with pH 4.7 in the top-soil and 4.2 in the sub-soil.

**FIGURE 5: Lime treatments, ryegrass and barley grass – Wongan Hills**



### To sum up

We had to wait a while for these results because limesand takes years to dissolve and reach the sub-soil where the most acid layer often is. The data was well worth the wait and a big thank you to Chris Gazey, Steve Davies and Abul Hashem from DAFWA for sharing their data.

It's likely that the weeds do suffer from acid soil – but it seems that our crops suffer more. Fixing soil acidity is not the answer to all of our herbicide resistance problems, but crop competition is a vital tool in a weed management plan, and our crops cannot compete when the soil is sick.

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# The harvest moon – Part 1

■ By Ian M. Johnston

Today's Australian broadacre grain farmers think in terms of thousands of hectares of crop. Therefore to imagine cultivating crops of a mere 60 or 50 acres, is possibly beyond their comprehension. But at the time of this story, Scottish hill farms consisted commonly of around 100 acres of arable soil and were often portions of large estates owned by wealthy titled land owners. The farms were operated by tenant farmers who rented the land and steadings from the land owners. Additional rough hill grazing for sheep might also be available.

Also it is significant that the yield per acre of grain (even then) amounted to often four or five tonnes per acre, several times that experienced on the average Australian grain farm. Plus of course combine harvesters had not yet made an appearance in Scotland and thus the harvest operation necessitated the employment of a team of willing hard workers.

## September 1950. 'Easter Colzie', Auchtermuchty, Scotland

### The preparation

The harvest moon bathed the glen with an eerie glow. Its radiance filtered through the small window panes of Old John Ferguson's bedroom, as if to tell him it was now time! But old John, a tenant farmer with a lifetime of hill farming experience,

was well aware of that and when eventually daylight came, he knew it signalled the commencement of the most demanding period of the farming year. It was harvest time!

Eck the foreman, Davey the boss's authoritarian son, Gordon the tractorman, and the young 16 year old agricultural student, gathered in the stable at 7 am to learn from Old John our agenda for the day. The morning briefings were routinely carried out in the warmth of the stable, as even in mid-summer at 7 am, high in the Auchtermuchty hills, there was invariably a chill wind sweeping down through the steep glens.

Being the lowly student, I remained obsequiously silent and refrained from interjecting, while as a group we listened attentively to the instructions being spelt out by Old John. The others nodded their collective heads in response to the directives.

Gordon was dispatched to the tractor shed to tend to his Ferguson and also to grease the binder, making sure that the straw-conveyor canvasses were correctly fitted and tensioned, the binder twine in place and the knotter correctly assembled. Also the toothed cutterbar needed to have its rust prevention grease removed and the teeth 'touched up' with a file.

The rest of us headed to the old harness room where our scythes awaited us. We each grasped one of these awkwardly shaped implements together with a sharpening stone, the shape of the latter resembling a petrified cucumber. Here I was introduced to the formidable and indeed perilous task of how to sharpen a scythe without taking a slice out of my hand! Old John insisted a scythe blade had to be as sharp as a cut-throat razor.

With our scythes lofted over our shoulders, the long curved blades honed to perfection, Eck, Davey and I trudged the short distance to the Flood Field. And there it was – 60 acres of golden oats swaying gently within the protection of the surrounding dry stane dyke.

### The scything

It should be noted that Scottish farmers are a frugal lot. Not one square foot of soil should ever remain unproductive. Crops were routinely planted right up close to the boundary of each



An 1890 harvest photo showing a scythe being sharpened.  
(PHOTO: H. Emerson)



Extreme care has to be exercised when sharpening a scythe to avoid a serious cut to the hand. (Photographer unknown)





**An early harvest scene. Note the stookers picking up the sheafs and erecting the stooks. (Photographer unknown)**

field. Accordingly, in order to make space for the horse or tractor pulled off-set binder to operate – without it flattening the crop growing at the edges of the field – it was necessary to first hand-cut a 30 foot wide strip around the perimeter of the crop – using scythes!

A tedious and physically demanding task indeed!

Learning to swing a scythe is a bit like learning to ride a bike. It takes time! While the others were skilled at the pendulum motion of sweeping the blade through the tall standing oats and having the long straws fall in regimented rows, I struggled with the relatively heavy and awkward device leaving behind a trail of shaggy looking scattered stocks of varying lengths.

Eck tutted and shook his head in despair. But after half an hour of embarrassment, I finally responded to Eck's tutoring and Davey's taunting, and in fact amazed myself by actually achieving quite a reasonable result.

We were joined by Eck's wife and Gordon's cheerful mother. Their job was equally demanding as they were required to gather up armfuls of the cut crop, fashion a rope of sorts out of the straw with which to bind the bundles into sheafs, eight of which were then built into self standing stooks. There they would remain for a few days, in the expectation there would be enough warmth in the sun to dry out any moisture in the heads containing the oat grain.

Following two strenuous days, the required border strip had been scythed. The stooks stood proudly in rows adjacent to the dyke, gazing frustratingly it seemed, heavenwards towards the frolicsome sun, which persisted in playing hide and seek between the scudding clouds.

### **The binder**

On the third morning of the harvest, Gordon manoeuvred the Ferguson into the field, behind which was towed the Albion binder. It was greased, the canvasses tensioned to perfection, a new coil of best quality Egyptian twine in place and the knotter theoretically would knot (if you follow me).

The entire binder mechanism was powered by an apparatus geared to the heavy centre located ground driven steel wheel. When Gordon moved the tractor forward, the binder wheel commenced to rotate. Old John, who was perched majestically high in the operator's seat, hauled on a lever and the contraption rumbled into life.



**A binder being towed behind a Ferguson tractor at a vintage farm machinery show in England. (Photographer unknown)**

The aforementioned gaggle of workers had now been joined by an assortment of florid faced, apron clad lasses, recruited from the surrounding farms. This augmented team was required to gather the sheafs, ejected in rapid fashion from the binder, and stand them into stooks.

Gordon exhibited no pity for the army of stookers, as he urged the Fergy in third gear around the 60 acres. The binder remorsefully spewed out its endless sheafs at a pace well beyond our ability to keep pace with its production.

At this stage I confess to a feeling of masculine cognisance, as one of the recruited farmer's daughters continued eying me somewhat covertly from behind her long lashes. But doubtless her mother would have warned her about these decadent agricultural students!

By around 3 pm the Ferguson and binder had completed their tasks for the day. Gordon returned the rig to the tractor shed where he no doubt would prepare it for the harvesting of a further 50 acres of oats in a field, euphemistically named The Coffin Paddock.

Old John headed off in the direction of a cup of tea.

It was a further two hours before we of the stooking fraternity gratefully completed our labours. All that was required now was for the sun to beam its warmth over the next few days upon the geometrically precise ranks of feathery stooks.

In fact, the weather proved uncharacteristically kind, enabling us several days later to gather in the stooks for the next stage of the harvest. This involved the harnessing of Jock The Terrible into the shafts of a large flat sided so called hay cart.

### **Jock The Terrible**

My allotted horse was named Jock The Terrible, simply because he was the exception to the big gentle Clydesdales one hears about. Jock was a cantankerous old whatsit with large yellow teeth giving the impression he could bite through a steel bar. He also boasted massive iron-shod hoofs at each corner capable of lashing out with the speed of a red belly black! I seriously respected Jock!

It was an unusually warm Friday as I guided Jock along



**A 1950 photo of Jock the Terrible taken at Auchtermuchty.**  
(PHOTO: IMJ using a Box Brownie)

between the rows in the Plood field. Riding in the jolting cart, I was safe from the afore mentioned teeth and hoofs. Gordon had been prised off his beloved Fergy and now was required to do some real work. He was on the business end of a pitch fork and it was his task to fork the individual sheafs from the stooks up onto my cart.

I had been taught the technique of placing layers of sheafs on the flat platform of the hay cart and systematically building them to a height of around six feet from the deck. The secret was to lock the sheafs in position by laying the heads pointing inwards. To do the reverse would inevitably result in the load toppling from the cart as it bounced its way over the rough surface of the field.

On our way back to the farm yard with the now loaded cart, I was obliged to drive Jock from the height of my lofty perch using a pair of long rope reins, as there was now no way I could descend to *terra firma* without the assistance of a ladder.

### The stacks

Eck the foreman was renowned for his stack building abilities. Accordingly he was the designated craftsman for the job. Commencing from ground level, his gracefully formed stacks would rise majestically heavenwards to be admired by all.

Arriving back at the farmyard area with the swaying load, it was now my turn to do the forking as I unloaded the cart, which I had brought to a halt alongside where Eck was ready to commence his first stack. When I failed to fork a sheaf precisely in front of where Eck knelt, a stream of good old Fife expletives was aimed in my direction.

As the stack grew and rose above the receding height of my load, Davey clambered up and joined Eck in order to pass him the sheafs as I pitched them up in his direction. Soon my cart was empty and Jock and I returned to the field for another load.

The top of each stack was crafted into an inverted cone shaped pinnacle and thatched with wheat straw. Heavy rain would simply run off the thatching leaving the oat straw underneath dry.

Within two or three days the farmyard was adorned with a dozen or so of Eck's magnificent stacks. There they were to remain, probably until mid-winter, when the contractor would arrive with his threshing mill, towed behind a belching coal fired traction engine. This was when the real work would begin!

The conclusion of Ian's Harvest Moon will appear in the next issue of *Australian Grain*. ■

## IAN'S CLASSIC TRACTOR QUIZ

A score of eight 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. 'Increase' was the middle name of which legendary farm machinery giant —  
**Harry Ferguson, Jerome Case or Daniel Massey?**
2. The D3606 was a model of which make of tractor —  
**Caterpillar, Deutz or Lanz?**
3. In the 1950s which make of French 4 wheel drive tractor was imported into Australia —  
**Renault, Latil or Sift?**
4. The clutch control of the LA Case was a —  
**Hand lever, foot pedal or both?**
5. The longest production run of any tractor model was the —  
**Ferguson TE20, Allis Chalmers B or John Deere D?**
6. The unlikely name of a stylish tractor, produced in Hartford, Michigan in the 1940s was a —  
**Monday, Wednesday or Friday?**
7. In 1974 the name of Oliver tractors was changed to —  
**Steiger, Chamberlain or White?**
8. Cockshutt tractors imported into Australia in the 1950s were produced in —  
**Brazil, Canada or New Zealand?**
9. Which of these British tractors featured a dual bench seat —  
**David Brown Cropmaster, Fowler VF or Turner Yeoman of England?**
10. The Challenger range of crawler tractors was manufactured by —  
**I.H.C., Fowler or Vickers?**

See answers on page 48.





## Sunflower leaves are the plant's growth powerhouse

■ By Cindy Benjamin

**L**EAVES are the powerhouse of plant growth and without them sunflower yield is reduced by up to 77 per cent. To determine which leaves contribute the most to final yield and oil content, Loretta Serafin, Leader, Northern Dryland Cropping Systems, NSW DPI conducted a preliminary trial in the 2014–15 season where a different number of leaves were removed from sunflower plants at different growth stages.

"Knowing which leaves contribute the most to yield helps inform decisions around disease, pest and general crop management," Loretta said. "Leaf damage may occur for a

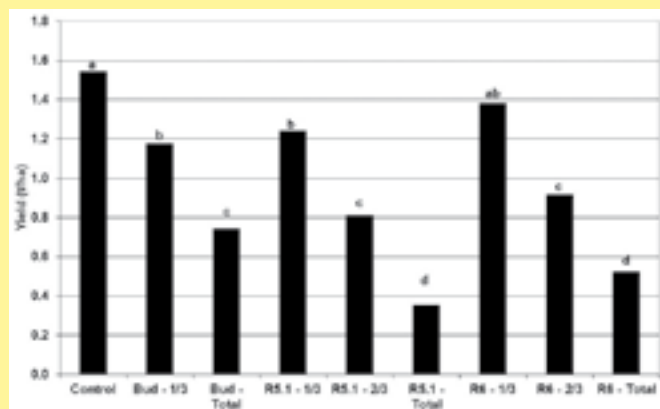
number of reasons, including powdery mildew and loopers, but historically there has been limited research in Australia to guide crop management decisions."

"Until now many growers and advisors have been using the rule of thumb that the top one-third of leaves have the most significant impact on final yield," she said. "Nuseed provided the Ausigold 62 seed for our trial on the Liverpool Plains in northern NSW over the 2014–15 summer season to start building a data set for the northern region to indicate which leaves make the greatest contributions to final yield."



Treatments applied at the start of flowering (R5.1) at 'Windy Station', Pine Ridge in 2014–15. Left – top one-third (10) leaves removed. Right – total leaf removal.

**FIGURE 1: Yield of sunflower (Ausgold 62) following varying levels of leaf removal at three growth stages, Pine Ridge, NSW 2014–15**



Bars followed by the same letter are not significantly different ( $P=0.05$ ).

Sunflower plants produce a large leaf area to support the development and filling of the maximum number of seeds. Amongst other roles, leaves capture sunlight and are instrumental in pumping water through the plant to sustain life and growth.

Defoliation treatments were applied at three growth stages – budding, start of flowering (R5.1) and once flowering had finished (R6).

Treatments included a control, where all leaves remained intact, and eight other treatments involving the removal of a varying number of leaves, leaving the leaf petiole intact.

Plant structure information (such as number of leaves) was collected, along with final grain yield and oil content.

### Impact on head size

“Removing leaves at those three growth stages had no impact on the final plant height,” said Loretta. “But there was a major impact on head size, with the removal of all of the leaves at the start of flowering dramatically reducing the head diameter.”

Generally, the larger the amount of leaf area removed, the greater the yield loss. Removing all of the leaves at the start of flowering (R5.1) caused a 77 per cent yield reduction, and removing all of the leaves at the end of flowering (R6) reduced yield by 66 per cent.

Removal of the top one-third of leaves (top 10 leaves) after flowering did not significantly reduce yields, while losing these top 10 leaves at the earlier growth stages of budding or the start of flowering, reduced yields by 20 to 24 per cent compared to the control.

Removing the top 20 leaves (2/3) before or after flowering effectively doubled the impact on yield, with a reduction of 50–40 per cent, respectively (Figure 1).

“This data confirms the importance of the top one-third of leaves at budding and before flowering,” said Loretta. “However, once flowering is complete these leaves no longer appear to contribute to the final yield.”

The trial will be repeated again at several sites across northern NSW during the 2015–16 season to validate these preliminary results.

**More Information:** Australian Sunflower Association member Loretta Serafin, Leader, Northern Dryland Cropping Systems, NSW DPI, Tamworth on 02 6763 1147 or [loretta.serafin@dpi.nsw.gov.au](mailto:loretta.serafin@dpi.nsw.gov.au). This research is jointly funded by NSW DPI and GRDC under DAN00197 ‘Tactical crop agronomy of minor oilseed crops in the Northern NSW Grains Region’.

Visit the Better Sunflowers website  
[www.bettersunflowers.com.au/bysp/agronomy](http://www.bettersunflowers.com.au/bysp/agronomy)

## Next Gen sunnies

SUNFLOWERS’ sensitivity to residual herbicides is a reality that has limited the industry’s ability to expand. With so many other factors being outside the control of the plant breeding program, Nuseed’s program manager for summer crops, Chris Haire, has been involved in the development of imidazole (imi) tolerant hybrids that will increase the opportunities to safely plant sunflower into situations that would be untenable with current hybrids.

“With an imi-tolerant hybrid, growers will be able to safely plant into paddocks where imidazole (Group B) chemistry has been recently applied – say after an IT-maize, IT-wheat or pulse crop – avoiding plant back issues even if the herbicide is still active in the soil,” Chris says.

“The second major benefit will be that an imi-tolerant sunflower hybrid could be planted into a paddock that had a broadleaf weed burden – a situation that would currently not be advisable.”

Ten years in the pipeline and still a few more years before commercial release, the imi-tolerant sunflower hybrids are utilising local as well as global breeding material from Nuseed’s extensive proprietary germplasm.

### Soon to be available

Nuseed expect to have the necessary permits in place in 2016–17 to allow the in-country trials required to gain chemical registrations for the new use pattern. Chris is hopeful that a small amount of seed may be commercially available in 2017–18.

Weed resistance to Group B herbicides, including imidazoles, can rapidly evolve so the release of another imi-tolerant crop will be supported with a stewardship program. This will require growers to monitor the frequency of Group B herbicide applications on a paddock and will also encourage the use of a variety of weed management strategies across the cropping sequence to remove any weeds that survive Group B applications and to keep weed numbers low.

This joint project has been supported by the Australian Sunflower Association and BASF to ensure a crop protection package is developed in line with the commercialisation timelines so growers will also have freedom to operate in terms of an over-the-top (OTT) herbicide package.

“I see the greatest value of imi-tolerance in sunflowers as the ability to negate the current 12+ month plant-back requirement, which restricts the choices that growers have in summer,” Chris says. “If the seasonal conditions present themselves, growers will be in a position to sow imi-tolerant sunflowers and take advantage of the excellent returns that are possible.”

**More information:** Visit [www.bettersunflowers.com.au](http://www.bettersunflowers.com.au)



**Chris Haire believes new imi-tolerant hybrids coming through the sunflower plant breeding program will be game changers.**



# Growers weigh up spray decision

**T**O spray or not to spray? That was the question facing grain growers across New South Wales and Queensland following a spate of *Helicoverpa armigera* emergence in chickpea and canola crops during spring.

With many early and moisture stressed crops nearing maturity and others benefiting from storm rains, estimating the rate of larvae development and therefore the need for control, posed a challenge for growers.

A Grains Research and Development Corporation (GRDC) supported initiative, the Beatsheet Blog, provides advice to help growers estimate the likelihood of grain damage by helicoverpa larvae in the lead up to harvest.

Queensland Department of Agriculture and Fisheries (DAF) principal entomologist Dr Melina Miles said there were some key considerations for growers in deciding on the need for a control strategy.

"Many of the very small-small larvae will die of natural causes,

so populations of small larvae below or close to threshold are unlikely to exceed threshold by the time they reach damaging 4–5th instar," Melina said.

"Death rates of very small and small helicoverpa larvae are very high. Larvae are easily dislodged by wind and rain, and can be eaten by predators.

"Loss of very small-small larvae is typically around 70 per cent. In the chickpea threshold, we include a conservative loss of 30 per cent of small larvae. Once you have 4th instar larvae (medium), there is very little natural mortality."

Melina said very small and small larvae feed predominantly on leaves and cannot penetrate pods to feed on seed until they are at least 4th instar.

"In a crop that is senescing quickly, the mortality of these small larvae will be added to by a lack of suitable food," she said.

"Growers may still find these larvae in the greener patches of the crop, but they need to estimate what proportion of the crop is still green if considering the need to control these larvae."

With 80 to 90 per cent of grain damage done by 5-6th instar larvae, Melina advised growers to undertake control measures before larvae reached 5th instar.

She said it was also important to note that larval growth rate was affected by temperature – the warmer the temperatures, the faster the larvae grow.

For more information on helicoverpa larvae development or to access figures showing the predicted rate of helicoverpa development for different locations, visit The Beatsheet blog [www.thebeatsheet.com.au](http://www.thebeatsheet.com.au)



**A spate of *Helicoverpa armigera* emergence during spring in chickpea and canola crops across the northern cropping belt, prompted growers to weigh up their spray options.**

(Photo contributed by DAF)

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# Herbicide tolerant summer cropping choices

**S**UMMER weeds are a challenge in the northern cropping region. In sorghum and corn crops, weeds like barnyard grass, liverseed grass, fleabane and bindweed are notoriously hard to kill and often survive herbicide treatments. They also have the potential to reduce yields by up to 30 per cent if left untreated.

Following a broadleaf winter crop, sorghum and maize allow effective in-crop control of broadleaf weeds and crop volunteers. But with limited in-crop herbicide options available to control grasses, added emphasis must be placed on preparing a clean seedbed and making agronomic choices that favour vigorous early crop growth to suppress weed germination and development, especially in sorghum.

## Early and effective weed control

Rob Crothers, Australian grain corn and sorghum product manager with DuPont Pioneer, says that early effective weed control is essential to preserve yield in both sorghum and corn crops.

"Grass weeds cost yield in sorghum and corn, particularly early in the season if weeds have not been well controlled in the fallow," he says. "With in-crop grass weed control options limited to the pre-emergent herbicide, metolachlor (herbicide Group K3) in sorghum, there is a place for herbicide tolerant summer crop hybrids."

## Imi-tolerant sorghum

"DuPont Pioneer is developing sorghum hybrids with Group B tolerance to expand the herbicide options in-crop," says Rob. "If we are successful in bringing this new technology to the market place it will enable growers to spray grass weeds with a post-emergent herbicide in crop for the first time. This will add to our suite of imidazolinone tolerant hybrids in canola and corn, all of which tolerate over-the-top spraying with certain 'imi' herbicides."

These new hybrids are not expected to be fully commercial for a couple of years although field trials are planned for late 2016 for growers to inspect. For now, planning to use a variety

of herbicide and non-herbicide tactics across the whole crop sequence is the only way to preserve herbicide effectiveness.

In preparation for the coming summer cropping season, now is the time to get on top of grass weeds after harvesting a winter crop or as a final task in the fallow.

## Weed control tactics

Atrazine and glyphosate can provide adequate weed control in no-till and minimum-till fallows, which also conserve more soil moisture and improve the chances of planting crops at the optimum time. Grass weed resistance to glyphosate is becoming a major problem in no-till cropping programs and as a consequence many farmers are using strategic tillage to manage resistant weed populations.

The decision to use atrazine rules out many crops other than sorghum and maize for 18 months due to crop sensitivity to the residual herbicide, and so must be considered when planning the whole cropping sequence.

Coming out of a winter crop, desiccation provides an aid to harvest in pulses, canola and cereals and is an opportunity to control weeds present at harvest. Taking stock of the weed spectrum and density in spring can assist with summer cropping decisions. If grass weeds are present in significant numbers there may be a case for avoiding sorghum and choosing another summer crop that offers more weed control options.

"If sorghum is chosen as the best option, growers have had varying success with inter-row cultivation or shielded spraying between the rows," says Rob. "The other important tactic available in current sorghum crops is to desiccate with glyphosate pre-harvest to assist with the harvest operation, reduce subsoil moisture losses through the sorghum plants post-harvest and prevent seed set in some weeds."

There are currently more herbicide options (both pre and post emergent) and a wider variety of hybrids, including 'imi' tolerant genetics, for corn. Depending on the weed spectrum and pressure, corn may be a useful crop to assist in summer weed management.

For more information about managing herbicide resistance visit the Weedsmart website: [www.weedsmart.org.au](http://www.weedsmart.org.au)



Rob Crothers says that early effective weed control is essential to preserve yield in both sorghum and corn crops.



Atrazine and glyphosate can provide adequate weed control in no-till and minimum-till fallows, which also conserve more soil moisture and improve the chances of planting crops at the optimum time.



# Senior agronomist to support cropping production in the north

**P**ULSE Australia and the Australian Herbicide Resistance Initiative (AHRI) are pleased to announce the appointment of Paul McIntosh to the position of industry development manager for the northern grains region for Pulse Australia and northern extension agronomist, Weeds for AHRI.

Paul is a highly experienced commercial agronomist who has been working in and around the pulse and grains industry in Queensland through a long and varied career.

Paul is well-known to many in the industry as a highly experienced agronomist and an expert in northern farming systems. He will be the first point of contact for enquiries related to pulse production and herbicide resistance issues in the northern grain production region covering Queensland and northern NSW.

Pulse Australia and AHRI have partnered to engage Paul in an innovative arrangement that will generate considerable leverage for the Grains Research and Development Corporation (GRDC) funds invested.

Paul's appointment is fully funded by grower levies through the GRDC. In this arrangement he will act part-time for Pulse Australia as an industry development manager and part-time as AHRI's northern extension agronomist.

GRDC's ongoing support for the pulse industry and the northern grains industry is fundamental to the sustainable development of farming systems in the region.

Considerable synergies are expected as Paul works to promote

pulses along with crop and weed management to manage herbicide resistance in the region.

For more information, please contact: Paul McIntosh, Phone: 0429 566 198, Email: paul@pulseaus.com.au



**Paul McIntosh has been appointed to the position of industry development manager for the northern grains region for Pulse Australia and northern extension agronomist, Weeds for AHRI.**



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# Champion water use efficiency

■ By Cindy Benjamin

**W**HEN it comes to crop water efficiency, it's hard to go past mungbeans. Being a fast growing crop, a fully irrigated mungbean crop requires just 3.5 to 4.5 ML per hectare. This is less than grain sorghum (5 ML/ha), sunflower (4.5–7.5 ML/ha), soybean (6.0–8.0 ML/ha) and maize (8–9 ML/ha).

Rob Ayre, general manager at Associated Grain says that coupling the water use efficiency with low fertiliser costs and solid returns, mungbean is well worth consideration when allocating irrigation blocks this summer.

"In the past, mungbeans have often been planted as an opportunity crop to take advantage of rain that comes too late for planting sorghum or cotton," he says. "This season there are good reasons for growers to allocate some area to mungbean, regardless of when the rain comes."

## Financially rewarding

"Being ready to plant at the right time and having everything in place ready to grow the best possible crop is likely to be very financially rewarding."

The average yield potential for a well-managed irrigated mungbean crop in the northern region is around 2.0 tonnes per hectare. For best results, aim to establish 30–40 plants per square metre and ensure the paddock is well drained. Waterlogging reduces the ability of the rhizobia in the root nodules to fix nitrogen, resulting in induced nitrogen deficiency.

"Overhead spray irrigation is optimal as it allows more frequent irrigations," says Rob. "Applying around 50 mm of water per week during flowering and pod fill will produce the highest yields and good quality grain. In flood irrigated paddocks, planting on hills or raised beds has advantages over flat planting.

"Depending on rainfall, a pre-wetting irrigation may be required to establish a high biomass crop. The first in-crop irrigation is required about seven days before flowering begins, usually 30–40 days after planting. The second irrigation should coincide with early pod development. Avoid irrigating too late as this can cause another flush of flowers, resulting in split maturity, delayed harvest and potential downgrading of quality."

Rob says that a mungbean crop can mineralise as much nitrogen as an 18-month fallow but with much higher returns.

"Pulse and cereals go so well together, particularly mungbean and barley," he says. "A rotation that works very well is mungbean sown into barley stubble followed with a September-plant grain sorghum crop and back to barley."

"Mungbean is a very high value crop with solid demand for export quality grain," says Rob. "The industry has come a long way in the past 10 years with excellent varieties and established agronomy and crop protection practices to ensure growers have the best chance to produce the high quality grain the international market has come to expect from Australia."

More information: [www.mungbean.org.au](http://www.mungbean.org.au)



Irrigated mungbean is the champion summer crop when it comes to water use efficiency. There are also the break crop advantages, low fertiliser costs and a strong market outlook. (PHOTO: Pulse Australia)



# Operating large mixed flow pumps at high efficiency levels

**A** COMPREHENSIVE testing program of conventional large mixed flow pumps typically used on irrigation farms has found that these pumps, if correctly tuned, can operate at high efficiency levels with reduced energy costs and lower carbon emissions.

The work was carried out by engineers from the University of Southern Queensland's National Centre for Engineering in Agriculture (NCEA) in Toowoomba in a project funded by the Commonwealth Department of Industry and Science and the Cotton Research and Development Corporation (CRDC).

NCEA water and irrigation specialist, Joseph Foley, said the aim was to test the large mixed flow pumps that dominated the irrigation industry to get a clear picture of how they were performing.

"Given our past work has shown that irrigation pumping is the largest energy consumption component on farm, we thought it wise to focus on the large 26-inch mixed flow pumps and to fathom how well this 50-year-old technology can operate," he said.

"We initially thought they would not perform well below their curve, but our test results clearly indicate they can perform quite well, similar to the large axial flow pumps but at a fraction of the capital cost."

Joseph said that in most of the situations they looked at, while the pumps had the potential to perform well they were typically being operated to the right of their curve at the low efficiency points in their range of capabilities.

## Correct tuning brings costs down

He said significant savings were possible when the pumps were tested, their current performance analysed, and adjustments made to the pump speed, operating head and pump flowrate.

"In each of these cases we have been able to make recommendations that will drastically reduce the energy consumption for the volume pumped," he said.

"In one instance we have been able to knock the energy consumption down by 46 per cent."

Joseph said one of the most critical components to analyse around any pumping station was the Total Dynamic Head (TDH) at which the pump discharged its water flowrate.

"The Total Dynamic Head (TDH) is a measure of the energy per unit weight added by the pump to the water to overcome the static lift, the friction headloss and minor headlosses," he said.

"The larger the TDH becomes, the higher the pumping costs per ML will be in any pump station."



Large mixed flow pump used to lift floodwater and tailwater into irrigation channel (left background) and large earthen storage (right background).

"The static lift component of the TDH can't be reduced at any one point in time, but the friction and minor loss components can be significantly reduced if the flowrate can be reduced, or if larger valves and fittings can be installed at the pump station.

"The minor headloss component of the TDH is something that can be reduced through an engineering re-design of the pump station pipework, so that it is no longer a major proportion of the pump's TDH."

In one of the tests on an electric 26-inch mixed flow pump, Joseph said it was found that the four metres of headloss could be reduced substantially by replacing the existing angled cut suction pipe entry and grate with a smooth bell-mouthed entry.

"This would reduce the TDH from seven metres to 5.5 metres, reducing pumping costs by 21 per cent to \$6.30 per ML, from the current \$8.04 per ML," he said.

Another recommendation to reduce pumping costs at that site was to bring into service an adjacent, unused tractor-PTO-driven 26-inch mixed flow pump, allowing two pumps to operate and pump speeds to be reduced substantially but maintain the delivery rate of 150 ML per day.

### Pumping costs almost halved

Joseph said by resetting each pump to deliver 80 ML per day, pump efficiency would improve from 75 to 88 per cent, plus the slower water velocities would reduce headloss from four metres to 1.3 metres.

"The same total flow rate is provided, but at a drastically reduced pumping cost of \$4.27 per ML, down from \$8.04 per ML," he said.

"This reduced the energy consumption from 29.5 kW.h per ML to 15.6 kW.h per ML, saving over \$11,000 in a 'typical'

season of pumping, and reduced emissions from 76.2 tonnes CO<sub>2</sub>-e (CO<sub>2</sub> equivalent) to 40.3 tonnes CO<sub>2</sub>-e per season."

In a separate test of a 20-inch diesel mixed flow pump, it was found the pump was operating more than 12 per cent below the manufacturer's benchmark, and reducing the flowrate accordingly.

Diesel energy savings of over \$1500 per season are expected with a new impeller in this pump, providing payback in three to four years, and reducing emissions by four tonnes of CO<sub>2</sub>-e each season.

### Lower pump speed

One of the key recommendations was to reconfigure the pump's drive to lower the speed, resulting in a 30 per cent reduction in pumping costs.

This could reduce the costs from \$8.40 to \$5.00 per ML and about \$10,000 in a typical season, but would mean reduction from 60 ML per day down to 23 ML per day.

With expected capital costs for a second pump installed being around \$40,000, payback on pumping costs at the required flowrate are around four years, and would reduce emissions by nearly 27 tonnes of CO<sub>2</sub>-e per year.

Funding from the Commonwealth Department of Industry and Science was made available under the Energy Efficiency Information Grants scheme to the Cotton Research and Development Corporation for engineers at the National Centre for Engineering in Agriculture to complete measurement and analysis on a number of large mixed pump stations on irrigated farms.

For more information: Visit [www.cottoninfo.com.au/energy-use-efficiency](http://www.cottoninfo.com.au/energy-use-efficiency)

Contact: Dr Joseph Foley, National Centre for Engineering in Agriculture, Ph: 07 46 311 559.

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## Long-running study assesses modern farming systems

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

ONE of Australia's longest running research and demonstration trials focused on key conservation agricultural principles, is delivering valuable information about how modern farming systems are coping with climatic variability.

The GRDC-funded Western Australian No-Tillage Farmers Association (WANTFA) long term no-till farming systems project and associated research is now in its ninth year and will continue until at least 2019.

It is investigating the agronomic and economic costs and benefits of using crop residue retention, diverse rotations, minimal soil disturbance and reduced compaction (controlled traffic farming) tactics over time.

The trial, based at the WA College of Agriculture Cunderdin, was initially set up to assess if maintaining high levels of crop residues could boost crop productivity, grain production and profits in no-till systems.

It has since evolved to allow researchers and growers to monitor the long-term impacts of an increasingly variable climate

and modern crop management practices – such as controlled traffic, windrow burning, tillage and fallowing – on the whole cropping system.

The three key partners are WANTFA, CSIRO and The University of Western Australia (UWA) which, along with the Department of Agriculture and Food WA (DAFWA) and the University of Western Sydney, are using the trial to measure and monitor soil nitrogen and carbon dynamics, soil biology, diseases, insects, weeds, soil water balance, crop yields and profitability.



GRDC western regional panel member Mike Ewing says trials supported by the GRDC highlight the importance of analysing cropping systems over a long cycle.

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## The main treatments

WANTFA project manager Neil Cordingley says the trial has five main treatments of:

- Maximum profit (tyne seeded, cereal-cereal-fallow/legume rotation, windrow burning and shallow tillage);
  - Maximum carbon input (disc sown, continuous cereal);
  - Maximum crop diversity (disc sown, cereal-legume-brassica rotation);
  - Continuous wheat (disc sown); and,
  - Permanent pasture,
- Each of these plots has been split into two:
- High residue (residue retained and spread behind the harvester); and,
  - Low residue (residue windrowed behind the harvester and burned).

Neil says this range of treatments is improving grower and industry knowledge about long-term rotation effects, tillage, windrow burning, crop residue management and decomposition, soil carbon and nitrogen, soil water and deep drainage.

He says given limited options for rotation diversity in WA's central grainbelt, the long-term trial had looked at the effects of including saia oats and oat/legume cover crops in the rotation every six years to build residue levels and provide yield benefits to following crops.

"But we found this tactic did not increase the productivity of subsequent cash crops and did not appear to be economic in most of the WA grainbelt," he says.

## More crop residue equals higher yield

CSIRO researcher Phil Ward says the WANTFA long-term trial has been showing that high stubble residues have limited impact on soil water loss during summer.

But he says high residues can reduce autumn and in-crop water loss and lead to potential yield increases of up to 0.2 tonnes per hectare.

School of Plant Biology and UWA Institute of Agriculture lecturer, Ken Flower, says soil carbon levels are slow to change

and, as found at the long-term trial site, appear to respond more to reduced biomass following dry seasons than to rotation or the different stubble retention strategies. But more years of research are required to confirm this.

Two student projects have value-added to the research site, including UWA's PhD research into carbon and nitrogen dynamics. The site is also contributing information to the GRDC National Frost Initiative about the effect of different crop residues on canopy temperature.

The Long term no-till farming project is showing minimal differences in the effect of high and low stubble residues on major insect pests. Continuous cereal plots are experiencing the biggest insect problems and incidences of root lesion nematodes (RLN), rhizoctonia and other root diseases.

## Benefits over the longer term

Ken says the long-term nature of the WANTFA trial is highly beneficial for WA grain growers to be able to see the effects of current crop management practices on yields and returns from whole systems over time.

He says for the first seven years of this trial there were no major differences in wheat yields between high and low stubble residue areas or crop rotations. But, since 2013, there has been a noticeable reduction in wheat yields and profits in the continuous wheat plots, with seasonal conditions having a big impact.

High residue levels appear to be advantageous for canola germination during dry starts to the season, but the trial indicates stubbles need to be carefully managed to achieve that benefit.

Neil Cordingley says the next steps for the trial are to more closely analyse the effects of including a fallow and some tillage in the rotation and to continue monitoring the long-term effects of high and low residue loads.

"We also want to better understand the interaction of the trial treatments with seasonal conditions and build our information on nitrogen mineralisation into APSIM models," he says.

"Based on the work of Phil Ward and other researchers, another key aim is for the trial to become a national resource for calibrating soil water modelling and remote sensing efforts." ■



**A wheat crop seeded into canola stubble at Cunderdin as part of the GRDC-funded WANTFA 'Long term no-till farming systems' project. The positive effects of various rotation and residue management strategies can often take up to seven years to show up. (PHOTO: Neil Cordingley, WANTFA)**





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# New biocontrol options for wheat root diseases

**C**SIRO researchers are using farmers' knowledge of crop performance on their properties to develop novel biocontrol products to protect wheat and canola from fungal root diseases. Dr Margaret Roper from CSIRO Agriculture approached farmers from across the wheatbelt of WA for help in sourcing a collection of soil bacteria that boost plant growth and provide protection from disease.

The farmers who took part in the survey pointed out areas of their properties that always seemed to produce good yields and low levels of disease. Margaret and her team collected wheat plants from these areas and isolated the bacteria that were living within their roots. After a decade of research they now have a collection of more than 50 different bacterial cultures including some that can boost plant growth and suppress disease.

Laboratory and glasshouse trials have identified several bacteria that are highly effective at combatting intractable diseases like fusarium crown rot of wheat, rhizoctonia bare patch, pythium root rot and take all.

The bacteria are ideally suited for use in developing biocontrol agents because they could be delivered as a seed coat and they take up residence in the plant roots so they do not need to compete with the general soil microbial community to survive. They also survive well in the soil because they form resilient spores that protect them from harsh conditions like drying and high temperatures.

Now that several bacteria that can inhibit the growth of fungal pathogens have been identified, the next stage of the project is field scale testing of the effectiveness of the biocontrol agents for suppressing fusarium crown rot in a wheat crop.

At the same time the potential of the bacteria to treat other fungal diseases like sclerotinia stem rot and blackleg in canola is being explored.

This research was co-funded by the Grains Research and Development Corporation and CSIRO.



The CSIRO team are investigating how effective various bacteria are at fighting fusarium crown rot and other root disease. Pictured is wheat (Wyalkatchem) showing the effectiveness of one of the bacterial biocontrol agents against fusarium crown rot. The seedling on the left is healthy. The seedling on the right is infected with fusarium crown rot. The seedling in the centre has been treated with the biocontrol bacteria as a seed coat before being infected with fusarium crown rot.



CSIRO Agriculture's Louise Thatcher, Cathryn O'Sullivan and Cindy Myers investigating bacteria activity in the glasshouse trials.



# Canola researchers aim to beat the heat

■ By GRDC western regional panel member, Darrin Lee

**A**USTRALIAN research has shown that canola is most vulnerable to heat damage at flowering and early pod fill stages, and that high temperatures can halve the yield potential of some varieties.

Unseasonably hot weather has reduced the yield potential of many canola crops in recent seasons, and some WA cropping areas this year experienced record temperatures exceeding 34°C in early September.

The Grains Research and Development Corporation (GRDC) is supporting a major canola heat tolerance research project at The University of Western Australia (UWA) which aims to identify heat tolerant genes and breeding material for canola breeders.

It is also establishing protocols that breeders can use to screen breeding lines.

This research is part of the National Brassica Germplasm Improvement Program which aims to provide canola breeders with advanced genetic lines so Australian growers have access to cultivars that allow them to compete effectively on world markets.

## Canola's most heat sensitive stage

Researchers, led by UWA's Institute of Agriculture and School of Plant Biology researcher Sheng Chen, have confirmed that



The UWA Institute of Agriculture and School of Plant Biology researcher Sheng Chen inspects the flowering and podding status of early-sown canola plants in trials at UWA.



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the most heat-sensitive stage for canola is seven days before and after the plant produces its first open flower.

According to Sheng, a range of canola varieties at this stage of development suffered average yield reductions of 20 per cent when subjected to temperatures of 35°C in a controlled environment.

The most heat susceptible varieties suffered yield losses of up to 50 per cent when exposed to these temperatures in field trials.

### Adjust sowing dates

Sheng says the information could be used by growers to help them adjust sowing times and select varieties to minimise the risk of yield losses.

By checking historic temperature records and variety information, growers can adjust sowing dates so that a canola variety is less likely to start flowering during higher temperatures.

Most canola crops are unlikely to start flowering when temperatures are as high as 35°C. But late sown crops may be at risk of being exposed to damaging temperatures of above 30°C.

Sheng says it is also worth noting that hot weather has occurred earlier in the season in many WA cropping areas in recent years.

The new information will also be useful to canola breeders as they will only need to assess breeding lines for heat tolerance during the two-week period around the onset of flowering.

Another achievement by Sheng and his team following two years of field trials and glasshouse studies is the selection of canola lines with potential heat tolerance.

These lines – sourced from around the world – will undergo further evaluation under controlled conditions at UWA and can be used as parental lines for heat tolerance improvement in canola breeding programs.

# A new faba bean suits Middle Eastern markets

■ By Cindy Benjamin

**F**ABA bean growers in South Australia, Victoria and southern NSW now have another variety to consider for planting in 2016. Pulse Breeding Australia has released PBA Zahra, a large seeded faba bean suited to the Middle Eastern markets, from the industry's breeding program.

Pulse Australia industry development manager – southern region, Mary Raynes says the new variety has achieved an average five per cent higher yield compared to similar, older varieties such as Fiesta VF, Farah and Nura.

"PBA Zahra is a possible direct replacement for PBA Rana, which was released in 2011, the only other large seeded faba bean variety adapted to the southern region," Mary says. "PBA Zahra has a uniform seed size and colour and also has superior grain quality to PBA Rana. In longer season environments particularly, PBA Zahra also delivers a significant long-term yield advantage over PBA Rana."

PBA Zahra is particularly responsive to high yielding situations where the yield advantage over PBA Rana can be over 10 per cent. In higher rainfall districts PBA Zahra has a distinct advantage due to its lower susceptibility to disease. It is resistant to the most prevalent strain of ascochyta blight (pathotype 1) found in the southern region. It is equivalent to PBA Rana and PBA Samira, and less susceptible than Farah and Fiesta VF, to chocolate spot and faba bean rust.

PBA Zahra produces large, light brown, plump grain, comparable in size to PBA Rana. The overall grain colour is uniform and bright and there is generally a low rate of darkening during storage.

PBA Zahra should be suitable to co-mingle with PBA Rana for a medium-large faba bean category for export to the major food markets in the Middle East.

Bred by Dr Jeff Paull of Adelaide University, PBA Zahra has an end point royalty of \$3.85 per tonne which applies upon delivery. Seed is available from the commercial partner, Seednet.

Download the variety management package (VMP) for PBA Zahra from the Pulse Australia website: [www.pulseaus.com.au](http://www.pulseaus.com.au)

For more information please contact Mary Raynes, on 0408 591 193 or by email [mary@pulseaus.com.au](mailto:mary@pulseaus.com.au) or visit [www.pulseaus.com.au](http://www.pulseaus.com.au)



GRDC western regional panel member, Darrin Lee.



Pulse researchers and agronomists Jason Brand, Jeff Paull, Rohan Kimber and Mary Raynes at the PBA Zahra launch.



# Getting smarter with data on pastures

**R**ESearchers at the Tasmanian Institute of Agriculture (TIA) are using sensors and autonomous technology to develop a system that not only tells you when to irrigate your pasture, but then goes ahead and does it for you.

Not only will the system automatically irrigate pasture, it will also apply variable volumes of water to the same paddock, which could save farmers time, water and money.

Research and Development Team Leader at the TIA Dairy Centre and Chief Investigator on the project, Dr James Hills, said the end goal is an autonomous machine interface that collects information about the pasture, water use, soil and climate and then uses crop modelling processes to make decisions about when and where to apply water.

## Better water use efficiency

The development of this autonomous system is part of a bigger three year project that is looking at the use of irrigation water in pastures by collecting data on water use, energy use and pasture production from five sites across Tasmania.

The project is supported by funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural Research and Development for Profit program, Dairy Australia and TIA.

From the data collected at the five sites, the team will work with the farmers to make changes to improve water use efficiency and will continue monitoring the sites to measure the success of these changes.

James says gathering this benchmarking data is an essential step to getting the most out of the new irrigation schemes.

"Significant investment in irrigation infrastructure in Tasmania from both federal and state government provides the opportunity to increase our agricultural productivity, but we need to make sure we are doing it properly and in a way that is going to be sustainable," James said.

"To introduce management strategies that increase efficiency

we really need that baseline data. We need to know the facts and figures for water use to know how you can improve on that use."

The five trial sites have been selected to give enough variability across different topography and soils that are likely to be irrigated.

David McLaren, Project Officer at the TIA Dairy Centre, will be on the ground installing the sensors and data logging equipment at the sites and will also oversee the data collected in the field.

## Visualise the data

"A big part of the project will be to visualise that data, so that when it comes to making management decisions we can very quickly know what to do through a visual display of data, and not have to interpret numbers," David said.

"The devices on site will have an interface that you can connect to from your smartphone or tablet so you can start to look at real-time values of pressure, temperature and energy without being physically on-site, which is a real advantage."

In its third year the project will trial an automation system at one of the sites to see how this type of system could be used to save farmers time and effort.

"We are very interested in how far we can go using a system with a machine interface as opposed to a human interface," James said.

To do this, the team has linked with The National Centre for Engineering in Agriculture at the University of Southern Queensland, who have developed a control platform called VARIWise.

The VARIWise system has been developed and tested in cotton, but this is the first time it will be applied to a pasture based system.

Installation of the sensor and logging equipment on the five sites was completed in October.

**TIA is a joint venture between the University of Tasmania and the Tasmanian Government.** ■



**Dr James Hills and David McLaren from the Tasmanian Institute of Agriculture.**

# Challenge to make energy efficient wheat

**W**ESTERN Australian researchers will contribute to a G20 nations' plan to strengthen future, global food security by making more energy efficient wheat.

According to The Food and Agriculture Organisation of the United Nations, global crop yields must double by 2050 to meet future food security needs.

To address this need, Agriculture Ministers of the G20 nations have established the International Wheat Yield Partnership (IWYP) – a unique, international funding initiative to co-ordinate worldwide wheat research efforts.

Professor Harvey Millar and Dr Nicolas Taylor, University of Western Australia researchers from the Australian Research Council Centre of Excellence in Plant Energy Biology and the UWA School of Chemistry and Biochemistry, form part of a team of Australian scientists that have been selected to address a key component of a global future food security solution by increasing the energy efficiency of wheat.

Globally, wheat is one of the most important staple crops, providing a fifth of daily calories. This project forms part of IWYP's plan to raise the genetic yield potential of wheat by up to 50 per cent.

## Novel approach

Through a novel approach that combines cutting-edge mass-spectrometry techniques with traditional breeding Harvey and Nicolas, along with colleagues from the Canberra and Adelaide nodes of the ARC Centre of Excellence in Plant Energy Biology, the ARC Centre of Excellence for Translational Photosynthesis and the International Maize and Wheat Improvement Centre (CIMMYT), in Mexico, will exploit the energy systems of wheat plants to dramatically improve their yield.

The approach will identify new opportunities for wheat improvement through selective breeding for energy use efficiency.

"Our preliminary data demonstrates that there is untapped genetic variation in the energy use efficiency of wheat," said Harvey. "This means we can fine-tune and optimise growth, which will have a positive impact on wheat yield."

The three year project will see wheat improvement through energy use efficiency tackled at the cell, tissue and whole plant level. One million dollars has been awarded for research activity to be conducted at UWA.

"This project will combine quantitative protein and metabolite measurements with growth studies and the high throughput analysis of photosynthesis and respiration in order to screen elite wheat germplasm," said Nicolas.

"Importantly, it also takes real world, field grown samples and analyses them using innovative techniques at the forefront of plant sciences to identify the best traits in different Australian and international wheat varieties."

More than 85 per cent of the energy captured by plants is used in cell activities, some of which are futile, meaning that only a very small amount of plant energy is realised as yield. Improving the ways in which energy is used and distributed within wheat plants has the potential to significantly increase yield. ■

# Soils project part of new research

**T**HE Grains Research and Development Corporation (GRDC) will embark on a five-year research project to help grain growers achieve higher yields and profits from problematic 'forest gravel' soils.

It is just one of a number of new projects announced in the GRDC External Investment Plan 2016–17, available at [www.grdc.com.au/Investment-Plan](http://www.grdc.com.au/Investment-Plan).

"While the forest gravels project is specific to WA, a number of projects outlined in the plan are broader investments but highly relevant to western cropping systems," GRDC western regional panel chairman Peter Roberts said.

Forest gravel soils are the dominant soil type in WA's high rainfall cropping area, accounting for about three million hectares of farming land.

"In recent years, there has been a shift away from pastures to cropping on these soil types, but despite the relatively high rainfall, yields and profits are often poor due to soil constraints and other issues," Peter said.

"Gravel contained in the soil can negatively affect soil water holding capacity, acidity, organic matter dynamics, root growth, nutrient supply, fertiliser responses and the activity of soil-applied herbicides.

"The top layer is often sandy with limited ability to supply nutrients – there is a high tendency for these soils to become water repellent and phosphorus deficiency is a common problem.

"Starting in July, 2016, the new GRDC project aims to provide growers, advisers and researchers with information about how the properties of forest gravel soils affect crop production and help growers use cost-effective practices to overcome constraints associated with these soils."

## Other issues for research

Peter said that in addition to forest gravels, other issues addressed in the GRDC External Investment Plan 2016–17 included heat tolerance research; locally important weeds; slugs and snails; legume options for low and medium rainfall zones; education resources; biosecurity preparedness; karnal bunt; and soil water and nutrient measurement.

Peter said the plan was developed as a result of industry consultation, taking into consideration currently funded investments and identified priorities.

"Growers and other grain industry representatives comprise the GRDC regional panels which regularly consults with growers and receives input on investment priorities at a local level from the GRDC's Regional Cropping Solutions Networks (RCSNs)."

Peter said that in addition to longer-term investments such as those contained in the GRDC External Investment Plan 2016–17, the GRDC also invested in many 'fast-tracked' one to three-year projects driven by the GRDC RCSNs. ■



**GRDC western regional panel chairman Peter Roberts.**



# USDA report keeps grain markets on edge



www.profarmer.com.au November 11, 2015

## LATEST WASDE AT A GLANCE...

- While wheat was unchanged, markets remain volatile.
- The USDA WASDE report saw values move lower across the board on the back of an increase in US stocks.
- Globally the report was not as bearish, but the market was heavily influenced by the US data.

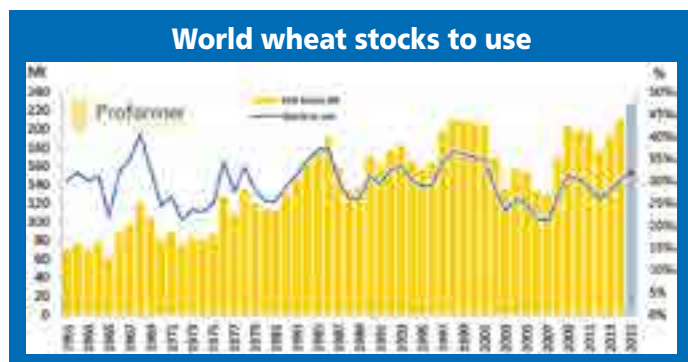
**T**HE USDA released their latest World Agriculture Supply & Demand Estimates (WASDE) report on November 10. Values responded lower across the board due largely to an increase in US stocks.

### Wheat

US wheat exports were revised lower as US wheat struggles to remain competitive in the global market at current prices. The USDA actually revised global ending stocks lower but much of this was attributed to a 1 million tonne increase in Chinese consumption. Due to the opaque nature of the Chinese market, changes in Chinese stocks tend to be taken with a grain of salt. The USDA reduced the Aussie crop size by 1 mt to 26 mt, which still remains almost two mt above many Australian analysts forecasts.

While global ending wheat stocks were reduced marginally, the report reaffirmed what was already well known – there remains an ample supply of wheat globally which is encouraging global competition.

As the world wheat stocks to use chart illustrates below, there is a notable increase in world ending stocks and stocks to use this season compared to last season. This continues to weigh on values.



### Corn

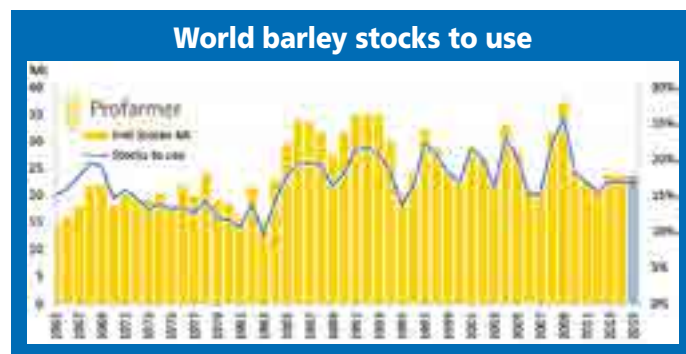
US corn experienced a similar increase in US ending stocks which weighed on values. A combination of an increase to US corn production estimates and reductions to US export estimates saw US ending stocks increased a whopping 5 mt.

The increase in stocks wasn't limited to the US with global stocks increasing as well. The USDA lifted world corn beginning stocks 12 mt higher month on month due to historical revisions to Chinese and Brazilian stocks. While a shift this big to

beginning stocks is hard to comprehend, it does reinforce the message that there is an abundance of grain available.

### Barley

Barley stocks to use remains fairly similar year on year. An expected reduction in Chinese appetite for feed barley this season appears to be outweighing similar production estimates.



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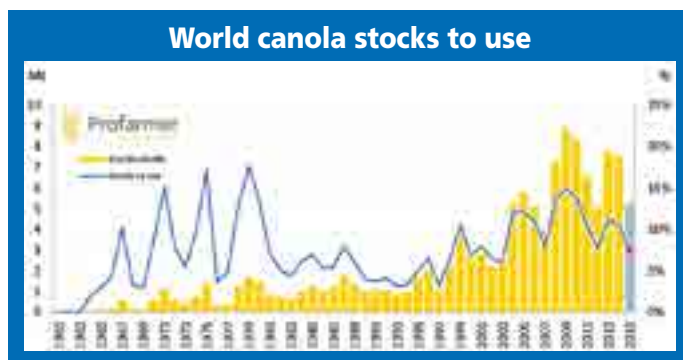
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## Canola

The November USDA WASDE report saw an increase to canola beginning stocks and production but this was partially offset by an increase in consumption. All in all there were very few major surprises to strongly influence the market one way or another.

Importantly there is a notable reduction in production year on year, while beginning stocks and consumption have shown very little change. It is this reduction in canola production that has provided strong support to offshore values in both Canada and Europe as well as locally here in Australia.

As the chart opposite illustrates, canola stocks to use is considerably less than last season which has provided support. ■



## THE BROOKFIELD-QUBE BATTLE FOR ASCIANO RAIL AND PORT ASSETS – NOT JUST A WA ISSUE

Growers are probably focused on harvest and not paying too much attention to the front pages of the financial papers, where a major takeover battle is under way for rail and port assets. The outcome is expected to have major long term implications for grain supply chain costs.

While the current focus is on WA – where Brookfield currently owns the below rail operations – the long term impact will be felt across Australia. This is because what is at stake is a principle which the ACCC will need to rule on. That is, what is the impact on competition for supply chain freight services if the below rail and above rail assets are owned and operated by the one, vertically integrated, party? (Below rail = provision of track, maintenance, infrastructure; Above rail = provision and operation of the rolling stock (locomotives and wagons etc).

### Who are the players?

The target is Asciano which owns port terminal services (Patrick's) and above rail services (Pacific National). There are two bidders for Asciano (so far): Brookfield (US-Canada based) which owns the below rail infrastructure in SW Western Australia which covers the WA grain belt; and Qube (ASX listed company) which owns and operates a diverse port services, logistics and bulk materials business.

If Brookfield wins control of Asciano, it would own both below and above rail operations covering WA grain supply chain to port, as well as the Patrick's port services. This level of vertical integration is what is concerning CBH on behalf of WA grain growers and why they are calling in ACCC for a ruling.

The ACCC is not due to decide till mid December 2015, but

have already indicated some flashing lights of concern.

If Qube wins control of Asciano, its primary target is to keep the Patrick's' ports operations, but sell off the Pacific National rail operations to their bid partners (Global Infrastructure Partners and a Canadian Pension Fund), thereby lessening the vertical integration argument which confronts the Brookfield bid.

But from a graingrower perspective, it's not quite that simple! Qube is also a 50 per cent partner in the (under-construction) Quattro Grains port terminal in Port Kembla, due for opening in March–April 2015. Qube runs trains, trucks, container terminals, stevedoring, storage services across many commodities, so through its Quattro investment, it will gain an intimate knowledge of grain logistics (if they don't have it already).

Their ability to package a range of services into an "integrated" logistics solution for grains will be very strong. This battle may all play out before this harvest is over, but the long term implications for grain supply chain costs will be felt for decades to come.

### And a wild card?

Could another bidder for Asciano emerge? There is nothing to stop that and don't forget there are major Asian entities with interests in wider northern Australian infrastructure. As well, the 50 per cent JV partner in Quattro with Qube is Noble, owned by Chinese food and agribusiness giant, COFCO, which is looking to expand its global supply chain footprint. This battle may have a few rounds yet.

(Note: The above comments are based on what has been reported publicly October and November.).



# Taking stock of the global market

■ By Stephanie Bryant-Erdmann, US Wheat Associates market analyst

**W**ITH the 2015–16 harvest wrapped up in the northern hemisphere, it is a good time to take stock of the global situation and look ahead to 2016–17. In its November World Agriculture Supply and Demand Estimate (WASDE), USDA projected the 2015–16 global wheat crop will reach a record 733 million tonnes (mt) – up 1 per cent from the previous record of 725 mt set last year. An increase in total output for half of the major exporters is expected and for the other half, a decrease.

## United States

USDA estimates the 2015–16 US wheat production increased 700,000 tonnes from last year to 55.8 mt, but fell 3 per cent below the five-year average of 57.8 mt. The slight increase in production resulted from an increase in harvested area to 19.1 million hectares this year – up 2 per cent from 2014–15 and 1 per cent above the five-year average.

This increase offset lower planted area and average yields similar to those seen last year.

As of September 30, USDA estimates total planted area for the crop harvested in 2015 was 22.1 million hectares, down 4 per cent from the prior year and 1 per cent below the five-year average.

USDA predicts 2015–16 US wheat yields to average 2.93 tonnes per hectare – similar to 2014–15 yields – but 4 per cent below the five-year average.

## Black Sea region

Despite a dry autumn, the Black Sea region – responsible for roughly 14 per cent of total global production – produced its third consecutive bumper crop in 2015–16 thanks to timely spring rains and favourable weather conditions throughout most of the growing season.

The Russian Agricultural Ministry estimates Russian production reached 63.8 mt, the largest in six years and up 4 per cent from last year despite dry conditions in several key wheat-growing regions. Russian exports slowed this summer due to the implementation of a wheat export tax that was reduced on October 1.

In Ukraine, spring rains improved yields, but reduced overall quality of the crop. According to the Ukrainian Agriculture Ministry, Ukrainian wheat production was similar to last year's crop – reaching 24 mt – but only 40 per cent will be of milling quality, down from 54 per cent in 2014–15.

The Kazakhstan Agriculture Ministry estimates wheat production reached 14.7 mt, up from 12.9 mt last year.

## European Union

According to analyst group Strategie Grains, the EU produced 150 mt of wheat in 2015–16, down 3 per cent from last year, but still accounting for 21 per cent of global wheat production. This year's EU grain has few of the quality issues that plagued the 2014–15 crop, with an estimated 72 per cent of the grain expected to be of milling quality, up from 60 per cent last year and up from the three-year average of 68 per cent.

France, the EU's top wheat producer, produced 40.2 mt of wheat – up from 37.5 mt last year.

## Canada

Agriculture and Agri-Food Canada has reported a 10 per cent



decrease in Canadian wheat production to an estimated 28.8 mt due to a decrease in planted area and droughts in Saskatchewan and Alberta. If realized, production would be slightly ahead of the five-year average of 28.5 mt and account for 4 per cent of global wheat production.

Canadian wheat supply decreased 17 per cent year-over-year due to the lower production and lower beginning stocks.

While 2015–16 Canadian durum quality improved this year, Canadian wheat export market share will decrease to an estimated 12 per cent, due to the decrease in supply.

## Southern hemisphere harvest

While the southern hemisphere accounts for only 7 per cent of global wheat production – the hemisphere's two major exporters, Australia and Argentina – are responsible for 19 per cent of global wheat exports.

## Australia

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) has decreased their estimate of Australian wheat production in 2015–16 to 24.0 mt.

## Argentina

Argentine wheat production will drop to an estimated 9.5 mt in 2015–16, 19 per cent lower than last year's 11.8 mt, according to the Buenos Aires Grain Exchange.

According to the International Grains Council (IGC), wheat planted area in Argentina fell 28 per cent year-over-year due to higher input costs, limited credit availability and unattractive prices.

## Crop planting progress in the northern hemisphere

Winter wheat planting is underway in the northern hemisphere, and the markets are closely watching the weather in the world's largest production areas. In early November, the USDA estimated 49 per cent of the US crop was in good or excellent condition, compared to 59 per cent last year, while 39 per cent is fair and 12 per cent is in poor or very poor condition.

Parts of Ukraine's wheat producing region was experiencing the driest autumn in 50 years, according to a November 2 Reuters report. The drought may negatively affect the country's wheat production, which accounted for 4 per cent of global wheat production in 2015–16.

The Agriculture Ministry of Ukraine estimates Ukrainian farmers will plant 6.2 million hectares of winter wheat for 2016–17 – down 700,000 hectares from last year.

The IGC reports Russian farmers are expected to plant winter wheat on 256 million hectares in 2016–17, up 1 per cent from 2015–16 levels due to increases in domestic prices. ■

## Breaking Bad risks in 2016

■ By Jay Horton, Strategis Partners



Jay Horton.

### AT A GLANCE...

Now is the time for growers to prepare for the inevitable surprises of the 2016 season, using a multi-pronged approach to taming risk.

Find the right balance between risk prevention and mitigation, and risk transfer measures:

- Consider taking out crop insurance.
- Build an adaptive season plan.

**S**USTAINABLE performance of the farm business depends on your ability to respond flexibly to unfolding events and trends in the season ahead. Flexibility does not come for free, but it is inherently valuable.

Farm risk management is not just about limiting the downside. Look for the upside. Invest in quality crop inputs in the face of good seasonal conditions, and take advantage of higher prices early in the season by selling more grain forward.

### Consider taking out crop insurance

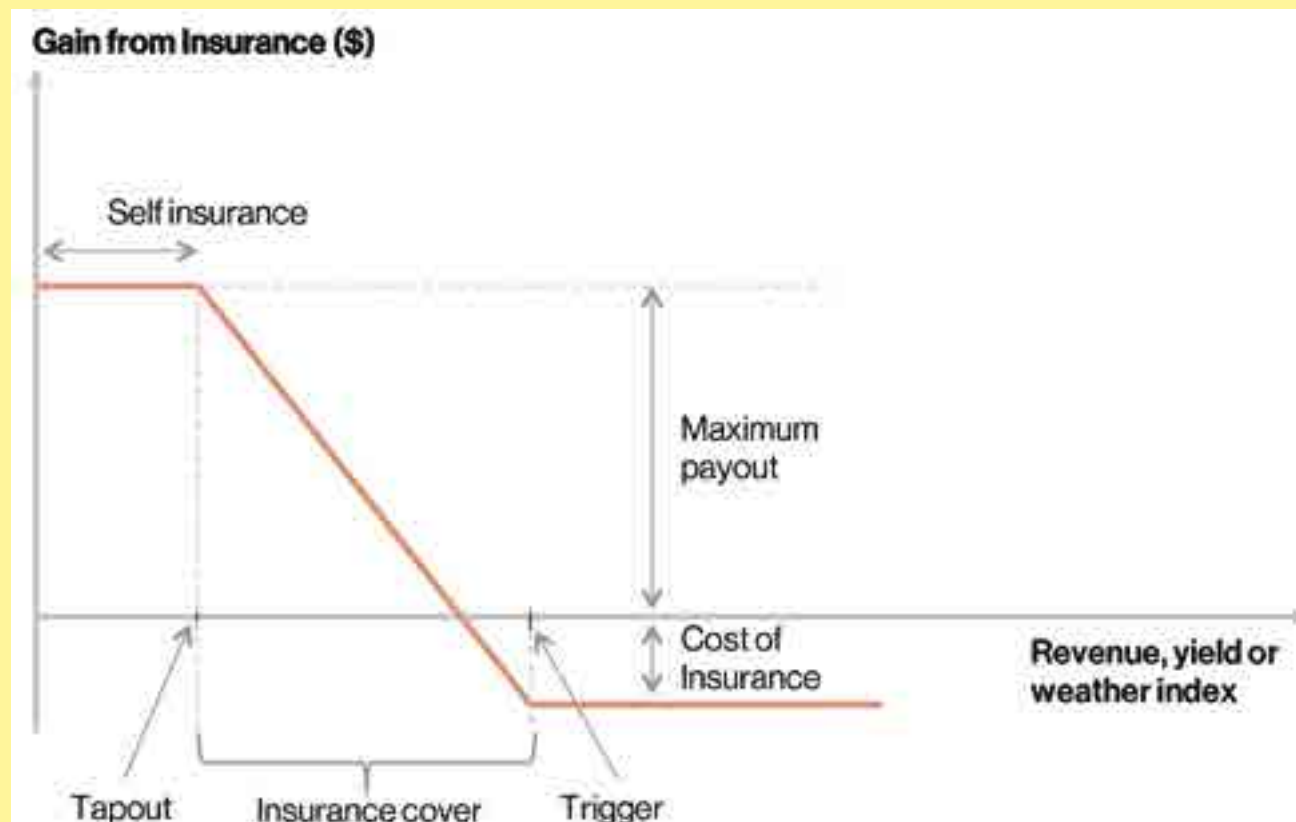
Talk to your insurance agent about the new insurance products and how they might work for you; for example Multi-Peril Crop Insurance (MPCI) and Index Insurance.

MPCI provides the most comprehensive protection against loss in the face of multiple perils, insuring a farmer against yield or revenue risk. Perils covered include water stress, flood, hail, wind, frost, lightning, excessive rain, temperature stress, cyclone, tornado, wildlife, accidental fire, bushfire, and insect or pest manifestation or plant disease. Revenue-based MPCI is fast becoming the preferred form of MPCI worldwide.

Index products – or weather certificates – use local weather parameters such as rainfall (high or low), frost or temperature (high or low) data, which are recorded at one of the hundreds of stations across Australia operated by the Bureau of Meteorology (BOM).

One advantage of weather certificates is that insurance claims do not need to be assessed. Once the event occurs there is an automatic payout based on the data received from BOM.

**FIGURE 1: Insurance payoff with Multi-Peril Crop Insurance or index insurance**







**Multi-Peril Crop Insurance can protect against loss from a range of perils including drought, fire, frost, hail, temperature stress and even insect and disease outbreaks.**

### Who should take up crop insurance?

If you are carrying relatively high levels of borrowing, if you are planning to invest in land or lease more land, or if you get stressed over the prospect of a poor harvest, you should consider crop insurance. It can provide a level of income support when you need it most.

### How do these insurance contracts work?

Figure 1 shows the range of potential payoffs from an insurance contract, whether it is multi-peril crop insurance or a weather certificate.

The horizontal axis corresponds to your nominated risk variable – farm revenue for revenue-based MPCl, crop yield for yield-based MPCl – or a weather variable such as growing season rainfall in the case of a weather certificate.

The vertical axis measures the net gain from insuring the crop (that is, the insurance payout less the premium paid).

The orange line traces out the insurance payoff as a function of the season's risk outcome.

Growers pay for the cost of the insurance contract, and receive a payment if the key variable falls below the 'trigger' value. The higher the trigger set for the contract the higher the coverage provided and the more expensive the premium. A farmer can elect a lower trigger to lower the premium or elect a much higher trigger that will give greater protection.

Growers can also elect to self-insure – that is, if the risk variable falls below the 'tapout' value there is no further insurance payout.

The number of grain growers across Australia taking out these types of insurance more than doubled in 2015. Similar growth can be expected in 2016 as more growers learn about the value proposition of agricultural insurance.

Growers can take advantage of assistance from the Australian and NSW Governments to select the best insurance product for their needs. Kicking off in early 2016, the Australian Government is providing \$29.9 million for farm insurance advice and assessment grants under a four-year program. The Government is partnering with State and Territory governments to enable 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.

### Build an adaptive season plan

Sam Davies, agronomist with Landmark at Minlaton SA, recommends that growers "develop the season plan with flexibility baked in". Sam explains that growers should be ready to change the season plan in response to changing conditions, using levers such as: Accelerate or defer sowing, buy-in services, and switch inputs or field scripts.

Adaptive planning works as follows:

- Build a base plan for the key decisions and activities for the season ahead. Identify those decisions, which do most to achieve a great harvest – not just the cheapest input program. For example, these choices include field selection, seed selection, and pest and weed management. The plan will also include the schedule covering the start and finish of sowing, and for spraying and harvesting.
- Consider what might lead to changes in the base plan, for example early or late rainfall.
- Next, incorporate into the plan, some contingency options that enable you to respond when the base plan is disrupted by unexpected changes. Such options include the use of early- or late-season wheat varieties at sowing time.

In conclusion, take heed of the Roman Stoic philosopher, Seneca who says: "He who fears nothing is a king. Delivered from fear, man is king of creation; he can dare to venture; the ocean itself obeys him, and he entrusts his fortune to it."

**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)



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# Camelina holds promise for biofuel and bees

■ By Jan Suszkiw, Agricultural Research Service – USDA

## AT A GLANCE...

- In the US, intercropping camelina and soybean can mean dual profit.
- The strategy addresses food versus fuel concerns.
- Oilseed flowers offer early-spring food for pollinators.
- Oilseed cover crops help reduce soil erosion and offer other benefits.

**O**NCE considered a weed, camelina (*Camelina sativa*) is finding favour in some parts of the US as a soil-protecting winter cover crop. The oilseed has also been researched and grown in Australia (see box story next page).

Oil from the seed of this yellow-flowered, herbaceous member of the mustard family can also be made into first-rate cooking oil and high-quality biodiesel, offering a renewable alternative to using imported petroleum for that fuel.

Over the past decade or so, Agricultural Research Service scientists at several locations across the country have conducted multi-faceted studies aimed at making novel oilseed crops like camelina more profitable for farmers to grow, easier for industry to process, and better performing as finished biofuels or other products.

At ARS's Soil Management Research Unit in Morris, Minnesota, a chief focus has been evaluating and integrating the use of camelina, canola, pennycress, and other oilseeds into the production systems of traditional midwestern crops, notably corn and soybeans. This past spring, the scientists published some of their research findings, which include potential gains for farmers and improved health for insect pollinators, like bees.

In one study, published in the April issue of *Agronomy Journal*, ARS plant physiologist Russ Gesch and ARS soil scientist Jane Johnson examined the seasonal water use of double cropping

and relay cropping, which is a strategy that overlaps the growth of winter camelina and soybean. Among their findings:

- Under natural rainfall conditions, relay cropping (in which the soybean crop is seeded between rows of growing camelina plants) used less water than double-cropping (whereby soybean seed is sown right after a camelina harvest, around mid to late June).
- Relay cropping camelina-soybean also used only slightly more water than a full-season soybean-only control treatment.
- Relay-cropped camelina resulted in higher soybean yields than sequential double cropping.
- Relay-cropped soybean yields ranged from 58 per cent to 83 per cent of yields for the full-season soybean; but the camelina seed yields more than compensated for any loss in soybean yield. Furthermore, the total oil yield for the relay system (camelina oil plus soy oil) was 50 per cent greater than a full-season soybean crop.
- Net economic returns of relay cropping were found to be competitive with those of full-season soybean, while adding the benefits of a cover crop.
- Before it is harvested for its oil, camelina cover crops may offer a way to 'mop up' excess soil moisture that goes unused before soybeans are planted, especially in rain-fed farming areas of the Midwest. In the absence of cover crops, excess moisture during fall and early spring often leads to leaching and runoff of nitrogen into ground and surface waters, where it becomes a pollutant, explains Russ.
- The study demonstrates a sustainable way to grow crops for both food and fuel on the same parcel of land, potentially offering farmers a dual source of income in a single season.

## Bees benefit as well

In a related study, published in the June 2015 issue of *Industrial Crops and Products*, postdoctoral researchers Carrie Eberle and Matt Thom, together with ARS agronomist Frank



A honey bee forages on a camelina flower. (PHOTO: James Eklund)



In Minnesota, ARS researchers monitor pollinators in a field of canola. (PHOTO: Russ Gesch)



Forcella and their collaborators, showed that the flowering periods of camelina, canola, and pennycress can provide honey bees and other insects with a critical, early-spring source of nectar and pollen that's usually unavailable then – especially in Minnesota, South Dakota, and North Dakota, where about one-third of the nation's managed bee colonies are kept from May through October.

"Fields of winter camelina and winter canola produce about 100 pounds per acre (112 kg per hectare) of nectar sugar over the course of a two to three week flowering season. That quantity produced in such a short time is enough to support the annual energy requirements of a typical bee hive, which is 100–200 pounds (45–90 kg) of sugar per year," notes Frank.

Other results of the 2012–14 study are as follows:

- Insect counts showed that the three oilseeds also attracted other pollinators, including wild bee species, butterflies, beetles, and hoverflies, whose larval stage feeds voraciously on aphids.
- Insects visited flowering canola up to 15 times more often than pennycress and camelina, perhaps because of higher nectar levels in each individual flower, which are much larger than those of camelina and pennycress.
- Canola failed to bloom during one of the study years, which is a reflection of its being less cold-hardy than the other two oilseeds.
- Camelina earned the highest marks overall, thanks to a combination of excellent cold tolerance, high seed yield, good ground cover, and high nectar production 89 pounds per acre (100 kg per hectare).

"Continued efforts to improve yield and crop characteristics will help establish these crops (especially camelina and

pennycress) as legitimate cash cover crops for the US Northern Corn Belt," Carrie and her coauthors write in their journal paper. "And as the demand to produce biofuels continues to increase, we may also expect to see an increase in their seed values," benefiting farmers and bees alike.

"Camelina Holds Promise for Biofuel and Bees" was published in the November 2015 issue of *AgResearch Magazine*.

## CAMELINA IN AUSTRALIA

Australian research trials – and very limited commercial production in WA and southeastern Australia – indicate that camelina grows best on the sandier soil types of WA and some regions of western Victoria through to the SA border. In very tough conditions camelina tends to hold on better than canola but without a long history of varietal improvement, camelina yields in the more average seasons, are usually much less.

Jon Slee, from WA-based Aus-Oils, suggests that a premium of around \$300 per tonne over the prevailing canola price is needed to make camelina gross margins stack up for growers.

But Jon points out that camelina's hardiness and applications to the food, cosmetic and health industries, can make it an attractive 'niche' product for farmers and consumers.

The gluten-free seed meal can be marketed as a healthy food ingredient to health conscious consumers. The oil has a pleasant nutty flavour and it has a high alpha linolenic acid (an Omega-3 fatty acid) content complemented and stabilised by natural antioxidants, such as vitamin E.

Aus-Oils processes WA camelina into cold-pressed oil and meal.

More information: Jon Slee at Aus-Oils on 08 9833 6267 or 0439 002 222.

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**CROPLANDS**

# Wheat leaf rust pathotype found for the first time in WA

**A**N eastern Australian wheat leaf rust (*Puccinia triticina*) pathotype has been identified in Western Australia this season, which may cause the rust resistance ratings of several wheat varieties to change.

Varieties that may become more susceptible to leaf rust include Mace, which is the most popular wheat variety in WA.

Wheat leaf rust can significantly reduce wheat yields on susceptible varieties, given appropriate environmental conditions.

Growers are advised to make careful variety selections and to be aware of the resistance ranking of their chosen varieties for 2016.

The wheat leaf rust pathotype new to WA was submitted to the Grains Research and Development Corporation (GRDC)-supported Australian Cereal Rust Control Program (ACRCP) at the University of Sydney, where it was identified by Professor Robert Park.

He said the pathotype 104-1,3,4,6,7,8,10,12 +Lr37 was identified in samples of leaf rusted wheat collected from four separate locations in the northern region of the WA grainbelt in late September.

"This pathotype was first detected in South Australia in August 2014, and has since spread throughout much of the eastern Australian grainbelt, and now to WA," Robert said.

## Two incursions in two years

"This is only the third example of a wheat rust isolate migrating from eastern Australia to WA in the past 25 years, all being wheat leaf rust, but it is concerning that two of these incursions have occurred in the past two years."

Robert said the pathotype's impact on wheat varieties grown in WA would be better understood at the end of this year, after the completion of field testing.

"In the meantime, the cultivars Arrino, Binnu, Emu Rock,

Envoy, Estoc, Grenade CL Plus, Mace, Tammarin Rock, and Zippy should be monitored closely for leaf rust," he said.

"If rust is detected in these varieties, growers are encouraged to send samples of leaf rust to the University of Sydney Plant Breeding Institute for pathotype analysis."

Rusted plant samples can be mailed in paper envelopes (not plastic wrapping or plastic-lined packages) to the University of Sydney, Australian Cereal Rust Survey, Reply Paid 88076, Narellan, NSW, 2567.

Department of Agriculture and Food (DAFWA) plant pathologist Geoff Thomas said the incursion of the pathotype was concerning, particularly following the 2013 identification of the separate 76-1,3,5,7,9,10,12 +Lr37 pathotype, which had resulted in resistance ratings of varieties including Mace being reclassified.

"Changes in variety classifications highlight the impact of rust incursions and demonstrate the importance of continued vigilance to stop the introduction of pathotypes, and monitoring for early identification of incursions," he said.

"While it is not known how the wheat leaf rust pathotypes entered WA from the eastern states, people should take precautions when travelling between farms, because rust can be introduced to new locations via clothing and footwear.

"To minimise the risk of crop damage from rust next season, WA growers need to think carefully about the varieties they plan to retain or source for crop seed.

"Controlling the "green bridge" and monitoring summer-autumn regrowth is imperative to limit carryover of rust into the 2016 growing season."

**Information on developing a rust management strategy can be found on the Rust Bust website [www.rustbust.com.au](http://www.rustbust.com.au), which includes a 'Rust Bust Management Checklist'.**

**The ACRCP is one of the GRDC's core investments to monitor, assess and develop a rust management strategy for Australian growers.**



Wheat leaf rust can significantly reduce wheat yields on susceptible varieties.





## ASK AN EXPERT – HOW MUCH MOISTURE AND NITROGEN IS WASTED ON WEEDS OVER SUMMER?

■ With Colin McMaster, Research and Development Agronomist, NSW DPI

**I**n winter-dominant rainfall areas, less attention tends to be given to the value of the rain that falls over summer and the contribution that the fallow period makes to nitrogen mineralisation and nitrogen removal via the weed. Likewise, little attention is given to controlling weeds growing over summer, provided they were 'cleaned-up' prior to planting crops in autumn.

Colin McMaster, NSW DPI and a group of other researchers have recently shared data from trials conducted in 2011–12 that shed some light on exactly how much soil moisture and nitrogen is wasted if weeds are allowed to grow over summer.

"We reckon that controlling summer weeds is like 'buying a spring'," says Colin. "Our trials in central NSW showed that summer rainfall and fallow nitrogen contribute up to 50 per cent of the following winter crop's yield potential, and reduce the probability of moisture stress during the spring."

"In the two trial years an extra 86 mm (2011) and 50 mm (2012) of rainfall was stored in the profile when weeds were controlled compared to the control sites," he says. "An additional 69 kg N per hectare (2011) and 45 kg N per hectare (2012) was also available for the following crop."

In summary, for every millimetre of moisture that was lost through summer fallow weed growth, mineral nitrogen levels reduced by 0.56 kg N per hectare. The economic benefit of every dollar per hectare spent on herbicides to control those weeds was \$8 per hectare."

The results of this trial in central NSW support the findings of other trial work conducted in Victoria and South Australia.

### How much extra grain was produced when weeds were controlled over summer?

**Short answer:** An extra 1 tonne per hectare of canola, and between 0.5 and 1.7 tonnes per hectare for wheat.

**Longer answer:** As a result of excellent summer weed control the canola was planted into a profile with an additional 85 mm



**Crops grown after a weed-free fallow (background) benefit enormously from the additional stored soil moisture and nitrogen that would otherwise be wasted on growing summer weeds.**

of plant available water (PAW) and 69 kg N per hectare, giving the crop the best possible start. More soil moisture promotes more rapid mineralisation of nitrogen so the two go hand in hand. For every extra mm of stored soil moisture, an additional 0.6 kg N is mineralised. Water and nitrogen increase grain yield through grain number (more tillers and more grains per head) and grain size. Controlling weeds is even more beneficial than maintaining stubble.

### Does the presence of weeds have an impact on other nutrients such as P, K and S?

**Short answer:** Not as much as on nitrogen.

**Longer answer:** Summer weeds do not appear to extract large amounts of P, K or S to a depth of 90 cm.

### Is there a difference in the returns on applied nitrogen when weeds are controlled over summer?

**Short answer:** Yes, there is a considerable financial benefit.

**Longer answer:** When weeds are not controlled in summer, side-dressing winter crops returns \$1 for each \$1 spent on fertiliser application. Where weeds are controlled over summer, each \$1 spent on side-dressing returned \$3 in grain value. The benefits of summer weed control on profitability and resource efficiency have been confirmed. ■



**Colin McMaster, NSW DPI says that controlling summer weeds is like 'buying a spring'. A trial in central NSW showed that summer rainfall and fallow nitrogen contribute up to 50 per cent of the following winter crop's yield potential, and reduce the probability of moisture stress or severity during the spring.**

## 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/aska-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.

# Farming in Foreign Fields...

## Keeping tabs on four combines by remote control

**"W**E had a new combine operator last year who was unfamiliar with changing crop settings," Canadian farmer Ian Perkins recalls. "He pulled into a new field thinking he had made all the changes, but I logged onto the AFS Connect and saw that his rotor was running 300 rpm too slow. And coming off triticale going into barley, that can make a huge difference in threshing quality."

Being able to make an observation like that, remotely, without having to go to the field or stop the machine, is the reason that Ian installed the new Case IH AFS Connect 2.0 system in his four Axial-Flow 8230 combines.

Ian is one of several family members operating Perkins Farms in Wainwright, Alberta. Their 13,000 acres (5260 hectares) of wheat, barley, canola, triticale and fava beans primarily supports their farrow-to-finish pig operation.

Long-time pig producers, the family now ships some 50,000 pigs annually. Feeding their own farm-grown ration is part of the farm's adherence to internationally recognised quality assurance programs. Since 2009, the Perkins family's pig production is antibiotic-free.

"Doing antibiotic-free on a large scale can be difficult, but we've been successful at it, and there's high demand for the

**Canadian farmer Ian Perkins.**

product," Ian says. He credits their relatively isolated location as one factor in their favour for sustaining herd health.

While grain production is an important part of their operation, Ian notes it's just one of many jobs their employees do. "They're good combine operators, but that's not their primary task. Things can get forgotten from year to year," Ian says. "Now, instead of having a lot of questions back and forth over the radio, I can look and see exactly what each machine is doing."

### Tapping into the equipment's diagnostic system

AFS Connect 2.0 is a telematics solution that taps into the equipment's diagnostic system and relays the status of operating parameters, via cellular signal, to a tablet, laptop or desktop computer. Machine information is presented in an easy-to-view dashboard display.

For Ian, this is exactly what he wanted for keeping tabs on his four combines. He uses an iPad tablet because it's easily portable, and he can check in from anywhere he has a cellular signal. His combines might work up to 25 miles away from the farm, although Ian says he's usually nearby, often running a grain truck.



"That's why I chose the iPad," he says. "I can take it with me in the truck; it's handier."

When harvest began, Ian says he did initial checks on all machines to make sure settings were correct. "I can see where the sieves are set, the rotor speed, the fan speed, everything," he says.

Once they're up and running, he logged on to each machine three times a day, simply to confirm everything's working correctly. He says engine load is one indicator he always checks to make sure the combines are running at capacity.

Whenever an alarm is triggered in a combine, Ian receives it as well. The alarm is stored in the system until he deletes it. These can include routine notifications such as full grain tanks as well as alarms signaling possible problems.

"I review the alarms from each machine at the end of every day to see if there are any consistent issues," he says.

The service alert and diagnostic capabilities of AFS Connect 2.0 are valuable.

### Problem solving

Ian cites an instance where a leaking DEF line set off multiple codes. He contacted his Case IH dealer whose technicians were able to log onto the combine through AFS Connect 2.0, analyse the codes, and come out to the field with the correct parts needed for the repair.

"We're not exactly close to our dealer, so it's good that they can come out with the right parts," he says. "That saves time and money for both of us."

The AFS Connect 2.0 system lets Ian determine who can have access to information in the system, and the amount of detail available to them. For example, he might allow his Case IH dealer to view data about machine operation, and allow an agronomist to access his site-specific yield information. But the bottom line is

that AFS Connect 2.0 system recognises that all data is owned by him, and resides exclusively under his direction and control.

Ian says the system was fairly simple to install and learn. His Case IH dealer helped with the installation, which took about an hour per machine including installing the modem and the antenna. Navigating the dashboard display from his iPad or desktop computer, he says, is pretty easy.

He adds that logging onto the system is quick with a good cellular signal, but can be slower if he or the machines are in an area where the signal is weaker. A cellular data plan is included with each AFS Connect 2.0 system.

The system uploads fresh operating information every minute. Should a cellular signal be lost during operation, the information is held in queue for download when the signal is restored.

Along with providing machine performance data, AFS Connect 2.0 also allows two-way messaging to the operator's Pro 700 display.

### More productive

After a season's use in four combines, Ian says the AFS Connect 2.0 system is helping him be more productive.

"Before, during harvest, I'd see a bad sample come in and wonder, 'why is that?' Now I can log on and see that the sieves are in the wrong spot, or the rotor's not running fast enough, or they're driving too fast. I can see exactly how the machine is set and talk with the operator over the radio to tell him what to do differently. A lot of times, it's just small stuff, but the small stuff adds up."

"I don't like to stop a combine," he adds. "Now I can figure out what's wrong and have the operator make a few adjustments, without running out to the field and stopping the machine. It's saving us time and money. This is a good tool to have."

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# Japanese corn diet unlocks potential of winning Wagyu herd

## AT A GLANCE...

### AACo profile

- 21 properties over seven million hectares across Queensland and the Northern Territory, equating to about one per cent of Australia's land mass.
- This year will turn off about 51,000 head of Wagyu and Wagyu-cross cattle into the Wagyu brands.
- 40,000 head of Wagyu cattle on feed in company-owned and external feedlots.
- AACo is the world's largest Wagyu beef producer.
- 15,000 hectares of dryland cropping and 2605 hectares of irrigation.
- Established in 1824, it is the oldest continuously operating company in Australia.
- Herd numbers have reached over 500,000.

### Wylarah, Surat

- 560 hectares of irrigated cropping and 5000 hectares of dryland cropping.
- Capacity of 10,000 head with 8000 during the spring.
- Aim for corn silage yields of 40 tonnes per hectare each season.
- Wylarah will produce 3200 fullblood Wagyu this year, climbing to 4000 in 2016.

**W**HEN it comes to feeding highly prized cattle, the world's biggest Wagyu producer, Australian Agricultural Company (AACo), takes a leaf out of Japan's book.

Since adding Wagyu to its business in 1996, the company has followed the traditional Japanese method of finishing Wagyu on a corn inclusion diet for up to 500 days, citing better marbling and overall consistency.

Most of the herd, which also includes Angus and Brahman, is grass-fed due to sheer numbers – it can reach over 500,000 head at times.

AACo's husbandry and feed regime is clearly working, winning gold at this year's Sydney Royal Fine Food Awards with a cut of grain-fed strip loin from its Master Kobe Wagyu brand.

Master Kobe also won gold at the Royal Melbourne Fine Food Awards in July, and in May the brand won grand champion at the World Wagyu Conference.

Master Kobe is sourced from cattle bred on AACo's Wylarah and Glentana Stations.

Chris Hardie, manager of Wylarah farm at Surat in southern Queensland, said they will produce 3200 fullblood Wagyu this year, climbing to 4000 next year. There are 8000 cattle on-farm currently.

"Our focus is to continue the full blood breeding of the Westholme Wagyu herd to produce bulls for the existing AACo commercial herds, and to raise feeder steers to 300 kg for the Master Kobe brand using Japanese methods for feed and growth," he said.

Chris said while the property's primary focus was breeding

and feeding, it crops 5000 hectares of dryland country and 560 hectares of flood irrigated country to produce feed for internal use.

"We grow all our own crops here so that we are not relying purely on pastures, which can be affected by weather.

"Our primary feed basis here is corn silage due to the energy and starch it provides, but the ration is typically a blend of corn silage, hay, steam flake grains (barley, wheat, sorghum) and protein pellets.

He said the Japanese feeding method ensured the highest quality and consistency.

"A ration of corn and other feed commodities is attractive due to the control and consistency it provides. It improves marbling and conditioning and the company relies on us to produce a large number of bulls consistently and we can't afford any hiccups. We can't afford to falter on genetic gain."

Last summer they planted 340 hectares of corn, and with average yields of 43 tonnes per hectare, it provided the property with over 14,000 tonnes of silage.

"Every time we put a corn crop in we aim for 40 tonnes per hectare, so that was a good result given the warm conditions we get around here."

The 2014–15 sowing consisted primarily of dual-purpose variety PAC 727, while this year they are trying PAC 624, along with another variety, to compare hybrids.

"This season we have 120 hectares planted and will work towards 4000 to 5000 tonnes of silage."

Chris said when selecting a crop, they are primarily looking for "yield for water, followed by standability and a variety that fits the 115-117 CRM window."

He said another reason why the Japanese-style corn silage diet works well is water use efficiency.

"Corn works so well in this area because we get a large volume of feed off a small area and it provides a great drought mitigation tool."

All of the corn is irrigated, as the Balonne River flows through the property and water can be harvested, and silage pits have been built to maintain continuity of feed supply throughout the year and in dry times.

At 30,300 hectares, Wylarah is one of AACo's 21 breeding, feeding, finishing or backgrounding properties which span a total of seven million hectares across Queensland and the Northern Territory.

With the herd numbers and knowledge behind it, the company hopes to continue to produce high quality meat to be marketed around the globe.



**AACo Wylarah manager Chris Hardie in a crop of PAC 727 corn, which was cut for silage.**



# Soil compaction and tyre inflation

■ By Julian Taylor, Taylor Engineering

## AT A GLANCE

- The best 'cure' for soil compaction is preventing it from happening in the first place;
- After the damage is done, compaction remediation treatments do not provide 100 per cent soil recovery;
- Any tyre, be it from a tractor, a combine, a truck, a fertiliser spreader, a chaser bin or any other wheeled machine traversing your field, has the potential to cause compaction.
- Be aware of the direct relationship between tyre pressure and soil compaction and adjust pressure accordingly; and,
- An in-cabin tyre pressure management system is a recommended first step in minimising soil compaction.

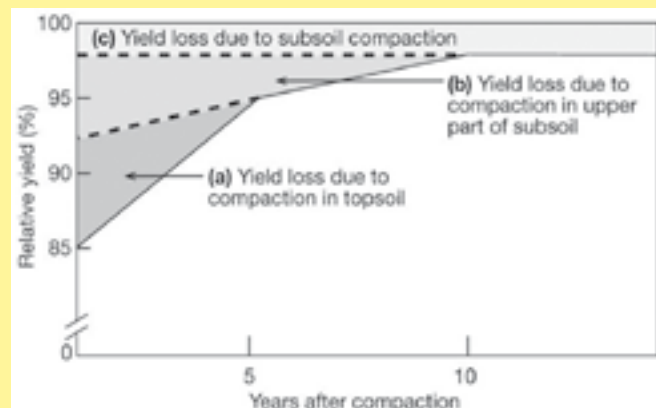
**S**OIL compaction from machinery or livestock is a major problem facing modern agriculture. Compaction decreases soil physical fertility through decreasing storage and supply of water and nutrients, leading to additional fertiliser requirements and increased production costs.

A detrimental sequence then occurs of reduced plant growth leading to lower inputs of fresh organic matter to the soil, reduced nutrient recycling and mineralisation, reduced activities of micro-organisms, and increased wear and tear on cultivation machinery.

Soil bulk density is the most frequently used parameter to characterise the state of soil compaction. Soil strength is also used as a measure of compaction as it reflects soil resistance to root penetration. A way of avoiding or preventing soil compaction is by reducing pressure on soil either by decreasing axle load and/or increasing the contact area of the wheels with the soil.

Results from a 2004 international soil compaction project, carried out by researchers at Penn State College of Agricultural Sciences in the US, showed that compaction due to axle loads of 10–12 tonnes reduced crop yields approximately 15 per cent in the first year, decreasing to three to five per cent 10 years after compaction.

**FIGURE 1: Effects of compaction in the topsoil (a) and upper part of the subsoil (b) are temporary, whereas deep subsoil compaction (c) is virtually permanent**



Two-thirds of the yield loss in the first year was due to compaction in the topsoil and upper part of the subsoil. The effects of topsoil and upper subsoil compaction disappeared in approximately five and 10 years, respectively (Figure 1).

The remaining yield loss was due to deep subsoil compaction, which did not disappear during the period in which measurements were taken (12 years for the longest experiments).

Lower subsoil compaction is, practically speaking, permanent and should therefore be avoided by all means, whereas topsoil compaction and upper subsoil compaction are temporary and should be limited as much as possible.

Two other important observations from these studies are:

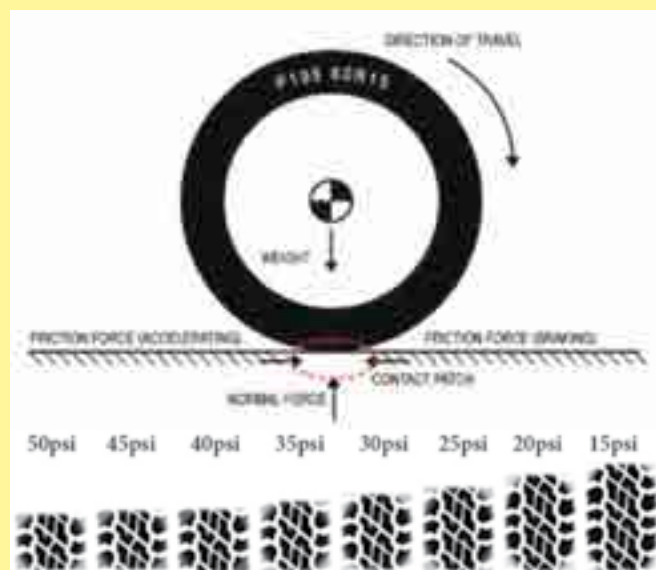
- Surface tillage did not completely alleviate surface compaction; and,
- Deep penetration of frost did not alleviate lower subsoil compaction.

In extensive Australian studies, soil compaction is estimated to be responsible for the degradation of about 30 per cent of the cropping soils in Australia (Hamza and Anderson, 2005; Tullberg, 2010; Rainbow and Derpsch, 2011). This runs into the millions of dollars each year.

## Definition of the 'footprint'

Traction is directly related to the amount of rubber that grips the terrain or the road – this is typically called the footprint, or contact patch. Increasing the tyre pressure (under constant load conditions) reduces the contact area thus reducing potential traction (Figure 2).

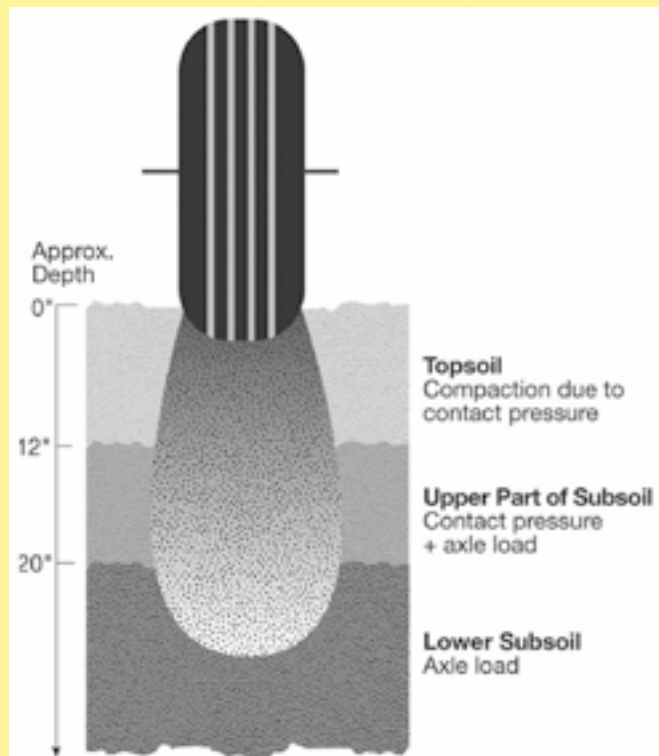
**FIGURE 2: Tyre footprint with changes in tyre pressure**



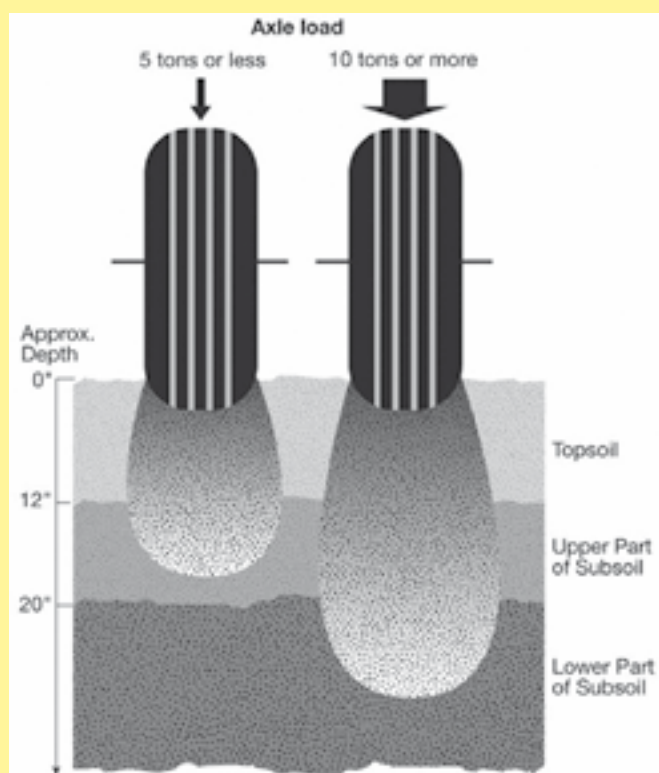
## What we now know

Our knowledge of soil compaction has increased substantially in the past two decades, especially after results of an international project of more than 20 soil compaction experiments in North America and Europe were published.

**FIGURE 3: Topsoil compaction is caused by contact pressure, whereas lower subsoil compaction is caused by axle load**



**FIGURE 4: Low axle load causes compaction in the topsoil and upper part of subsoil only, whereas high axle load causes compaction in the lower subsoil as well**



Based on this work researchers have discovered that:

- Compaction in the topsoil is related to ground contact pressure only;
- Compaction in the upper part of the subsoil is related to both ground contact pressure and axle load; and,
- Compaction in the lower subsoil is related to axle load only (Figure 3).

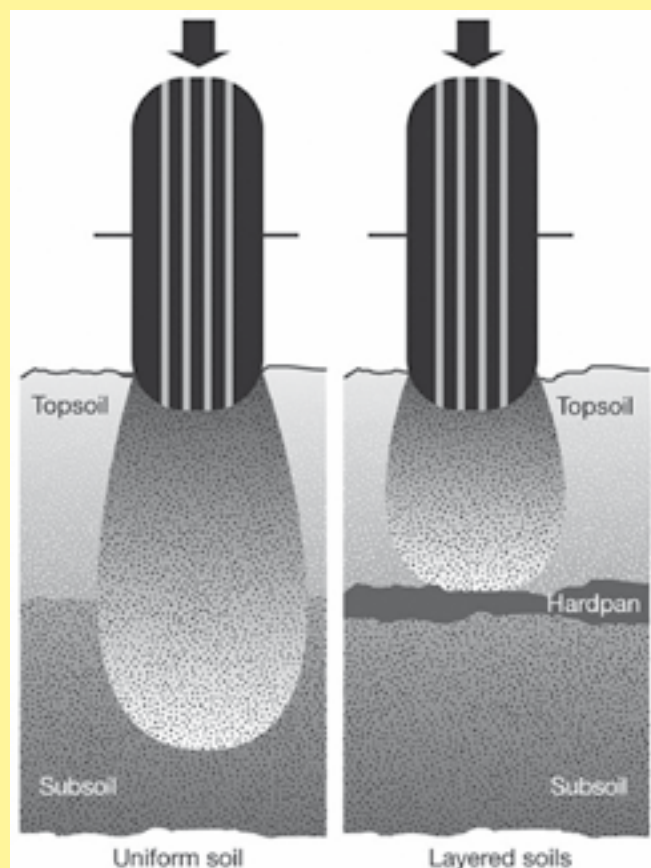
### Keys to soil compaction avoidance

#### (A) AXLE LOAD

Axle load is the first factor that has to be considered in soil compaction. Axle load is the total load supported by one axle and farm equipment with high axle loads will cause compaction in the topsoil and subsoil. The key to eliminating deep subsoil compaction is to keep axle load low (Figure 4).

The amount of top- and subsoil compaction caused also depends on the presence of a natural or traffic-induced pan close to the surface (Figure 5). In a uniform soil, stress will be transmitted from the surface deep down into the soil profile. In a soil with a pan or dense subsoil, soil stress tends to concentrate near the surface.

**FIGURE 5: In a uniform soil, compaction is transmitted deep, whereas in a soil with a hardpan, compaction is concentrated above the hardpan**



#### (B) CONTACT PRESSURE

Contact pressure is the pressure that is exerted by a tyre or track on the soil surface. Reducing contact pressures will cause less topsoil compaction.

#### (C) NUMBER OF PASSES AND TRAVEL SPEED

Research in tilled soils has shown that approximately 75 per cent of the increase in soil density and 90 per cent of wheel



sinkage is caused during the first pass. But the compaction caused by subsequent passes may cause as much damage to a crop because the small changes to soil density are now in the high range, which is more likely to be detrimental to root growth.

It has also been shown that the longer the dwelling time of a load on soil, the greater the increase in density.

So we need to:

- Limit the percentage of the field trafficked;
- Concentrate repeated traffic in travel lanes so remedial action can be taken there; and,
- Drive faster to shorten the load dwelling time.

#### (D) SOIL MOISTURE CONTENT

Monitoring soil moisture content is extremely critical to avoid soil compaction. Most compaction studies are performed at moisture contents near field capacity (approximately 24 hours after soaking rain) to simulate worst-case scenarios. If farmers can stay off their fields when soils are too wet, soil compaction is not likely to become a problem. Dry soil can sustain high axle loads and high contact pressures without adverse effects.

But the problem is that factors such as optimum planting or harvest time often dictate that a farmer will be in the field at suboptimum soil moisture conditions for traffic.

Driving on wet soil causes rutting, slipping, and increased deep soil compaction. Dry soil cannot be compressed to as great a density as moist soil. But at moisture contents above the 'plastic limit' soil compaction decreases because all pores are filled with water that cannot be compressed. Driving on agricultural soil that is wetter than the plastic limit has many problems. Rutting and slipping have devastating effects on soil structure that will be difficult to remedy.

Trafficking very wet soil (especially with high loads and tyre pressures) causes a 'hydraulic ram' effect. The topsoil is compressed very quickly to saturation. Because water cannot be compressed, surface stresses are now directly transferred to the subsoil. Therefore, driving on very wet soil is very likely to cause subsoil compaction.

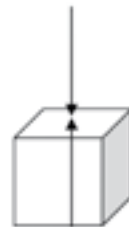
#### A simple lesson in physics

To examine soil compaction it is constructive to review the forces acting on a truck and how these forces are displaced to the road surface. Newton's third law states that, "for every action there is an equal and opposite reaction." Keeping Newton's law in mind, we need to imagine the surface of the road (or the surface of your cropping field) as a series of little cubes sitting next to each other.

In any type of propulsion there is a conversion of energy. For example, in an internal combustion engine stored energy (petrol) is released through a chemical reaction. The release of energy is

equal to the work done by the motor. The result is the driving force supplied by the motor (Figure 6).

The impact loading of the vehicle (weight divided by the number of tyres) is supported by the road surface (the cubes). This is shown as the reaction force and is distributed evenly over several of the cubes. Consider one cube – there is an equal and opposite force acting – an action/reaction scenario.



Now the soil particle (one of the cubes) has a finite capacity with which to balance this weight. This is usually described in terms of bearing stress and is measured in N/m<sup>2</sup> (Pascals).

At the tyre contact point the weight (Force) is divided by the tyre footprint (Area) to determine the bearing stress.

$$\sigma(\text{bearing}) = \frac{\text{Force}}{\text{Area}}$$

If this figure is greater than the capacity of the soil, failure occurs and the soil is compacted, that is, the soil has collapsed.

The cohesive bonds between soil particles and the accompanying rotting plant material are broken and the soil collapses onto itself eliminating the air voids between the particles.

This is the cause of the compaction problem faced by farmers when vehicles drive across fields.

The problem is visually seen as rutting. The collapsing soil pushes out the air and gives no opportunity for atmospheric nitrogen penetration. It suffocates the nitrogen fixing bacteria and forms impenetrable barriers to plant roots, worms and water. The later either dams or increases surface (and erosion) runoff.



**Rutting – visual evidence of the collapse of soil.**

As the weight penetrates deeper into the surface the area over which it acts increases in size.



**FIGURE 6: Forces acting on a vehicle**



Eventually the bearing stress generated by the weight is balanced by the bearing stress capacity of the soil. The soil will continue to compact until the point is reached and it is only at this depth that the soil compaction tapers to zero.

Now two things come into play in this analysis.

- Firstly the initial weight per unit area is smaller on the low inflation tyre since the footprint is larger. That is, the initial bearing is much less.
- Secondly, the larger the starting footprint the shallower the depth where the bearing stress generated by the weight of the vehicle is balanced by the bearing capacity of the soil. This is because the bearing area spreads out under each condition at the same rate, but the lower pressure tyre has a starting area 'advantage'.

But there is one further benefit obtained by using low pressure tractor or truck tyres.

When an overinflated tyre creates a rut it pushes the soil outwards and away from the edge thus worsening the problem. On the other hand a soft tyre has 'give' in the middle of the tyre. That is, a lower pressure hollow is formed allowing soil to be pushed inwards therefore compensating for the passage of the tyre (Figure 7).

**FIGURE 7: (A) Soil pushed back inwards under low inflated tyre; (B) Soil pushed away by overinflated tyre**



## To sum up

Deep subsoil compaction is permanent and should be avoided at all costs.

Compaction in the topsoil can be avoided by:

- Reducing tyre pressure;
- Reducing the number of trips over the field;
- Reducing the total area per hectare actually travelled; and,



**An in-cabin tyre pressure management system is a recommended first step in minimising soil compaction.**

- Driving on soil that is wetter than the plastic limit should be avoided at all times.

Research material points to drivers adopting optimal tyre pressure as a solution to soil compaction. The right tyre pressure for the load/tyre and terrain conditions will result in the best solution to the prevention and minimisation of soil compaction.

The benefits of matching optimal tyre pressure in tyres based on load/tyre and cross-referenced against terrain conditions is often overlooked, particularly in the transport industry.

Traditionally heavy truck/tractor tyre pressures have been based on full load conditions and were based around the original full ply tyre. This was necessary to maintain side wall strength for control, but since the development of the stronger side wall radial tyre, loading became an equally important consideration.

The new technology is still to filter through to the industry resulting in poor work solutions.

To determine the optimal tyre pressure a driver refers to the manufacturers' recommended load/inflation tables. This recommended tyre pressure is cold pressure and allowance would need to be taken into account when the tyre is at hot pressure.

Note that the driver then needs to consider the terrain they will travel on.

This needs to be done for every change in load conditions and terrain conditions.

The procedure would be extremely time consuming and impractical unless the tyre inflation system is in-cabin and can be done 'on the run' thereby allowing the driver to continue their journey with minimal inconvenience.

Julian is a consulting engineer with AIR CTI and has a keen interest in environmental issues and research. AIR CTI is based in Moe, Victoria and the company has recently completed a 'white paper' on Central Tyre Inflation and is working on an Australian Standard/Best Practice for CTI systems. AIR CTI has also produced a CTI Recommended Practice booklet.

For more information contact AIR CTI and speak to Andrew or Chet on 03 5127 6128 or go to [www.aircti.com](http://www.aircti.com)

## WHAT IS AIR CENTRAL TYRE INFLATION?

AIR CTI is a system controlled from the cab which enables the operator to suit the vehicle's load to the terrain, and the driving conditions. This achieves better traction, better tyre life and a better ride, while having greater control over braking, steering and speed. This all adds up to improved safety, improved fuel economy, and improved job scheduling.

The system can be fitted in all types of vehicles – from 4WDs to tractors, combines, fertiliser spreaders and prime movers.

The ability to control tyre pressure will help maximise tyre and vehicle life. AIR CTI is extremely effective in all terrain conditions, including on and off road conditions, from sand, gravel and mud, to bitumen.

Just push the button on the dash to adjust the tyre pressure to suit your needs.

The pressure adjusts to the set pressure, and is maintained at that pressure.

If a puncture occurs, a visual and audible warning warns the driver, then automatically adds air to keep the tyres inflated up to the capacity of the truck compressor. This allows the driver to continue to operate until there is a convenient time to repair the tyre.

On start-up, the highest pressure is automatically selected but the controller box can be programed to allow fine tuning from a pre-set value.



# Landmark GM decision – Court finds no case for zero tolerance

■ By Australian Farm Institute

ON Tuesday 10 September, the WA Court of Appeals handed down its decision in the Marsh vs Baxter case, in which an organic farmer sued his genetically modified (GM) crop growing neighbour for allegedly contaminating the organic farm, which resulted in a loss of organic certification and therefore a substantial amount of income. By a two to one majority, the Appeals Court judges supported the decision of the original judge, and dismissed all the claims made by the organic farmer.

The temptation for the media to style this story as being about the little Aussie battler organic farmer versus the multinational-backed rapacious GM farmer was obviously too tempting, and this has been the flavour of most of the reporting of this case.

The opening sentence of an ABC media report gives a sense of this – ‘An organic farmer in Western Australia whose crop was contaminated with genetically modified (GM) canola from a neighbouring farm has lost his court appeal for compensation’ – is the opening line, and the story goes on to describe the ‘plight’ of the organic farmer in his quest for compensation.

## The facts of the case

The facts of the case, as described in intricate detail by the majority appeal court judges (and the original trial judge), do not correspond with this characterisation. In both the original judgement and the majority Court of Appeals judgement, a distinctly different picture of the situation emerges.

Put briefly, the judges found that Michael Baxter planted GM canola on his farm in accordance with all the guidelines, and the advice of his agronomist. He observed all the requirements with regard to buffer zones on his property, which in any case was separated from his neighbour’s property by a 20 metre road and a line of trees. To harvest the canola it was first windrowed and left to dry – a standard practice for canola crops.

Before it was harvested, some of the drying canola plants were allegedly blown onto his neighbour Steve Marsh’s property, who is a certified organic farmer. Marsh identified the plants, but according to the judges, rather than removing them, left them there for up to six months and meanwhile notified his organic certifier, NASAA, about the presence of the plants.

According to the reported judgements, NASAA subsequently visited the organic farm and decided to decertify it, which meant that Marsh lost his organic certification, and could no longer sell his produce as organic. This resulted in a financial loss which Steve Marsh then decided to seek to recover via a court case. But as the judges pointed out:

- Areas of the Marsh farm had already been decertified previously due to the use of chemicals;
- There was no canola being grown on the organic farm so there was no possible risk of genetic contamination; and,
- The decision by NASAA to decertify Marsh’s farm was not necessary based on the guidelines and rules under which it operated.

The picture that emerges from the published findings of the judges is one where, instead of the normal situation where the offending canola stalks would have been quickly collected up and



removed, or the neighbour asked to collect them and remove them, the situation was escalated all the way to the courts as a consequence of actions by the organic farmer, the overzealous and seemingly incorrect actions of his organic certifier NASAA (according to the judges), and ultimately a band of anti-GM campaigners who saw the case as an opportunity to inflict some damage on those supporting GM crops.

## A case of backfiring

The case has seemingly backfired on the anti-GM campaigners rather spectacularly.

- First, the judges have pointed out that merely having some GM crop plants present on a farm does not constitute ‘contamination’;
- That in any event, contamination implies harm or damage and there is no available evidence that GM crops have ever caused harm or damage; and,
- Finally, that as a consequence of losing the case, it is possible that all the costs of the case will have to be borne by Steve Marsh.

As noted in relation to the first court decision, it seems that the judges are hinting quite strongly that the party most to blame in this situation was the organic certifier NASAA, and the organic standard which sets a zero tolerance requirement, contrary to the more realistic and practical standards that apply everywhere else in the world.

All those anti-GM campaigners who so willingly jumped on the bandwagon now face the difficult moral decision about whether they are prepared to open their wallets and help pay for Steve Marsh’s likely costs.

There are claims that the case will now be appealed to the High Court, but it appears there is a real risk this would simply be inflicting more stress and uncertainty on the two protagonists and further fattening the pockets of lawyers.

The reality is that neighbouring farmers have dealt with these sorts of problems in a practical and cooperative manner for generations, and resorting to the courts every time a sheep strays or weeds appear, will never be a solution. ■

# Hard water is fine when the chemistry is right

**F**OR robust results from summer knockdown herbicides – namely glyphosate – farmers should choose the right chemistry for the water hardness.

That's the advice of Peter Jones, technical services manager with Australia's own Vicchem, a leading R&D based manufacturer which has developed a range of unique three-in-one spray adjuvants for summer knockdown weed control.

"Trials show Hot-up is ideal when using soft to moderate water such as town and most channel water – typically less than 300 ppm of hard water ions," said Peter.

"Being oil-based, Hot-up prevents droplet breakdown in the hot and dry conditions of Australian summers.

"For moderate to hard water from dams, open channels and bores – up to 750 ppm – we recommend the new spray adjuvant Outright 770, which delivers better adhesion and spread of glyphosate as well as water conditioning.

"For very hard bore water or channel water – harder than 750 ppm – glyphosate works best when tank mixed with Infiltrator and Assert," he said.

Director of Vicchem's adjuvant research program for more than 10 years, Peter said hard water often contained calcium or magnesium ions which could interact with glyphosate to form insoluble complexes, rendering it inactive.

"But hard water can be managed with Vicchem's summer adjuvant range because the ammonium sulphate in Hot-Up, Outright 770 and Assert prevents this interaction, instead forming glyphosate-ammonium which is readily dissolved and absorbed."

Peter said the main source of hard water ions came from limestone leaching which was common in Australian aquifers. Zinc and iron could also influence water hardness but were less common.

"Many commercial laboratories offer water testing services which can quantify the range of minerals in a water sample," he said.

"Simple DIY test kits are also available which can provide a useful guide to water hardness within a few seconds.

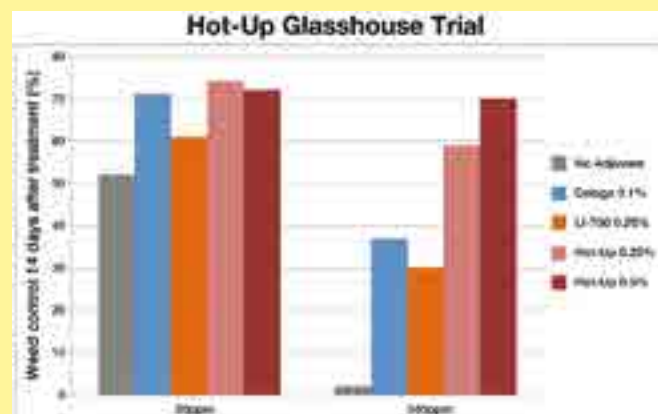
"Hard water can also affect the function of surfactants, leading to problems such as poor wetting, flocculation and nozzle blockage.

"But these problems are largely avoided if the right adjuvant chemistry is chosen for the level of water hardness," he said.

Peter said Vicchem had launched a campaign in rural Australia to promote its summer adjuvant range and the latest research on managing hard water.

For more details, contact Peter Jones or Owen Connelly at Vicchem's Coolaroo headquarters on (03) 9301 7000 or go to [www.vicchem.com.au](http://www.vicchem.com.au)

**FIGURE 1: RoundUp CT was applied at sub-lethal rate 70g a.i. and 145 L water/ha to oats at 1-1.5 leaf stage**



The data shows that Hot-Up boosts glyphosate in soft water and out-performs wetting agent and acidifier adjuvants in hard water.

**FIGURE 2: Applying RoundUp CT at 222g a.i. and 64 L water/ha to oats at 1.5-2 leaf stage was most cost-effective when mixed with Outright 770 at the correct rate for the water hardness**



Vicchem's technical services manager, Peter Jones (left) with business development manager, Owen Connelly.



## Western region



### WESTERN REGION SUMMARY

The Grain Industry Association of Western Australia (GIWA) November forecast for total grain production in Western Australia for the 2015–16 harvest, on the back of the dry spring, is reduced by almost 450,000 tonnes, or three per cent, from that forecast at the beginning of October.

Dry and warm spring weather has reduced the potential of the 2015 grain harvest in most zones of the Western Australian grainbelt. Very little rain has fallen since early September in the Kwinana and Albany zones, with the northern Geraldton zone failing to receive a substantial rain event since August 12.

Crops in the Esperance zone are the exception with high yields likely to produce very good quality grain. The final total harvest tonnage in Esperance is expected to be a record for the zone.

Early harvest reports in the Geraldton, Kwinana and Albany zones show a high level of screenings in wheat and barley, and low test weights in oats. Frost has also caused grain losses and quality defects. Protein levels in barley and wheat are not showing the expected higher protein normally associated with a dry spring. This is most probably due to lower nitrogen inputs applied to match the average growth due to the extended dry periods during winter. When higher yield potential became apparent in August, the time had passed for further nitrogen applications which could give an economic return.

Of all commodities, canola is looking to be the most resilient crop for this season. The very early sowing opportunity saw a large percentage of the canola crop sown before May. This enabled canola plants to be well advanced in maturity before the end of August and be able to produce good yields despite rapidly drying conditions.

Lupin crops are yielding at average to above average levels, with harvesting efficiency the limiting factor in the Geraldton zone where many crops are short.

The impact of frost in the Albany zone, and even as far north as the Yuna district in the Geraldton zone, is unknown. The additional impact of the October storms, resulting in widespread damage from hail, in the Kwinana East and east Albany zones is also yet to be established, and whilst devastating to affected crops, it is likely to be restricted to a loss of less than 200,000 tonnes of grain but with impacts on lower grain quality in affected areas..

**Grain Industry Association of Western Australia  
November 6, 2015**

### NORTH

Harvest is well underway in WA's northern grain region. Some growers in the east of the region are close to finishing while some coastal growers have only just got underway.

Late August and September were very dry across the region

# District Reports...

**November–December 2015**

with decile 1 or 2 rainfall in most areas. This saw many crops 'droughting' as they tried to fill grain.

As discussed in previous reports, the hot dry conditions have favoured crop growth on the higher water holding capacity soils. This has translated to yield. Across the landscape there are higher crop yields on loam soils while yields are less on the lighter sand soils.

Anything that improves plant root growth has contributed to a significantly increased grain yield. Long-term lime applications and deep tillage have given good yield responses this year.

### How the various crops have performed

Wheat crops are generally performing as expected. Frost has damaged crop yield and quality on some farms. The problem is widespread but generally isolated to frost prone parts of individual farms. It has been a minor rather than a major problem on most farms.

Quality is generally good but there are screenings problems in some areas where the soil moisture ran out.

Canola crops have had a huge yield range. Some crops in the north and east were yielding in the high 'ones' with some over two tonnes per hectare. While others were severely damaged by insects and yielded very poorly. Green peach aphid and diamondback moth were the main insect problems. Crops again performed well in the wetter parts of the landscape and on the better soil types.

Lupins are generally performing well and most growers are happy with their crops. The exception is the very dry Irwin area where crops are performing poorly due lack of moisture plus a severe wind event that cut many crops off.

Barley crops are good where rainfall has been 350 mm or above for the year but have struggled where the season was dry and finished quickly. Almost all crops are going on the feed stack due to high grain screenings levels.

Generally crops are performing as expected given the tough season we have had in the north. Frost damage has added to the disappointment for some growers.

In the past few days there has been widespread light rainfall but there were also a couple of heavy rainfall strips. Hopefully that is the end of the rain and the weather warms up and dries out crops quickly so we can get harvest completed.

Good luck with harvest at your place.

**Peter Norris**

**Agronomy For Profit and Synergy Consulting, Geraldton  
November 10, 2015**

### SOUTH COAST

Seasonal conditions over the past two months have been mixed. Spring rainfall was very minimal – fortunately most areas had very good reserves of stored soil moisture to adequately finish crops.

Harvest was underway in early October with canola and barley being the first crops to come off. Yields have been very good with canola ranging from 1.2 to 2.5 tonnes per hectare with oil as high as 50 per cent.

# District Reports...

November–December 2015



**A drone's eye-view of harvesting Bayer IH51 PodGuard canola at the Gibson district property of James and Susie Lewis. Gibson is 25 km to the north of Esperance. Canola yields have been generally very good ranging up to 2.5 tonnes per hectare.**

Barley yields have been from 3.0 to 5.5 tonnes but quality is mixed with some higher screenings and low protein.

Harvest conditions have been frustrating with some grower wags describing it as a FIFO harvest – two days on, three days off – due to continual showery weather.

In spite of this cool damp weather, grain quality is generally holding up very well.

On the good harvest days, grain is being taken off at an incredible rate. This is testament to modern harvest management, capacity and grain handling logistics. A record 55,000 tonnes was received in one day within the Esperance Port Zone.

Given the early yields coming off, the Esperance Port Zone should be on track to achieve record grain deliveries. We just need a good run of harvest weather.

**EDITOR'S NOTE:** After the GIWA state summary and Quenten's WA South Coast reports were written – and just as the magazine was going to press – the deadly and devastating bushfires struck. Quenten and the South Coast community tragically lost one of their much-loved local farmers in Kym 'Freddy' Curnow to the fires as well as three young international farm workers – Anna Winther (Norway), Julia Kohrs-Lichte (Germany) and Tom Butcher (Britain).

Our thoughts are with the families and friends of those who have lost loved ones. As Quenten said: "The local farming community is strong and resilient – we will all pull together to get this mess sorted out as quickly as possible – but it's good to know we all have the support of so many across Australia."

**Quenten Knight,  
Agronomist, Precision Agronomics Australia  
November 10, 2015**

## Southern region



### SOUTH AUSTRALIA SUMMARY

Crops were travelling along very nicely across most of the state until record temperatures over a scorching Labour Day weekend (October 3, 4 and 5) stopped them in their tracks. Hopes of above average grain and oilseed yields have been reduced to average at best.

A combination of hot winds and heat in early October – following on from earlier frost damage – took their toll on crops.

Rainfall for the past 12 months remains well below average for the South East, Southern Mallee, Fleurieu Peninsula and Southern Yorke Peninsula.

Soil moisture in the upper layer of the soil profile (20 cm) is generally below average over much of the cropping region of the state while the lower layer soil moisture is above average.

By mid November most cropping areas of SA were busily harvesting taking advantage of favourable weather conditions.

### WIMMERA/MALLEE

The Mallee harvest is underway after an earlier-than-normal start for many in the third week of October.

Unfortunately, below average yields are expected. This is



**It's been a very challenging and tough season in the Mallee. As a result, the winter crop harvest had started by late October. The BCG plot harvester was also brought out of the shed much earlier than usual and was put to work at the Wemen trial site.**



# District Reports...

**November–December 2015**

again a consequence of very little rainfall in the critical months of August and September. For much of the Mallee it has been a decade 1 growing season.

Some crops have also suffered heat stress with temperatures hovering between the mid to high 30s for almost a week during October. As a result, crops ripened too quickly – and given the limited moisture in the soil – it has had a negative impact on grain size. Crops that were already filling grain at the time of the heatwave seem less affected.

During October a number of poor cereal crops were cut for hay with growers keen to recoup some of their costs. This decision was easier for those who were already set up for hay production and who had enough seed for 2016.

Yields are averaging 0.4 to 0.8 tonnes per hectare for lentils, 0.4 tonnes for field peas and 0.5 to 1.8 tonnes per hectare for cereals. Most of the barley is making feed quality (F3) and lentil grains are small.

For most, harvest came to a standstill in the first week of November with rain (in varying amounts) falling across the district. The rainfall, together with warm conditions, may effect grain quality through sprouting. Weeds will now also need to be controlled in a month's time.

On a positive note, growers are amazed at the amount of crop that has been produced despite the very dry seasonal conditions.

**Justine Severin**  
**PR Officer, Birchip Cropping Group**  
**November 6, 2015**

## Northern region



## NSW STATE SUMMARY

Storm events and rainfall between the end of October and early November caused damage to, and delayed harvest of, mature cereal crops. The rainfall and winds caused crops to lodge and put grain at risk of being downgraded.

The El Niño event has continued to intensify and is likely to peak soon. While such an event is usually linked to warmer summer temperatures and more frequent heatwaves, its effect on rainfall across NSW usually diminishes during summer.

Recent information suggests that it is most likely that the El Niño event will be followed by a return to neutral conditions in 2016. The probability of it being followed by a La Niña event is declining.

### Rainfall

Rainfall during October was below average across much of western, southern and south eastern NSW, as well as areas of the north.

Significant storm rainfall occurred across much of the state from the end of October through the first week of November,

with most of the state receiving more than 15 mm and many areas up to 100 mm.

The strong El Niño event is continuing to intensify and has been reinforced by a positive Indian Ocean Dipole (IOD) event. The IOD event is likely to decay in November or early December. This combination resulted in dry conditions during September and October. Warmer sea temperatures to the west of Australia have once again moderated the effects on rainfall during early November.

During summer, an El Niño event increases the likelihood of higher temperatures over NSW and an increased number of heatwaves. But its effects on rainfall tend to decrease.

### Crops

Lack of rainfall and hot weather during October reduced winter crop yield prospects in western areas and hastened maturity. Some crops on the far northern and southern margins of the cropping belt were abandoned. Harvest commenced early in the northern and central areas.

The November storms and rainfall caused damage to unharvested winter crops, particularly in the western areas, and delayed harvest. The rainfall will benefit grain-fill in crops in the east.

Dryland summer crop sowings in northern and central NSW were delayed due to lack of topsoil moisture. The recent rainfall will encourage further sowings and crop establishment and benefit soil moisture storage on fallowed areas. Water allocations in central and southern areas have favoured sowings of cotton over other crops.

### Pasture growth

Pasture growth declined across the western half of NSW during October, particularly across the far west and areas of the north west, central west, central Riverina and far south. Growth was maintained in areas of the eastern and western Riverina, the south west slopes, tablelands and adjacent slopes, the south east and the coast.

**NSW Seasonal Conditions Summary, NSW DPI**  
**November 13, 2015**

## LIVERPOOL PLAINS

October temperatures in the region have been the highest on record but the month ended well with good falls in the gauge thanks to long anticipated storm rain.

This was a blessing for many who have started sowing summer crops – mainly sorghum – and a relief for those growers who already have cotton in the ground.

The district has experienced one of the biggest armyworm infestations seen in years in wheat (mainly durum) and barley crops.

Durum crops are finishing well due to the recent rain and we will look to harvest commencing in the coming weeks.

**Lauren McGavin,**  
**Precision Seeding Solutions, Premier**  
**November 12, 2015**

# District Reports...

November–December 2015

## DARLING DOWNS

### Winter crop

The harvest is well underway and crops are yielding excellently on both the eastern and central Downs. This result is well above expectations for an El Niño winter.

Barley has been the first crop to ripen, and yields have generally been between three to five tonnes per hectare on dryland country, depending on whether short or long fallow ground. Irrigated barley has yielded to 6.5 tonnes per hectare, and the new variety Compass, has been the top yielding variety.

Grain quality has been good, despite many crops needing some disease control for SFNB and powdery mildew earlier in the season.

The chickpea plant was well over the normal area due to the high prices, and despite the frosts and cold weather causing some damage to plant structure and seed numbers per pod, yields have been good. They range from 1.0 to 3.5 tonnes per hectare, with most crops around 2.5 tonnes per hectare. The majority of chickpeas were double cropped into sorghum ground, so this is a good return for growers.

There were only a couple of crops found with ascochyta, and heliothis pressure was not too heavy.

There have also been some forward sales of the 2016 crop at good prices.

Wheat is starting to be harvested now (early November) and again yields are good at 2.5 to 5.5 tonnes per hectare depending on fallow length. There was very little disease through the season, but the rainfall through October has improved yields but dropped protein.

The eastern Downs has some Prime Hard quality, but the Central Downs crop is more in the APW/H2 range.

There was some hail damage in a few places to all crops, and



Winter and summer crops overlapping on the Darling Downs. A wheat crop close to harvest in early November while the neighbouring dryland corn is growing nicely.

some shot grain to the west, but overall harvest has gone well so far.

### Summer crop

We have had better than average conditions for planting summer crop, and this has meant a very wide planting window this season. Early crops were planted in mid-September, and we can expect planting to continue through into January.

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# District Reports...

November–December 2015

## CENTRAL QUEENSLAND

### Weather

October/November is the season for storm rain in Central Queensland and that is what we have had thus far. The central highlands has had patchy storms mostly only paddock wide, sometimes property wide, but not yet district wide. North of Emerald is still mostly very dry. There have been some useful mostly isolated and patchy storms south of Emerald around Springsure and Rolleston – but it is a long way short of being wet.

The Dawson and Callide valleys are faring much better with most properties receiving good rain and some doing even better. Bauhinia Downs currently looks a picture of green.

### Winter crop

**Wheat:** Lack of planting rain resulted in only a small area of wheat being planted to wheat this winter in CQ, perhaps as little as 15,000 hectares (down from an average of 200,000

The main limitation looks to be available ground, with so much winter crop planted.

About 70 per cent of the expected sorghum crop is planted, with the most advanced crops already in the boot stage. The area will be less than last season, but the early crops look very good at this stage with the ongoing rainfall. There will be more sorghum planted during November, before a switch to other crops.

The usual spring plant of corn occurred with some thrip pressure early, but we expect more corn to be planted in December for both grain and silage, as growers switch from sorghum to corn.

Mungbeans are again a very strong price, and with the rainfall growers are hoping to double crop into early barley crop ground, as well as last season's late sorghum ground. However, because of the massive chickpea planting, the mungbean area will be back a bit from last season.


This has been the first chance for a few years to plant dryland cotton and the area is up, both for dryland and irrigated crops.

The crop is looking good and showing better vigour this season, although there is replanting in a few areas due to rain damage. The cotton planting window will also be one of the widest ever seen, with crops planted from September 20 to the end of November.

The summer outlook looks good at this stage, with the moisture profile steadily improving.

**Hugh Reardon-Smith**  
Agronomist, Landmark Pittsworth  
November 11, 2015

## Seasonal rainfall across the grain regions – 25 year averages and year to date

| Brought to you in<br>association with<br><br>JOHN DEERE | 25yr<br>Annual<br>Average<br>(mm) |  | 2015<br>rainfall<br>to date<br>(mm) |  | Summer<br>25yr<br>Annual<br>Average<br>(mm) |  | 2014–15 |  | Autumn<br>25yr<br>Annual<br>Average<br>(mm) |  | 2015 |  | Winter<br>25yr<br>Annual<br>Average<br>(mm) |  | 2015 |  | Spring<br>25yr<br>Annual<br>Average<br>(mm) |  | 2015<br>to date |  |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--|-------------------------------------|--|---------------------------------------------|--|---------|--|---------------------------------------------|--|------|--|---------------------------------------------|--|------|--|---------------------------------------------|--|-----------------|--|
|                                                                                                                                            |                                   |  |                                     |  |                                             |  |         |  |                                             |  |      |  |                                             |  |      |  |                                             |  |                 |  |
| Emerald Qld                                                                                                                                | 549                               |  | 258                                 |  | 242                                         |  | 283     |  | 112                                         |  | 20   |  | 60                                          |  | 43   |  | 122                                         |  | 59              |  |
| Toowoomba Qld                                                                                                                              | 662                               |  | 517                                 |  | 272                                         |  | 339     |  | 130                                         |  | 212  |  | 82                                          |  | 63   |  | 121                                         |  | 154             |  |
| Roma Qld                                                                                                                                   | 578                               |  | 330                                 |  | 247                                         |  | 286     |  | 128                                         |  | 54   |  | 72                                          |  | 100  |  | 126                                         |  | 61              |  |
| Goondiwindi Qld                                                                                                                            | 608                               |  | 555                                 |  | 251                                         |  | 308     |  | 124                                         |  | 158  |  | 96                                          |  | 133  |  | 135                                         |  | 74              |  |
| Narrabri NSW                                                                                                                               | 633                               |  | 543                                 |  | 227                                         |  | 148     |  | 119                                         |  | 252  |  | 126                                         |  | 98   |  | 160                                         |  | 114             |  |
| Gunnedah NSW                                                                                                                               | 660                               |  | 465                                 |  | 234                                         |  | 178     |  | 118                                         |  | 163  |  | 129                                         |  | 107  |  | 177                                         |  | 112             |  |
| Dubbo NSW                                                                                                                                  | 609                               |  | 592                                 |  | 197                                         |  | 239     |  | 132                                         |  | 138  |  | 128                                         |  | 172  |  | 152                                         |  | 120             |  |
| West Wyalong NSW                                                                                                                           | 444                               |  | 438                                 |  | 113                                         |  | 166     |  | 86                                          |  | 33   |  | 118                                         |  | 189  |  | 126                                         |  | 44              |  |
| Wagga Wagga NSW                                                                                                                            | 537                               |  | 597                                 |  | 130                                         |  | 133     |  | 114                                         |  | 85   |  | 151                                         |  | 259  |  | 143                                         |  | 147             |  |
| Swan Hill Vic                                                                                                                              | 322                               |  | 177                                 |  | 73                                          |  | 20      |  | 65                                          |  | 37   |  | 89                                          |  | 83   |  | 95                                          |  | 41              |  |
| Bendigo Vic                                                                                                                                | 514                               |  | 342                                 |  | 109                                         |  | 77      |  | 102                                         |  | 84   |  | 167                                         |  | 113  |  | 136                                         |  | 78              |  |
| Horsham Vic                                                                                                                                | 384                               |  | 217                                 |  | 75                                          |  | 84      |  | 70                                          |  | 38   |  | 132                                         |  | 61   |  | 107                                         |  | 46              |  |
| Lake Bolac Vic                                                                                                                             | 529                               |  | 315                                 |  | 117                                         |  | 78      |  | 100                                         |  | 82   |  | 160                                         |  | 113  |  | 152                                         |  | 62              |  |
| Murray Bridge SA                                                                                                                           | 369                               |  | 325                                 |  | 66                                          |  | 65      |  | 76                                          |  | 129  |  | 128                                         |  | 83   |  | 99                                          |  | 54              |  |
| Kadina SA                                                                                                                                  | 343                               |  | 243                                 |  | 58                                          |  | 31      |  | 77                                          |  | 54   |  | 120                                         |  | 112  |  | 88                                          |  | 59              |  |
| Cummins SA                                                                                                                                 | 395                               |  | 368                                 |  | 51                                          |  | 47      |  | 87                                          |  | 104  |  | 175                                         |  | 176  |  | 82                                          |  | 59              |  |
| Esperance WA                                                                                                                               | 615                               |  | 468                                 |  | 80                                          |  | 30      |  | 142                                         |  | 155  |  | 249                                         |  | 211  |  | 144                                         |  | 94              |  |
| Wagin WA                                                                                                                                   | 402                               |  | 271                                 |  | 46                                          |  | 16      |  | 95                                          |  | 97   |  | 171                                         |  | 109  |  | 89                                          |  | 89              |  |
| Northam WA                                                                                                                                 | 404                               |  | 316                                 |  | 42                                          |  | 19      |  | 85                                          |  | 81   |  | 192                                         |  | 177  |  | 86                                          |  | 40              |  |
| Mingenew WA                                                                                                                                | 366                               |  | 207                                 |  | 31                                          |  | 1       |  | 92                                          |  | 56   |  | 176                                         |  | 98   |  | 68                                          |  | 10              |  |
| Moora WA                                                                                                                                   | 384                               |  | 389                                 |  | 43                                          |  | 51      |  | 86                                          |  | 77   |  | 183                                         |  | 223  |  | 72                                          |  | 40              |  |
| Mullewa WA                                                                                                                                 | 309                               |  | 410                                 |  | 48                                          |  | 40      |  | 90                                          |  | 230  |  | 131                                         |  | 135  |  | 50                                          |  | 6               |  |

Last rainfall reading November 16, 2015.

# District Reports...

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hectares) and most of that was in the Dawson/Callide Valleys. While the yields on the central highlands were generally very low (under one tonne per hectare), excellent yields of four tonnes per hectare were achieved in the Dawson.

**Chickpea:** About 45,000 hectares of chickpea were planted across CQ, most of this on the central highlands and almost all of it deep planted to chase soil moisture. Low soil moisture meant plant numbers established were frequently low and patchy. This caused problems at delivery post-harvest with late maturing plants still holding green pods. Yields of 0.75–1 tonne per hectare were average. Cooler weather during the central highlands chickpea harvest resulted in few header fires but a couple of weeks later, hotter, drier weather and bigger crops resulted in many header fires during the Dawson/Callide chickpea harvest. The better chickpea crops there yielded more than 2.5 tonnes per hectare.

## Summer crop

I expect a big summer crop of more than 250,000 hectares of sorghum and more than 50,000 hectares of mungbeans – but only if sufficient summer rain falls. When and where rain falls will determine how much, and when, this season's summer crop is planted. There has been sufficient rain to ensure a large mungbean crop for the Callide and a significant area of sorghum and mungbeans will be planted in the Dawson.

## Livestock and pastures

Currently there is excellent grass at Bauhinia Downs and good grass on offer across most of the Dawson and Callide districts. In areas where there have been storms across the central highlands there is a short green pick for cattle but many graziers are just holding on, waiting for decent rain to fall to begin summer grass growth. Areas beyond this part of CQ such as north of Belyando Crossing, are still desperately dry. Areas to the west are



**Wheat harvesting near Theodore in the Dawson Valley. This excellent crop yielded 4.0 tonnes per hectare for Brendan and Bec Conway from 'Wongalee'. The Dawson was one of the few areas of Central Qld to enjoy a reasonable winter crop season. (PHOTO: Brad Conway, Moura)**

patchy with some areas receiving good rain but many areas still heartbreakingly dry.

## Water

The Fairbairn dam is currently at 41 per cent capacity or 530,000 ML.

About 18,000 hectares of cotton have been planted on the Emerald irrigation area, up from about 15,000 hectares last year.

**Maurice Conway**  
**Department of Agriculture, Fisheries & Forestry**  
**Emerald, Queensland**  
**November 11, 2015**

## IAN'S CLASSIC TRACTOR QUIZ ANSWERS

- 1 – Jerome Increase Case.
- 2 – Lanz.
- 3 – Latil.
- 4 – Hand lever.
- 5 – John Deere D.
- 6 – Friday.
- 7 – White.
- 8 – Canada.
- 9 – David Brown Cropmaster.
- 10 – Fowler.



**These chickpeas were another good result for Brendan and Bec Conway of 'Wongalee', Theodore. The 2.5 tonnes per hectare yield was at the top end of performances for CQ chickpeas this season. (Photo: Brad Conway, Moura)**

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