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**FRONT COVER**
**MICRONUTRIENTS AND MACRO RETURNS**


The Liebe Group in WA is looking at micronutrient management for drier cropping areas. See article page 24 and the *Grower Group Focus* pages 25–30.

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**F**INALLY ... by mid-June some season opening rains had made their way to much of the southern and Western Australian grainbelt. But track north of the Murray River through the Central West of NSW and into southern Queensland, and the early winter crop situation is patchy at best. Central Queensland crops are tracking along pretty well but a general rainfall of 50 mm plus over the national grainbelt would not go astray. Winter crop planting windows are about to slam shut!



## International trade wars

As always, this issue has plenty of agronomy-based articles to help make every production post a winner this season. But with the ongoing trade war between China and the US – and its ramifications for innocent bystanders such as Australia – we also take a closer look at what this stoush between the planet's two biggest economies might mean for world agricultural trade.

Many analysts say this trade war will set the global trading environment back decades. Fearful for Australia's agricultural exports in particular, AgriFutures Australia has commissioned a report which gives policy makers, industry peak bodies and primary producers a roadmap as to how a less predictable trading environment may impact our export markets (see page 36).

AgriFutures Australia Managing Director, John Harvey says the analysis gives Australian exporters the knowledge they need to take a leadership role in attempting to restore stability for agricultural commodities in global trade.

"The findings show that unilateral moves by the Trump Administration to renegotiate existing trade agreements have threatened World Trade Organisation (WTO) principles of a rules-based trading system, creating uncertainty for Australian agriculture," John says.

Even major US agricultural export representative bodies such as the US Wheat Associates (UWA) have to agree. In a recent *Wheat Letter*, UWA policy vice president Ben Connor said the Trump Administration imposition of tariffs and other protectionist measures invited both imitation by other countries as well as retaliation against US agriculture exports.

The UWA shares many of the Trump Administration's concerns about how WTO trade rules are applied by various countries. But the UWA believes that the use of tariffs by the US under 'national security grounds' (Section 232) "undermines the long-term interests of the US economy and US agriculture in particular; and any gains made because of these tariffs are likely to be short term while the damage to the rules-based (global) trading system could be permanent."

## Launch of a new series: Grower Group Focus

In each issue of *Australian Grain* our new *Grower Group Focus* series will showcase the results of some recent grassroots research carried out by our fantastic regionally-based groups. This is a platform to show the rest of the country what they've got and what they've done – and it's very good! (See pages 25–30)

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# AUSTRALIAN GRAIN

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## In this issue...

### What mice want

Research is revealing new insights and understandings about mice in Australian broadacre cropping systems, especially in terms of their food preferences and aversion to bait.



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### International team finds new clues for improving wheat

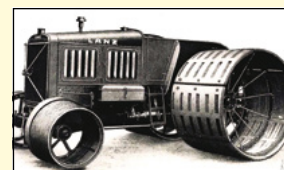
A team of Kansas international wheat scientists are tapping into 10,000 years of evolution in the plant's genetic code as part of their continued efforts to understand how historic processes that shaped modern wheat can help to improve the varieties grown by today's farmers.



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### Assumptions!

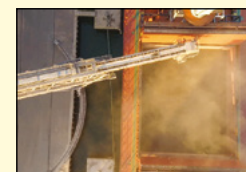
My recent observations reveal to me that classic tractor enthusiasts – who as you know are normally on a higher intellectual plane than mere mortals – are sadly not entirely immune from being guilty of erring in their interpretations of accurate facts.



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### 'No rules' trading environment unsettle Aussie ag exports

New research shows uncertainty from ongoing bilateral trade wars between China and the United States have set the global trading environment back decades and undermined Australian agricultural exports.



See article ..... Page 36

### Does chaff in a chaff line suppress weeds?

In the wake of rapid adoption of chaff lining – the newest harvest weed seed control tool developed by Australian farmers, a substantial research effort has been made to validate the efficacy of this practice.



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# What mice want: Grains research unearthing new knowledge

**R**ESearch is revealing new insights and understandings about mice in Australian broadacre cropping systems, especially in terms of their food preferences and aversion to bait. The Grains Research and Development Corporation's (GRDC) major mouse-related research, development and extension program has shown that mice prefer cereals over lentils, background food significantly affects consumption of bait and strategic use of bait is more effective than frequent use of bait.

As part of the suite of GRDC investments, CSIRO researchers have been undertaking bait substrate trials to determine what is driving a perceived reduction in efficacy of zinc phosphide bait and testing potential new bait substrates that might be more attractive to mice.

Researchers are testing the willingness of mice to transition from one food to another and then determining whether mice will continue to eat that alternative food source once zinc phosphide bait has been applied.

## Lentils down the list

CSIRO researcher Steve Henry says one experiment involved mice being held on a background food type (barley/lentils/wheat) for two weeks and then offered the choice of an alternative grain type (malt barley/durum wheat/lentils) for five nights.

"A clear key message from this work is that mice don't like lentils," says Steve. "Results from trials have shown that mice have a clear preference for cereals over lentils which indicates lentils wouldn't be a good bait substrate for zinc phosphide."

Another experiment has aimed to determine the acceptance

of different toxic bait substrates by mice when challenged against a different background food type.

Mice were held on a background food type (lentils/barley/wheat) then offered an alternative of the three types of zinc phosphide-coated grain (barley/husked malt barley/unhusked malt barley) for three consecutive nights, as well as the background diet.

"Mice consumed toxic bait grains regardless of the bait substrate type, but background food type significantly affected the number of toxic grains consumed," Steve says.

"Mice established on a wheat background consumed fewer toxic bait grains than mice on a lentil or barley background diet. Mice on a barley background diet showed a slight preference for malt barley."

Steve says an interesting outcome of this experiment was in relation to toxic bait aversion.

"Mice that ate a sub-lethal dose of toxin on the first night showed bait aversion – they stopped taking toxic grains on nights two and three.

"In all rodent populations, there will be some animals that are susceptible and some that are less susceptible to bait. If those less susceptible individuals consume zinc phosphide and don't die, then we end up with almost instant bait aversion."

The next phase of the research will examine the role of available alternative food on commercial zinc phosphide bait effectiveness.

## Mouse ecology

The GRDC mouse-related investments include a focus on mouse ecology. This work will involve a series of experiments aimed at understanding how mice function in zero and no-till cropping systems.

"Historically, mice lived on the margins of paddocks and moved into crops when conditions were favourable," Steve says. "Now, with low levels of disturbance in paddocks, mice are building burrow networks in paddocks and living where resources are most plentiful."

The mouse ecology research will address five key topics –



**CSIRO researcher Steve Henry: "Results from trials have shown that mice have a clear preference for cereals over lentils which indicates lentils wouldn't be a good bait substrate for zinc phosphide." (PHOTO: GRDC)**



**Mouse holes in stubble. (PHOTO: GRDC)**



farming practices, managing refuge habitat, understanding mouse movements, mouse burrows and bait delivery.

The results of the bait substrate experiments, in conjunction with the results of the work in the five key mouse ecology priority areas, will form the basis of a series of recommendations for improved mouse control strategies for Australian grain growers.

"The current approach to bait application is to spread bait on a broad scale across entire paddocks," Steve says. "To date, the majority of our understanding of mouse ecology and behaviour is based on work undertaken in conventional cropping systems."

### More strategic bait applications

"Better understanding of mouse ecology in zero and no-till cropping systems could lead to more strategic application of bait, potentially reducing the quantity of bait spread or increasing the effectiveness of bait by targeting high activity zones in paddocks."

In the meantime, Steve encourages growers to remain vigilant throughout the 2019 cropping season.

"While our monitoring shows that numbers are generally low across southern, northern and western cropping regions (apart from a moderate risk of damage around Geraldton in the west), largely because of continuing dry weather, we know mice can breed to high numbers very quickly if conditions change and favour mice," Steve says.

The work being undertaken by CSIRO is outlined by Steve in a new GRDC podcast at <http://bit.ly/2Wyo1PA> and video at <http://bit.ly/305AayV>, and has been detailed to growers and advisers attending GRDC Grains Research Updates.

Steve's GRDC Grains Research Update paper, which details the latest research insights and management advice, can be found at <http://bit.ly/2U6SwLA>

Information about changes in mouse numbers can be accessed via the Mouse Alert website at <http://bit.ly/2IXevDV>. A comprehensive GRDC Mouse Control resource hub is available at <http://bit.ly/2ImjEEn>



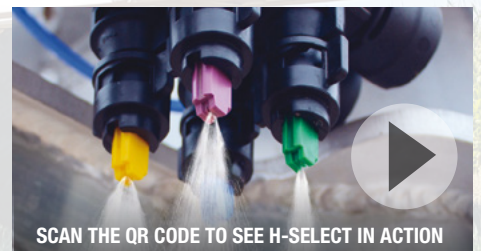
Steve Henry and fellow researchers are testing the willingness of mice to change food sources. (PHOTO: GRDC)



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# Climate, grain composition and brewing efficiency

**W**HILE the quality of your favourite tippie isn't under threat from climate change, heat stress may have an impact on beer production, says University of Queensland food and nutrition scientist Dr Glen Fox.

"While we've noticed heat and drought stress produces a change in the starch properties of the barley used in beer production, brewers will always ensure a constant quality of their golden beverage," Glen said.

Beer is made from barley and other grains such as wheat or sorghum, along with hops for bitterness and aroma, and yeast is used for fermentation.

But heat and drought stress are impacting on the composition of these grains during the critical 'grain fill' period – the final stage of growth in cereals.

"Grain fill is where the grain is getting nice and plump just before maturity. There are also hundreds of compounds going through some metabolic change and a lot of those systems are all very sensitive to temperature," Glen said.

He said European researchers were noticing the effect as well.

"From an Australian perspective, we are seeing quite severe heat shocks much earlier in spring and that is having an impact on grain fill efficiency," he said.

"We are still trying to understand the impact of this but what we are seeing is that the heat stressed grain requires a higher temperature to make all of its grain components soluble in the initial stages of brewing. This can reduce efficiency."



**Earlier flowering and maturing barley varieties have generally less risk of a stress event during grain fill.** (PHOTO: Glen Fox)

## Grain composition

Glen said it was not so much a question of climate change impacting on the barley yield – or its even protein content – rather the grain composition.

"The risk for maltsters and brewers is that the barley might meet current specifications but does not perform the same in production, and this could cause problems in malting and brewing. But maltsters and brewers will always strive to ensure consistency of their products."

Glen said his message to industry was to also consider grain composition and do some additional testing rather than risk finding problems further downstream in the brewing process.

"Barley growers do an amazing job but the challenge for them will be to potentially select varieties that might flower and mature a little bit earlier to reduce the risk of suffering some sort of stress event during grain fill. Yield is absolutely important but maltsters don't buy barley on yield – they buy on quality."

"Also our barley breeders invest enormous resources to develop high yielding varieties with the required quality. Climate change unfortunately is presenting extra challenges for everyone."

Glen said climate change impacts such as heat and drought stress could also impact on the nutritional profile of the grain.

"This also poses a risk for grain food industries as well, such as the baking industry."

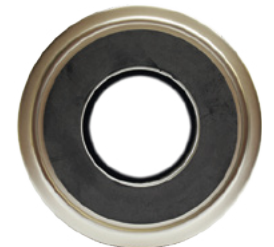
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**Dr Glen Fox, Senior Research Fellow, QAAFI, University of Qld.**





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# Barley variety honours historic brewery

■ By Andrew Spence

**A** NEW barley variety named after the site of the original Coopers brewery is being bulked up this season with a view to becoming the South Australian brewers' malt of choice. Bred by the University of Adelaide at its Waite Institute, WI4896 has been named 'Leabrook' having passed stage 1 malt accreditation in March. It will become an accredited malting variety in March 2020 if it passes Stage 2 this year.

The variety is being bulked up this season through Seednet Partners growers at eight sites:

- Three in South Australia;
- Two in Queensland;
- Two in New South Wales; and,
- One in Western Australia.

About five tonnes of seed has gone out with more than 400 hectares planted and about 1000 tonnes of seed likely to be kept for the commercial launch in 2020.

Seednet Partners General Manager Simon Crane said Leabrook would be grown alongside other barley varieties such as Compass, Spartacus and La Trobe for comparison purposes.

He said it was a tall and vigorous plant type with a two to five per cent yield advantage on other Seednet Partners malting varieties, which include Commander, Compass and Scope. Leabrook has also shown to have a slightly higher malt extract than other varieties, Simon said.

"Yield is the main reason but we're hoping that on the malt side it's got something to offer as well so end users are asking about it as well as growers who are keen to grow it," he said.

"Planet is the hardest barley to beat these days in the long season regions so it won't beat that for yield but more in the low-



**Coopers Brewery Maltings Manager, Doug Stewart in the new malting facility. (PHOTO: John Kruger)**

to-medium rainfall regions and in the tougher seasons this variety has proven to have a yield advantage.

"I wouldn't say it's been bred specifically for craft brewing but there's definitely interest. It's also in the national variety trial system so there is a lot of trial results but this year will be the first larger scale evaluation and demonstration of the variety."

## More than 130 years of brewing history

Based in Adelaide, South Australia, Coopers is Australia's largest independently owned brewery, selling about 80 million litres a year.



**Barley grain kilning at the Coopers malting plant in Adelaide. (PHOTO: John Krüger)**



Its famous ales were brewed at Leabrook in Adelaide's eastern suburbs from 1881 until the brewery relocated to its current site at Regency Park in 2001.

Coopers malted Leabrook barley last year and made a test batch of beer as part of the accreditation process. It will likely malt two more batches at its new 54,000-tonne malting facility alongside its brewery in the coming months.

Leabrook barley is closely related to Compass, which was also bred by the University of Adelaide and is currently used by Coopers as its standard malt across its range.

Coopers' Maltings Manager Dr Doug Stewart said if all went well with testing and Stage 2 accreditation, it was likely that Leabrook would eventually replace Compass as the barley of choice at the brewery in a staged transition as the variety adopted by more growers.

He said Leabrook performed "perfectly" in the first malt trial at Coopers last year.

"There were no problems at all so we're very enthusiastic that it will be a good replacement for Compass," Doug said.

"The variety Compass is very much in line with the domestic brewing industry so I think the new variety will find its way into a number of different domestic beers including some craft beers.

"It will certainly keep that Compass type of barley around for longer, which is a style of barley and malt that we enjoy."

### What's in a (barley) name?

The University of Adelaide's barley breeding program at the Waite Institute ended in June 2017 meaning that WI4896 could be the last commercial barley variety officially named by the university.

The Waite is the largest agricultural research and teaching hub in the southern hemisphere and is also home to CSIRO, Plant



Coopers was a hive of brewing activity even in the 1940s.

& Food Research Australia and The Australian Wine Research Institute.

The University of Adelaide has traditionally used maritime terms such as clipper, schooner, keel and fathom when naming its barley, which Doug said made the break from tradition to use the Leabrook name all the more special.

"Coopers has been involved with the breeding program at the University of Adelaide for many years and we have ongoing research projects with them as well. So it's a lovely touch that they've agreed to name it after our original brewery site," Doug said.

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# Falling number grain quality test gets a tweak from researchers

■ By Sharon Durham, Agricultural Research Service – USDA

**S**CIENTISTS and engineers at the USDA Agricultural Research Service (ARS) have developed a more precise method to determine a major factor in grain quality. Quality testing is dependent on accurate and repeatable tests that assure a fair marketing system. That also means tests are always tweaked and improved to meet the needs of the industry.

The recent advancement deals with a test known as ‘falling number’ (FN).

FN is a procedure used worldwide to characterise the suitability of wheat for processing into foods such as pan and flat breads, noodles, biscuits and cakes. The procedure relies on the heating of watery mixtures of starchy materials – like wheat flour – in a boiling water bath.

The ‘falling number’ is literally the number of seconds it takes a standardised object to ‘fall’ through a heated wheat meal-water mixture undergoing starch gelatinisation and the enzymatic breakdown of the starch molecule.

The longer the object takes to fall – a measure of its viscosity – the better the quality of the sample and the grain lot it represents.

Through experimentation in a low-pressure chamber, US Department of Agriculture’s ARS agricultural engineer Steve Delwiche and his team at the Food Quality Laboratory in Beltsville, Maryland, developed the correction so that FN results can be expressed at equivalent laboratory conditions, such as what exists at sea level.

## Local environment and the Falling Number test

Barometric pressure variation caused by laboratory land elevation and local weather patterns means that the thermal conditions of this test can vary, as can the reported FN.

Depending on the land elevation of the laboratory performing the FN test, some grain samples on the margin may fall above the

specification, but when evaluated at a different laboratory – for example at a sea terminal – the result may fall on the other side.

This can lead to uncertainty and inefficiency in the market system. Commonly in the US, wheat samples with FN below 300 seconds are discounted by US\$0.25 per bushel (A\$13 per tonne).

A new mathematical correction addresses this variation problem.

Starting in May 2019, USDA’s Federal Grain Inspection Service (FGIS) will implement the correction. Likewise, the American Association of Cereal Chemists International (AACCI) has amended their ‘Approved Method’ on FN as an optional correction.

## The impact at the farm gate

Wheat grown in the US Pacific Northwest (PNW – Washington, Oregon, and Idaho) is annually worth around US\$1.5 billion at the farmgate. Most of this PNW wheat crop is exported overseas and is desired for its highly prized characteristics in end-product quality.

PNW wheat tends to be grown at higher elevations than other regions in the US. So, too, are the locations of the laboratories that evaluate PNW wheat.

The high land elevations of grain inspection laboratories in this region result in lower water boiling temperatures, and hence longer ‘cook’ times during the FN operation.

Implementation of this correction by the grain industry will allow for more accurate management of wheat consignments, which, for samples in the PNW alone that give test results near the 300 second cutoff, may result in savings of US\$10 million recaptured to the growers in weather-challenged years that foster low FN wheat

**The Agricultural Research Service is the U.S. Department of Agriculture’s chief scientific in-house research agency.** ■



Wheat being tested for falling number. This test characterises the suitability of the wheat for processing into various foods such as bread, biscuits and cakes.





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# International team finds new clues for improving wheat

■ By Kansas State University, Research & Extension

**A** TEAM of Kansas (US) State University wheat scientists are tapping into 10,000 years of evolution in the plant's genetic code as part of their continued efforts to understand how historic processes that shaped modern wheat can help to improve the varieties grown by today's farmers.

The exhaustive study, which is published in *Nature Genetics*, involved sequencing the genomes of nearly 1000 wheat lines collected from different parts of the world with different environments.

## Agriculture Victoria involvement

The work was led by researchers from Kansas State and Agriculture Victoria, in collaboration with the University of Saskatchewan (Canada) and the University of Minnesota (US).



Kansas State University wheat geneticist and pathologist Eduard Akhunov works in the university's greenhouse. (PHOTO: K-State Research & Extension)

"We compared the genomes (in the 1000 wheat lines) against each other, and looked for nucleotide base changes, or mutations, that distinguish one wheat accession from another," said Eduard Akhunov, a Kansas State wheat geneticist.

He noted that the researchers found more than seven million differences in the genetic code of the 1000 lines.

"These differences can affect the function of genes that control various traits in wheat that helped it adapt to new growth conditions, such as withstanding drought and heat stresses; fighting off diseases; and yielding nutritious grain," Eduard said.

The changes that occurred in the genetic code can tell researchers a history of each wheat accession.

"When humans started spreading wheat from the site of its origin to other places, they brought it into contact with wild wheat, and wild ancestors accidentally began to inter-breed with bread wheat," Eduard said. "What happened then was that bread wheat inherited the genetic diversity that was present in the wild emmer wheat."

## Gene flow is key

That process of one species sharing genes with another species is called gene flow, and it is key for explaining the genetic diversity of today's wheat varieties, according to Kansas State wheat breeder Allan Fritz.

"Understanding gene flow between wild emmer and common wheat is more than just academically interesting," Fritz said. "The importance of historical introgression suggests that a more strategic use of wild emmer should have value for future wheat improvement."

Fritz noted that Kansas State scientists have been using wild emmer in developing germplasm for new wheat varieties in projects funded by the Kansas Wheat Commission and the university's Wheat Genetics Resource Center.

The work by Eduard and his research team allows breeders to "evaluate the diversity in wild emmer and be intentional and strategic" in how they employ desired traits in new wheat varieties, according to Fritz.

"As we move forward, we can apply what has been learned here to also focus future efforts on traits related to health and nutrition that wouldn't have been direct targets of historical selection," he said.

Eduard adds: "For the first time, we have described how wild emmer's genetic diversity contributed to the development of bread wheat. And what it's done since humans domesticated wheat is it's helped to develop a better crop."

Kansas State's study was funded by the Agriculture and Food Research Initiative's competitive grants program, administered through the U.S. Department of Agriculture's National Institute of Food and Agriculture and part of the International Wheat Yield Partnership, which Eduard said aims at increasing the genetic yield potential of wheat using innovative approaches.

Eduard also said that Corteva Agriscience and the agriculture division of Dow/DuPont provided financial support through its collaboration with Agriculture Victoria Service. Their support, he said, allowed the researchers access to needed technologies and to develop the set of data indicating the genetic differences in wheat varieties, also called an SNP dataset.

Kansas State received additional funding from the Kansas Wheat Commission and the Bill and Melinda Gates Foundation.





# Assumptions!

■ By Ian M. Johnston

**Throughout life, we can all be blamed for sometimes making incorrect assumptions relating to an array of topics. Indeed, up until a few centuries ago, civilisations believed the Earth to be flat.**

My recent observations reveal to me that classic tractor enthusiasts – who as you know are normally on a higher intellectual plane than mere mortals – are sadly not entirely immune from being guilty of erring in their interpretations of accurate facts.

Having exposed these lugubrious revelations, I feel duty bound to immediately tender authentication of the foregoing, in order to circumvent a profusion of irate classic tractor devotees causing the crash of my email *modus operandi*.

(Gosh – did I write that? It is the sort of waffle one would expect from a politician, when asked a complex question about his or her travel allowances!)

Anyway, here goes with a few of these common incorrect assumptions.

## Lanz Landbaumotor

It is widely believed that the range of tractors manufactured by the German firm Heinrich Lanz A.G., consisted entirely of numerous models of the ubiquitous two stroke single cylinder crude oil burning Bulldogs, which were in production from 1921 until the late 1950s. These tractors were the top sellers in Europe for many years and enjoyed bounteous sales throughout Australia.

But it is not broadly known that in the early part of the 20th century, Lanz initially produced a fine range of heavy-weight tractors, which were at the forefront of technical design.

Lanz introduced its first tractor in 1912, a decade before the introduction of the Bulldog. The Landbaumotor, as it was named, was powered by a four cylinder 80 hp petrol engine made by Kamper of Berlin. The big tractor remained in production until 1926 with 585 examples being sold, mainly to the more affluent European farmers.

But of particular interest to tractor buffs is the fact that a variation of the Landbaumotor was a model entitled the Koszegi.

My knowledge of the Germanic language is limited to such utterances as *danke schon*, *guten morgan*, *auf wiedersehen* and

so forth, therefore I am regrettably unable to precisely translate Koszegi. Anyway in my limited opinion it sounds more Polish or Czech than German, and to me the Polish and Czech languages are so baffling, that I am amazed even the Poles and Czechs understand each other!

But I digress.

Despite my lack of linguistic capabilities, I do know that the word Koszegi relates to rotary cultivators. Accordingly the Landbaumotor Koszegi consisted of the tractor complete with a giant rotary cultivator – or if you prefer – rotary hoe. Considering this was developed as early as 1912 during the very early stages of farm mechanisation, amazingly the chain driven attachment was raised and lowered by means of a hydraulic cylinder (decades before Harry Ferguson appeared on the scene with his three point linkage hydraulic system).

And now back to ‘assumptions’.

We in Australia tend to link the invention of the rotary hoe with Arthur Clifford Howard and his Howard Cultivators. This is a common belief shared by many classic tractor enthusiasts.

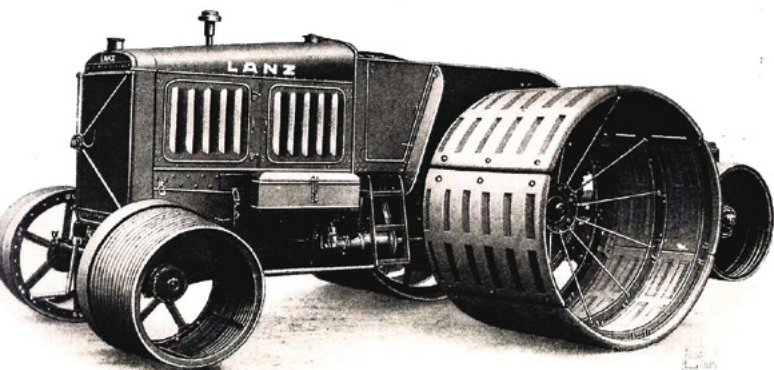
Sorry – wrong!

The very first rotary cultivator was developed not by an Aussie, but by James Usher of Edinburgh, Scotland, back in 1849. Admittedly it was steam powered – but it was a revolving rotary cultivator! Yet another example of Scottish ingenuity. (I am of course, not at all biased.)

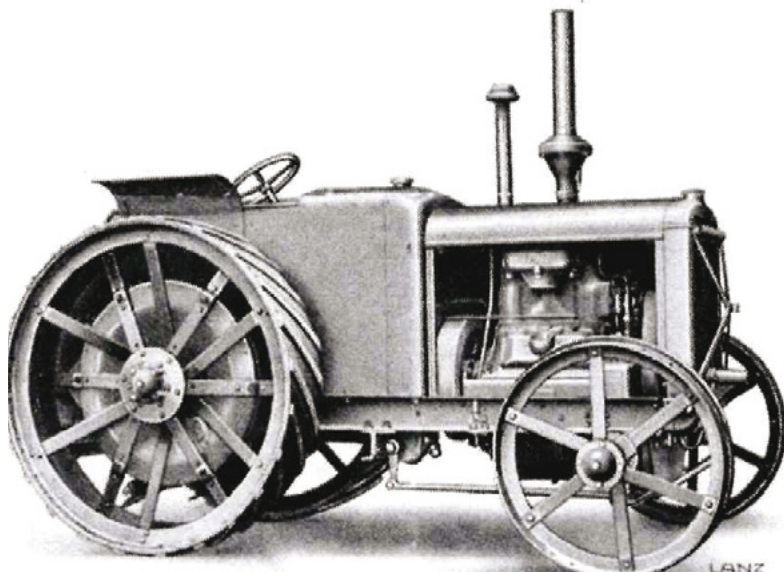
## Lanz Felddank

In the year 1923, Lanz released a physically larger tractor weighing 4500 kilograms named the Felddank.

The power unit was a Lanz designed two cylinder vertical hot bulb engine which produced (surprisingly) a mere 38 horse power at 650 rpm. This relatively low power rating was despite its cubic capacity of 12.5 litres. But the torque of the engine (never

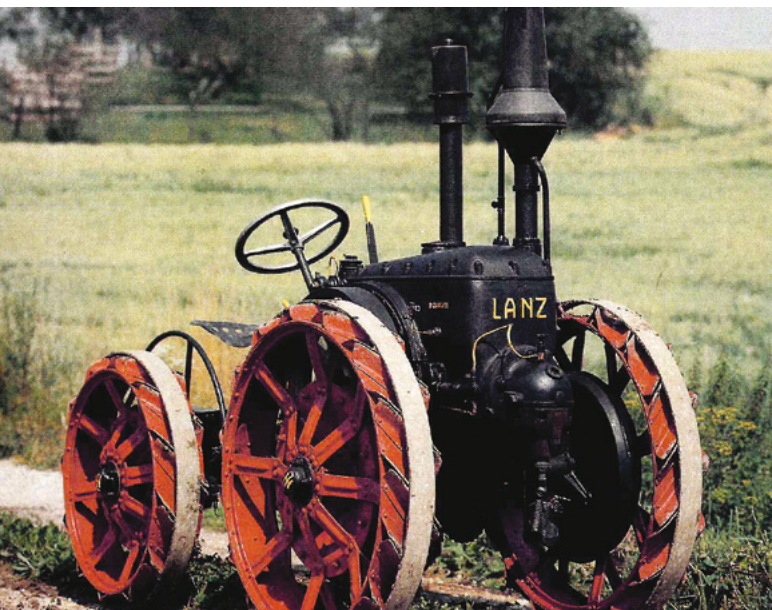


**A 1914 Lanz Landbaumotor, equipped with marshland wheels, powered by an 80 hp Kamper four cylinder petrol engine.**



**A 1924 Lanz Felddank, 12.5 litre two cylinder powered by a Lanz vertical hot bulb engine.**





**The 1923 single cylinder crude oil burning Lanz Acker Bulldog featured four wheel drive and an articulated two section configuration – a world's first combination.**

measured) must have been considerable as the Felddank was considered one of the big powerful German tractors of the era.

Many of the 2000 units produced were conscripted by the German military and deployed as heavy haulage tractors.

Production of the Felddank was ceased in 1927, possibly owing to the increasingly powerful Lanz Bulldog models, with their lower production costs and rapidly expanding popularity.

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## **Acker-Bulldog**

Yet another common assumption is that Lanz never manufactured and marketed a four wheel drive Bulldog.

Sorry, wrong again!

The brilliant Bulldog designer Doctor Fritz Huber perfected his revolutionary Acker-Bulldog tractor in 1923 – a mere two years following the release of the original HL Bulldog. It represented an important step in the evolution of the farm tractor, as not only was it four wheel drive (which in itself was not unique but nevertheless rare) but also featured a ground breaking articulated design! The tractor hinged in the middle, thus providing a hitherto unheard of degree of manoeuvrability.

Vignerons cultivating their vines on the steep slopes of the banks of the Rhine, welcomed the versatility of the remarkably compact 12 hp Acker-Bulldog. Whilst in the heavy black clay soils of the Saxony regions, the innovative tractor could easily outperform conventional two wheel drive tractors during ploughing operations.

Despite the foregoing, few were sold, possibly on account of it being ahead of its time and the fact it was considerably more expensive than the regular two wheel drive Bulldogs, the sales of which were sky rocketing.

The Acker-Bulldog was discontinued in 1926.

## **Schutte-Lanz**

Another common assumption is that Heinrich Lanz A.D. concentrated entirely on the manufacturing and marketing of farm related machinery, since the firm's inception in 1859.

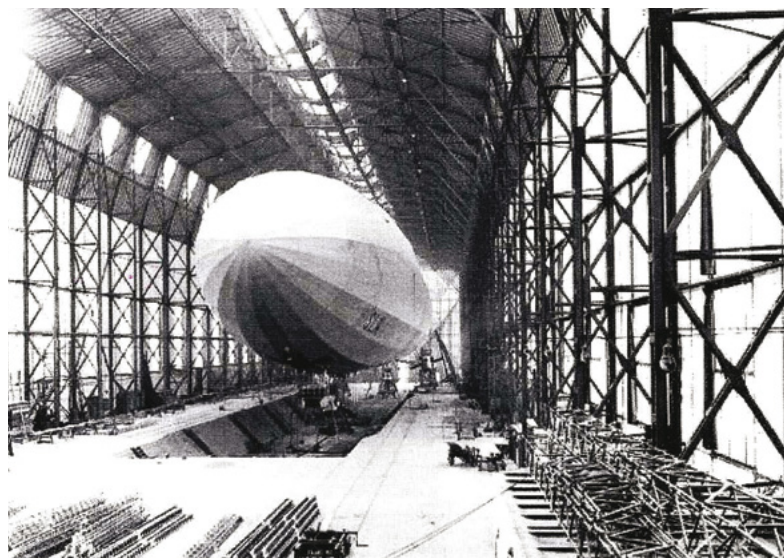
Well you guessed it – not true!

In the year 1911 the Mannheim industrialist Johann Schutte approached the Lanz board with a proposition. In return for a substantial financial contribution, he offered Lanz a partnership in his latest inspired project.

Schutte had been following the career of Count Zeppelin and the production of his innovative huge lighter-than-air Zeppelin airships, which a few years later were to roam the skies over Europe and drop bombs over London and other capital cities with impunity.

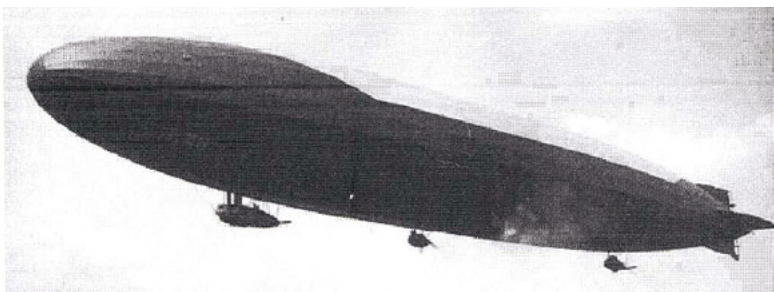
Schutte had plans to design what he considered to be a more advanced and lighter airship, using a laminated wooden structure, rather than the metal framework of the Zeppelins.

Accordingly, the cigar shaped massive Schutte-Lanz airships



**A 1913 photo of a Schutte-Lanz airship being assembled at the Mannheim factory.**





**A Schutte-Lanz airship, 143 metres in length and supporting three gondolas, each with a 240 hp Maybach engine.**

began production in 1912, in an extension of the Lanz Mannheim farm machinery plant.

Although there were several variations of design, the majority of the Schutte-Lanz airships featured a length of 143 metres and a width of 18.5 metres. The internal gas bags had a capacity of 2548 cubic metres of lighter-than-air hydrogen gas, which provided a lift capacity of 7122 kilos at a height of around 2200 metres. Either two or three gondola shaped control cabins were rigidly suspended below the gargantuan structure, each supporting a 240 hp Maybach petrol engine driving a single propeller.

Alas, problems occurred. In damp weather the wooden frame absorbed moisture, adding undesirable significant weight. Also the timber laminations tended to warp and glued joints separated.

The first airship to be brought down in flames during World War 1 was indeed a Schutte-Lanz. It crashed off the Danish coast.

## Not an assumption – a fact!

Apart from the Lanz factory being destroyed by US Airforce bombers, during the latter weeks of World War 2, the Schutte-Lanz episode is the only misadventure to befall the otherwise hugely successful era of agricultural design and production performed by the German firm of Heinrich Lanz A.G. of Mannheim, since it began trading in 1859. ■

## IAN'S MYSTERY TRACTOR QUIZ

**Question:** Can you identify this Aussie tractor?

**Clue:** It is powered by a GM 371 two stroke diesel (and restored by Ian).

**Difficulty:** Any 10 year old country lad could identify it – probably.

**Answer:** See page 48.



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## Easy to adopt crop competition tools

■ By Peter Newman

*"We choose to go to the Moon! We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard," John F. Kennedy, 1962.*

**A**LL well and good if you're the American government with a king's ransom to spend. But if you're an Australian farmer? It's probably better to do the easy things.

"We choose to adopt stacked crop competition tools, not because they are hard, but because they are easy."

Agronomist Chris Davey and the team at YP AG on the Yorke Peninsula in South Australia were determined to help their clients improve their ryegrass control through stacking crop competition tools with robust pre-emergent herbicide mixes. They were well aware that if the competition tools were too costly or complex, their clients weren't likely to adopt them, so they focused on the tools that are easy to adopt in a trial near Paskeville in 2018.

By switching from wheat with a standard herbicide mix to a competitive barley variety – with a premium herbicide mix – sown east/west, they more than doubled grain yield and reduced ryegrass seed set potential by a whopping 95 per cent. All of these tools are easy to adopt at relatively low cost and they made a big difference to both profit and the future seedbank of the farming system.

We are very grateful to Chris and the team for sharing these trial results with us and showing us how it's done. They showed us that stacked crop competition doesn't have to be hard, it can be relatively easy, and we should perhaps do the easy things first.

### The Paskeville site

The ryegrass at this site near Paskeville, on the northern Yorke Peninsula in South Australia, was big in number and you guessed it, very resistant.

- Trifluralin – 100 per cent resistance;
- Avadex – 50 per cent resistance; and,
- Boxer Gold – 35 per cent resistance.

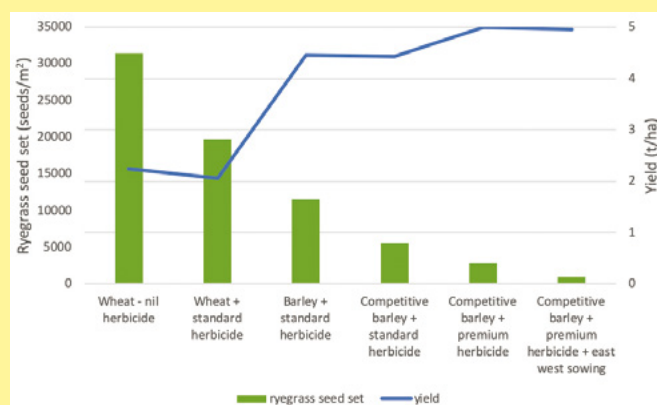
As a result, the poorly competitive Emu Rock wheat sown with nil herbicide was low yielding and swamped with ryegrass. Chris Davey and the team from YP AG estimated ryegrass seed set potential by counting ryegrass tiller numbers, spikelet number and the average number of seeds per spikelet.

Figure 1 is a selection of some of the data from this trial that tells the story of stacking herbicide and crop competition tools. Now let's break it down into the steps.

#### Stack 1: Add standard herbicide to wheat

Adding the cheap, no-frills standard herbicide brew of trifluralin + Avadex to the wheat reduced ryegrass seed set by only 37 per cent – clearly affected by the resistance to these herbicides at this site.

**FIGURE 1: More crop, fewer weeds**



#### Stack 2: Switch to barley

**Boom!**

Switching crop types from wheat to barley with the same herbicide brew further reduced ryegrass seed set potential by 42 per cent and doubled the yield in this trial. Just by switching from wheat to barley! This is purely because barley is more competitive than wheat. Pretty simple to adopt and profitable too given that barley nearly doubled the yield of wheat.

	Yield (t/ha)
Barley	4.27
Wheat	2.76

#### Stack 3: Switch to competitive barley variety

**Boom!**

A further 50 per cent reduction in ryegrass seed set just by switching to Compass barley which is known to be more competitive than Spartacus. Adoption doesn't get much simpler than switching varieties.

#### Stack 4: Switch to premium herbicide

**Boom!**

A further 50 per cent reduction in ryegrass seed set by switching to Boxer Gold + Avadex, despite the fact that there is some resistance to both of these herbicides at this site. Sure, there is an extra cost, but it is simple to adopt and the extra cost, in this case, is easily covered by an extra 0.5 tonne per hectare of yield.

#### Stack 5: Switch from North/South to East/West sowing

**Boom!**

A massive 69 per cent reduction in ryegrass seed set. Ok, not every paddock lends itself to east/west sowing, but for those





**Barley has a much higher competitive ability than wheat – and some barley varieties are better competitors than others.**

paddocks that do, it may well be worth the hassle of changing run lines. What's more, the cost of adoption is essentially zero.

There was essentially no difference in yield in the barley between N/S and E/W sowing, and this is consistent with past research. But the wheat sown E/W yielded about 0.5 tonne per hectare more than wheat sown N/S. This is likely due to the wheat having less competitive ability than barley and therefore benefiting from the extra competition that E/W sowing offers.

There was essentially no difference in yield in the barley between N/S and E/W sowing, and this is consistent with past research. But the wheat sown E/W yielded about 0.5 tonne per hectare more than wheat sown N/S. This is likely due to the

wheat having less competitive ability than barley and therefore benefiting from the extra competition that E/W sowing offers.

	North/South (t/ha)	East/West (t/ha)
Barley	4.29	4.24
Wheat	2.53	3.07

	Average wheat and barley yield (t/ha)
North/South	3.41
East/West	3.66

## What does that all add up to?

Competitive barley + premium herbicide + East/West sowing:  
Potential ryegrass seed set 890 seeds/m<sup>2</sup>

### Compared to

Less-competitive wheat with standard herbicide treatment, sown North/South:

Potential ryegrass seed set 19,700 seeds/m<sup>2</sup>

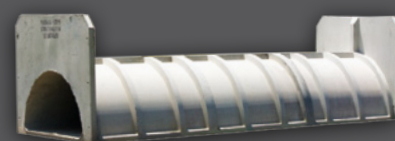
### Equals

95 per cent reduction in ryegrass seed set.

## Conclusion

Crop competition didn't matter much when the herbicides all worked, but it matters now. The great thing about this trial is demonstrating that adding some relatively simple and cheap crop competition tools, in addition to robust pre-emergent herbicides, can make a huge difference to both crop yield and the weed seed bank. More crop, fewer weeds, by doing the easy things – which matches the AHRI slogan perfectly: "More crop, less weeds – sustainably!"

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# Practical approach delivers spray drift practice change

**A** DRIER season might have reduced the need to spray weeds in south west Queensland, but it hasn't stopped Roma farm overseer Kayne Maskill from putting in place changes that should reduce the risk of spray drift in the future.

Kayne from Echo Hills Farming Company was one of more than 95 growers, who took time out to learn about best practice spray application at workshops organised by ConnectAg and supported by the GRDC.

Developed in response to locally identified needs, the Spray Drift Awareness workshops were designed to give participants practical tools and guidelines to make changes at farm level to reduce the risk of spray drift.

Kayne and his wife Sonya work with mixed farming operators Peter and Nikki Thompson and said the workshop had already prompted him to make changes at Echo Hills.



**Roma farm manager Kayne Maskill from Echo Hills has already started making changes to reduce spray drift risk.**

## Look at spraying with fresh eyes

"This workshop allowed me to look at our spraying practices with fresh eyes and make some changes, which we are ready to put into practice in the paddock as the season improves," Kayne said.

A survey, conducted six months after the workshops, found an impressive 70 per cent of participants surveyed had already implemented changes to their spray practices or were now confident their current procedures were best practice.

The survey found a total of 45 per cent of respondents had already implemented changes to their spray practices in the six months following the workshops. They were motivated to make changes as a result of what they learnt at the workshops, coupled with the regulatory changes to 2,4-D usage that came into effect last October.

Another 25 per cent of respondents said the workshops reinforced that their spray application operations and procedures were already best practice.

A total of 30 per cent of respondents reported that they had intended to make practice changes post the workshop, but implementing these changes had been hindered by ongoing drought conditions over summer.

Organiser Rhonda Toms-Morgan from ConnectAg in Roma said survey feedback indicated that the information delivered had been straightforward, offered a complete guide to effective crop spraying and prompted practice change or confirmed growers were already implementing industry best practice.

Presented by spray specialist Mary O'Brien, the Spray Drift Awareness workshops covered topics such as record keeping, weather conditions including inversions, nozzle selection, spray quality, coverage and efficacy, water quality, sprayer speed and adjuvants.

"Workshop participants were primarily property owners responsible for more than 650,000 hectares of farming country in this region," Rhonda said.

"Interestingly more than half reported this as the first spray drift awareness workshop they had attended. A total of 85 per cent were aged between 19 and 50, which also suggests we are reaching the next generation, or a new generation of growers."

Rhonda said the participants who made practice changes primarily reported investing in new nozzles as their major mechanical change.

This was followed by behavioural changes in:

- Scheduling spraying to avoid night-time applications;
- Improved weather monitoring to detect inversions and determine appropriate spray conditions; and,
- Better record keeping.

"Tough seasonal conditions have hampered people's efforts to put some of these things into practice," Rhonda said.

"But participant feedback indicates the information was relevant and helped people better understand the implications of the regulatory change which has followed the workshop, for 2,4-D specifically.

"They are now well positioned to decide how to equip their operations to adhere to label changes for chemical applications into the future."

Rhonda said when asked about the most important learnings from the workshop, the majority of attendees valued information about inversion risks at night and the impact of weather conditions on drift management.

"These workshops were developed in response to a grower-identified gap in knowledge between understanding and in-paddock practical spraying," she said.

"What growers wanted were practical guidelines for best practice so they could ensure chemicals were landing on target and they were reducing the risk of drift right across the region."

## Demand for practical information

GRDC Crop Protection Officer – North, Vicki Green, said the workshops were an example of organisations, such as the GRDC, being responsive to grower demand for practical information delivered at a regional level.

"The GRDC understands growers want to get product on target, because it means they are getting the best bang for their buck in terms of chemical use and application," Vicki said.

"To support growers, the GRDC are committed to playing a part in improving awareness, understanding and guiding the implementation of best practice through workshops like these."

Mary's farm spray drift management presentation at the workshop was complemented by a herbicide resistance session with well-known agronomist Paul McIntosh from the Australian Herbicide Resistance Initiative (AHRI), a GRDC investment.

Other presenters included Mick Russell from Workplace Health and Safety Queensland, who explained the current legal guidelines for safe workplaces, and GRDC Biosecurity Manager Ken Young who, along with Vicki, discussed chemical regulations and ongoing research into spray management.

**For the latest spray best practice information from the GRDC go to <https://bit.ly/2vYVrwv>**





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# Focus on micronutrients for macro returns

**D**RY periods during the growing season in Australia's grainbelt in recent years have heightened grower interest in improved diagnosis and treatment of micronutrient deficiencies, to better inform decision making.

While decision support packages are common for macronutrients including nitrogen and phosphorus, there is still some uncertainty surrounding micronutrient decision making.

A two-year project with GRDC investment, led by the Liebe Group, in Western Australia, aims to determine the requirements for and benefits of micronutrient foliar application in medium-to-low rainfall areas of WA's Northern Agricultural Region (NAR).

Liebe Group executive officer Rebecca McGregor said research into micronutrients had previously been conducted in the WA grainbelt, but much of this work had been in medium to high rainfall areas in southern and central cropping regions.

"Establishing a data set for our area would help local growers to make informed decisions about micronutrient fertiliser type, rate, timing and placement, that may improve the yield potential of their crops," she said.

## Managing micronutrient efficiency

"Many growers believe crop-limiting micronutrient deficiencies are occurring in their paddocks and they want to know why this is happening and what strategies or practices are needed to address this."

Rebecca said plant tissue testing remained a critical tool for diagnosing micronutrient deficiencies but was not widely used by growers, and the project also aimed to increase understanding of the benefits of utilising this decision support tool.

A 2018 Liebe Group survey of 25 farm businesses in the region confirmed that many local growers believe their crops have micronutrient deficiencies.

"Of the growers surveyed, 44 per cent believed their crops

were deficient in micronutrients, and of these, 90 per cent thought zinc (Zn) and copper (Cu) deficiencies were limiting crop potential, and 33 per cent perceived that Zn, Cu and manganese (Mn) were limiting crop potential," Rebecca said.

"Ninety two per cent of surveyed businesses used a compound fertiliser including Zn and Cu in trace amounts, and of these businesses, 24 per cent additionally used foliar-applied Zn and/or Mn, and 20 per cent also used a seed-applied product or a liquid micronutrient product banded at seeding.

"Most of the perceived deficiencies were on deep sandy earths and sandy duplex soil types."

## Scale and impact

Rebecca said the project was collecting and analysing plant tissue data from the region in order to gain a greater understanding of the actual scale and impact of micronutrient deficiencies.

She said 100 wheat paddocks, comprising a total of 400 sites, had been sampled across the region in 2018, a year in which most farms in the area had received good growing season rainfall.

"Plant sampling, conducted at the mid tillering stage, showed 17 per cent of plant samples had Zn levels considered to be marginal, with only five per cent considered deficient, and 6.75 per cent of samples had marginal Mn levels, with 2.25 per cent considered deficient," she said.

"No copper deficiencies were identified in the plant sample survey."

In 2019 the project will establish a demonstration site which will explore the impact of timing and rates of foliar micronutrients (Zn, Mn and Cu) on a wheat crop in the Latham region.

**Information about monitoring plant nutrition levels, including micronutrients, is available on the DPIRD website at <http://bit.ly/2ViXRjN>** ■



**A two-year project with GRDC investment, led by the Liebe Group, aims to determine the requirements for and benefits of micronutrient foliar application in medium-to-low rainfall areas of WA's Northern Agricultural Region.**  
(PHOTO: Shaun Fitzsimons, Buntine)





## Researchers gain ground on soil water challenge

**T**HE effective capture and storage of water is a holy grail for northern grain growers who have long strived to harness the productive benefits of every millimetre of rainfall.

It's underpinned enormous change in farming techniques over the years with the adoption of practices like zero tillage, but researchers believe that significant additional productivity gains are possible with a well-managed cover cropping program.

DAF extension officer David Lawrence says early results suggest that cover crops can increase net water storage across fallows with limited ground cover and deliver dramatic yield increases in subsequent cotton and wheat crops.

"In recent trials, measured yield gains for various cover crop treatments were 950, 1461 and 1129 kg per hectare respectively, representing increased returns of between \$250 and \$380 per hectare," David said.

"These are quite remarkable results and while unlikely to occur often, may demonstrate the value of retained surface moisture for good establishment."

### Effective capture and storage

While the industry is becoming increasingly more adept at utilising available soil water and improving individual crop performance in dryland systems, the effective capture and

storage of rainfall across the whole farming system remain major challenges for northern grain and cotton growers.

For a number of years GRDC farming systems research investments have been assessing ways to improve this system water use, and to achieve 80 per cent of the water and nitrogen limited yield potential in northern cropping systems.

This work adds to past research by GRDC's Eastern Farming Systems project and Northern Growers Alliance (NGA) trials that suggested cover crops and increased stubble loads can reduce evaporation, increase infiltration and provide net gains in plant available water over traditional fallow periods.

"Consequently, cover crops may be a key part of improved farming systems providing increased productivity, enhanced profitability and better sustainability," David said.

Cover crops are used in southern Queensland and northern



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DAF extension officer David Lawrence. (PHOTO: DAF)



# Harvest weed seed control benefits organic croppers

**O**RGANIC farmers are the original integrated weed managers. Now, some of the innovations that are being developed to combat herbicide resistant weeds on conventional farms are proving useful for organic farmers too.

Phil and Ashlee Jackson, in partnership with Brad and Jenna Jackson, manage a 400 hectare organic farming system at Westmar, southern Queensland, growing wheat, linseed and lablab.

Since 2014 Brad and Phil have been developing valuable weed management tactics, such as camera-guided inter-row cultivator, narrow windrow burning and green manuring, that can be employed in both conventional and organic farming systems.

With cultivation being the only real option for summer weed control in organic farming operations, Brad and Phil are keen to investigate any options that will help them stay ahead of the weed seed bank.

"Not being able to do any in-crop weed control was a big concern for us," says Brad. "Three years ago we bought a Garford inter-row cultivator from the UK to use in our wheat and linseed crops."

The cameras on the cultivator guide the alignment of the tynes to follow the plant row with an accuracy of just 10 mm. The 500 mm row spacing enables use of the inter-row cultivator, which can be used when the crop is 100 to 400 mm high.

"We use it mainly to control wild radish and wild oats," says Phil. "It suits our 12 metre controlled traffic farming system and there is no reason why we couldn't also use it strategically in our no-till conventional farming operation at Gurley, NSW."

At harvest, Brad and Phil use narrow windrow burning on as much of the area as possible, to collect and burn weed seed present late in the season. They have found this practice a good way to reduce the weed seed bank most years without burning all the stubble.



**Phil Jackson (left) with brothers Matt (centre) and Brad (right). Phil and Brad manage the organic farm at Westmar Queensland and all three brothers work alongside their parents Peter and Janice on their conventionally-farmed land at Gurley northern NSW.**

**At the Bungunya site, the biggest yield increases were from the cereal cover crops, especially the late-terminated millet and the sorghum. (PHOTO: DAF)**

NSW to overcome a lack of stubble and protect the soil following low residue crops such as chickpea and cotton or following skip-row sorghum with uneven stubble and exposed soil in the 'skips'.

## When to terminate cover crops?

Growers typically plant white French millet and sorghum and spray them out within about 60 days to allow recharge in what are normally long fallows across the summer to the next winter crop.

Research to date has shown that allowing these cover crops to grow through to maturity led to significant soil water deficits and yield losses in the subsequent winter crops.

"But the Eastern Farming Systems project showed only small deficits, and even water gains, accrued to the subsequent crops when millets were sprayed out after six weeks, with average grain yield increases of 0.36 tonnes per hectare," David said.

"Furthermore, NGA work supported by GRDC is indicating that the addition of extra stubble (from 5–40 tonnes per hectare) after winter crop harvest appears to reduce evaporation, with initial studies showing between 19 mm and 87 mm increases in plant available water.

"These gains will be valuable if validated in further research and captured in commercial practice."

For more information on the cover cropping research project, David's 2019 Goondiwindi GRDC Grains Research Update paper is available from the Resources and publications section of the GRDC website [www.grdc.com.au](http://www.grdc.com.au) or by following this link <https://grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2019/03/cover-crops-can-boost-soil-water-storage-and-crop-yields>



Phil says it can be rewarding when the conditions are favourable, particularly to control annual ryegrass. "We try to burn as early as is safe to clear the way for cultivation for summer weed control," he says.

The Jacksons also utilise green manuring – an age-old weed control tactic in organic farming. They have found the summer legume lablab to be a good option for green manure ahead of a long fallow. Lablab produces a dense and competitive crop that prevents weeds from establishing, while also giving the soil a nitrogen boost.

The tactics employed in this organic operation tick off all the non-herbicide weed control tactics in the WeedSmart Big 6 promoted as a practical system to combat herbicide resistance. In an organic system, five of the six tactics can be broadly applied to reduce weed pressure.

- **Rotate crops and pastures** – The Jacksons' rotation is simple but effective. Linseed is grown after wheat to control soil borne root diseases including crown rot, common root rot, yellow leaf spot and spot form of net blotch. It is also resistant to both main species of root lesion nematodes. Linseed yields are higher when grown after AMF host crops that maintain high numbers of the arbuscular mycorrhizae fungi (AMF). High performing crops are one of the best ways to combat weeds.
- **Mix and rotate herbicide MOA** – Not applicable on organic farms but very important in systems that use herbicides.
- **Increase crop competition** – High performing winter crops combined with a summer legume green manure crop in rotation.
- **Use the double knock to preserve glyphosate** – Not applicable on organic farms. The idea of monitoring weed control efficacy and removing survivors still applies – more crop, less weeds.

■ **Stop weed seed set** – Cultivation in the fallow and in-crop (with the guided inter-row cultivator) significantly reduces weed seed set.

■ **Implement harvest weed seed control** – The Jacksons currently use narrow windrow burning to capture weed seed at harvest. They are also looking at other options such as chafflining and impact mills. All the current harvest weed seed control tactics are non-chemical tools that are being rapidly adopted on Australian farms.

For more information about non-herbicide weed control tactics, visit the WeedSmart website: [www.weedsmart.org.au](http://www.weedsmart.org.au)



Narrow windrow burning can be successful in reducing weed pressure in the following seasons, particularly for annual ryegrass. The Jacksons use narrow windrow burning as a harvest weed seed control in both their organic and conventional operations.

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# What doesn't kill you, makes you stronger

■ By Cindy Benjamin

**E**XPERIENCING hardship is often the best way to learn the big lessons in life. Heartbreak, financial difficulty, hunger and hard manual labour are often times great motivators and they build resilience in those individuals who are not crushed by them.

But, like banging your head against a brick wall, it is good when it stops! Taking a person who has experienced hardship and giving them an opportunity or access to resources will often result in great success. There are many examples where tenacity and grit have underpinned the success of social reformers, sportspeople, businesspeople and performers, and even everyday people in their every-day lives.

Researchers Gulshan Mahajan, Amar Matloob, Barbara George-Jaeggli, Michael Walsh and Bhagirath Chauhan have studied this same phenomenon in an emerging weed in the northern grains region – African turnipweed.

Working with two biotypes of African turnipweed – one from the higher rainfall environment of Dalby, Queensland and one from the medium rainfall environment of St George, Queensland – the researchers wanted to know if there were differences in the way that these two populations respond to environmental stress. They also wanted to gather intelligence about the germination biology of this weed, which is emerging as a potential threat to cropping in the northern region.

### Weed ecology studies underpin effective weed control

African turnipweed (*Sisymbrium thellungii*) is currently more common in southern Queensland, but is also present in northern NSW, mainly on black soil country. Until recently it has been a fairly innocuous weed that had not really been of concern to farmers.

But, it is becoming increasingly difficult to control in winter crops and there is one confirmed case in southern Queensland of resistance to Group B (acetolactate synthase (ALS) inhibiting) herbicides.

Having flown under the radar for so long, researchers have now set their sights on gaining a better understanding of the biology of this weed species. Weed ecology studies are an essential first step in developing a management strategy – you can't manage what you don't understand.

In this AHRI Insight we are bringing you the combined results of two weed ecology studies:

- A study of the effect of water stress on plant biomass and seed production of African turnipweed in a pot trial using seed from two distinct biotypes (Dalby and St George).

- A study of the effect of temperature, light, salt, osmotic stress, pH, crop residue, burial depth and agricultural environment (fence line vs. cropped area near St George) on germination behaviour of African turnipweed under controlled laboratory conditions.

### Understanding weed behaviour

When grown under a range of soil moisture conditions (25, 50, 75 and 100 per cent soil water holding capacity) the St George biotype (medium rainfall) plants were much larger (89 per cent more biomass) and produced vastly (321 per cent) more seed than the Dalby (high rainfall) biotype.

When the plants were grown under water stress (25 per cent WHC) the Dalby biotype produced only 28 seeds per plant while the St George biotype powered through to produce 4061 seeds per plant.

When the water stress was removed, the Dalby biotype



When grown without competition, African turnipweed plants have high biomass and produce more than 67,000 seeds per plant.



**TABLE 1: Data summary of environmental effects on African turnipweed seed germination percentage**

Altern. temp. day/night	Germ. %		Osmotic potential MPa	Germ. %	NaCl conc mM	Germ. %	pH	Germ. %
	Light/dark	Dark						
15/5 C	81.0	77.7	0.0	93.7	0	93.7	4.0	62.7
20/10 C	97.3	65.3	-0.1	54.3	50	87.3	5.0	72.7
25/15 C	84.7	19.0	-0.2	28.7	100	11.0	6.0	73.7
30/20 C	2.7	0.0	-0.4	17.0	150	0.0	6.4	92.0
LSD (0.05)	68		-0.6	7.3	200	0.0	7.0	81.0
			-0.8	0.0	250	0.0	8.0	82.0
			-1.0	0.0	LSD (0.05)	6.1	9.0	79.0
							10	78.7
							LSD (0.05)	7.3

produced 4787 seeds per plant compared to 9834 seeds per plant for the St George biotype.

And this is the nub of the problem.

If widespread resistance to herbicide were to evolve in the St George biotype, there is immense potential for a weed seedbank explosion. This potential is great in the current geographic region of the St George biotype, but even greater in the Dalby area if there were to be an incursion of the St George biotype (via grain, hay, livestock or machinery movement) into this more favourable environment.

When it comes to germination ecology, African turnipweed is clearly a tough character (see Table 1). It is not the least bothered by soil pH (achieving over 60 per cent germination at pH 4–10) and can handle highly saline conditions (as high as 100 mM NaCl). To preserve the seedbank, it holds out for sufficient soil moisture before initiating germination and does not germinate in day/night temperatures of 30°/20°C and over. All these traits combine to give this weed a competitive edge, particularly in marginal soils or seasons.

It is well suited to a no-till farming system with large quantities of seed being deposited on the soil surface. In a no-till farming system, strong germination rates (over 80 per cent) were observed in temperature regimes (day/night temperatures) ranging from 15°/5° to 25°/15°C.

Although African turnipweed seed will germinate in the dark (albeit at a lower rate), it will not emerge from depths as little as one cm. The addition of four tonnes per hectare or more of residue reduced seedling emergence by about 30 per cent compared to the 80 per cent emergence in the no-residue treatment. Lower levels of crop residue may have the opposite effect, conserving some moisture while not providing sufficient shading effect, resulting in improved germination.

In an associated seed bank persistence study, almost all of the African turnipweed seed placed on the soil surface decayed (or germinated) within 12 months. When buried at a depth of 2 and 10 cm, about 30 per cent of the seed remained viable after 24 months.

### Formulating an IWM strategy for African turnipweed

Getting to know more about a weed species' biology is critical to formulating a control strategy and avoiding herbicide resistance.

In cereals, there are some herbicide options, other than Group B, available to control African turnipweed, but in pulses and oilseed crops, the chemical options are very limited.

The good news is that African turnipweed is susceptible to crop competition – particularly in cereals.

When grown without competition, African turnipweed plants have high biomass and produce more than 67,000 seeds per

plant. In 18 cm row spacing wheat crops, where the canopy starts closing after four or five weeks, African turnipweed plants remained very small and did not grow through the crop.

Chickpea – being a less competitive crop – allowed African turnipweed to establish and set seed. The weed seed was shed before the crop was ready to harvest, making harvest weed seed control ineffective for this species.

Preventing weed seed set in African turnipweed is a sure-fire way to bring this weed under control within a few years. The rapid decay of seed left on the surface can be exploited to help manage the seedbank and keep weed numbers low provided seed set is prevented in those plants that germinate. Strong crop competition is a good way to achieve this.

Other cultural control possibilities include occasional light tillage (to a depth of just a few centimetres) of weedy patches and, in high residue situations, stubble cover of four tonnes per hectare or more can provide sufficient shading of the soil surface to prevent germination in a no-till farming system.

Bear in mind that if cultivation is used to re-set the seedbank in a heavily infested patch, although the seed will not germinate from depth, the buried seed will remain viable for longer and so must remain undisturbed for many years. Even the planting operation could bring some seed back to the surface where germination would be possible.

This research also clearly demonstrates the need to observe and respond to regional differences in weed behaviour and to take farm biosecurity seriously – clean seed, clean paddocks, clean borders.



**In a competitive wheat crop environment, African turnipweed struggles to grow. African turnipweed can establish in chickpea crops and will shed its seed before the crop is ready to harvest so it will not be controlled at crop desiccation or with harvest weed seed control strategies.**

# Transferring sorghum's weed-killing power to rice

■ By Sandra Avant, Agricultural Research Service – USDA

**S**CIENTISTS have transferred a biochemical pathway found in sorghum, which produces a weed-killing compound, into rice plants. The compound sorgoleone, secreted by sorghum, helps the plant combat weeds. It works so well that some other crops struggle to grow in fields where sorghum has been grown, causing problems for growers who want to rotate different crops in those fields.

Scientists at ARS's Natural Product Utilization Research Unit (NPURU) in Oxford, Mississippi, are investigating whether sorghum's weed-inhibiting properties can be transferred to other crops like rice and used as a bioherbicide.

Producing sorgoleone in other crops would potentially give those plants the ability to fight weeds and reduce reliance on synthetic herbicides, says NPURU molecular biologist Scott Baerson.



**Scientists are investigating if sorghum's weed-inhibiting weed compound sorgoleone can be transferred to other crops such as rice.**

Prior to this research, nothing was known about the genes that make sorgoleone, Scott says. After years of research, the NPURU team, which include Scott and molecular biologist Zhiqiang Pan, recently reached a milestone that allowed them to transfer the sorgoleone compound into rice.

## Twofold research impact

The impact of this research, part of which was recently published in *New Phytologist*, is twofold, according to Pan and Scott.

- The rice plants that produce sorgoleone should require less herbicides to control weeds. At a minimum, the natural compound could reduce the amount of synthetic chemicals sprayed onto food crops. Secondly, growers would spend less on buying and applying chemicals – a major part of their input costs.
- In addition, a crop that produces its own herbicide potentially would be more efficient – increasing profits for farmers and food processors. Ultimately, these savings could be passed on to consumers, Scott adds.

In earlier studies, the researchers successfully increased sorgoleone to make sorghum more resistant to weeds, which would help growers who do not rotate sorghum with other crops. They also stopped sorghum plants from producing sorgoleone, which would benefit farmers who want to rotate different crops with sorghum.

## The next step

The next step is to see if rice plants grown in the laboratory will produce sorgoleone as they grow and have the same weed-fighting ability as sorghum.

ARS has five patents on this technology.

**The Agricultural Research Service is the US Department of Agriculture's chief scientific in-house research agency.**

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# Peanut genome sequenced with unprecedented accuracy

■ By Jan Suszkiw, Agricultural Research Service – USDA

IMPROVED pest resistance and drought tolerance are among potential benefits of an international effort in which Agricultural Research Service (ARS) scientists and their collaborators have produced the clearest picture yet of the complex genomic history of the cultivated peanut.

Scientists undertook this large project to better understand the molecular and cellular mechanisms that underpin the peanut plant's growth and development, as well as the expression of desirable traits, like high seed yield, improved oil quality and resistance to costly diseases and pests such as root knot nematodes.

Cultivated peanut, *Arachis hypogaea*, is an important grain legume and oilseed crop, with a total global production area of approximately 24 million hectares. Besides oil, peanut seed contains protein, vitamins and other nutrients.

## A cultivated peanut from the wild side

The story of the cultivated peanut begins several thousand years ago in South America, where the genomes of two wild ancestors, *A. duranensis* and *A. ipaensis*, merged in a rare genetic event.

The result, in modern-day peanuts, is a complex genomic blend that's nearly as big as the human genome – which is about 3 billion DNA base pairs.

Initially, scientists sequenced the genomes of the two wild ancestors separately, using DNA taken from the two species rather than from cultivated peanut. This made it easier to identify structural features of the genomes and the genes residing on them.

The team reported that progress in a 2016 issue of the journal *Nature Genetics*. Now, using advanced DNA sequencing equipment, the researchers have sequenced the two merged genomes in a single commercially grown peanut, namely 'Tifrunner,' filling in knowledge gaps that the previous effort missed.

This latest advance, reported in the May issue of *Nature Genetics*, has already generated interesting leads, including the geographic origin of *A. duranensis*, one of the two parents of cultivated peanut. The team's genomic analysis of populations of plants that make up the wild peanut species pointed to a region in northern Argentina known as Rio Seco.

Researchers surmise that ancient farmers migrating there from Bolivia exposed *A. duranensis* plants to another species they had brought with them – *A. ipaensis*, considered the other parent of cultivated peanut.

## Crossing ancient lines

The researchers also recreated this genomic merger by crossing the two ancient peanuts species and analysing the results in seven generations of offspring plants.

This revealed an interesting pattern of DNA swapping and deletions (eliminations) taking place in the offspring plants that likely explains the diverse seed size, shape, colour and other traits seen in commercial peanuts today.

The DNA swapping is unusual in that it occurs between



Two wild ancestors: *Arachis ipaensis* (left) and *Arachis duranensis* (right) – of the cultivated peanut.  
(PHOTO: Merritt Melancon/University of Georgia)

the two 'subgenomes' of the two contributing wild species – something that's possible due to their high similarity.

Led by University of Georgia researcher David Bertioli, the effort is a continuation of the *International Peanut Genome Initiative* and involves scientists from four ARS laboratories and other partner organizations in the United States, Argentina, Brazil, China and India.

The ARS team's contributions included providing bioinformatics support, peanut germplasm resources and data for analysis, mapping and comparison. Brian Scheffler at Stoneville, Mississippi; Steven Cannon at Ames, Iowa; and Baozhu Guo and Corley Holbrook at Tifton, Georgia, were among ARS contributors.

The Agricultural Research Service is the US Department of Agriculture's chief scientific in-house research agency. Daily, ARS focuses on solutions to agricultural problems affecting America.

# Decoded durum genome opens doors to potential improvements

■ By US Wheat Associates

**I**N April this year, the results of a study by a consortium of researchers from seven countries was published in *Nature Genetics* describing the sequence of the entire genome of an Italian durum wheat variety called 'Svevo'. Durum breeders suggest this is an important finding that will help speed development of new, improved varieties of the crop that provides semolina for high quality pasta products.

"We can now examine the genes, their order and structure to assemble a blueprint that provides an opportunity to understand how the genes work and communicate with one another," said University of Saskatchewan wheat breeder Dr Curtis Pozniak in a statement from the consortium. "With this blueprint, we can now work quickly to identify genes that are responsible for the traits we select for in our breeding programs such as yield, disease resistance, and nutritional properties."

## Groundbreaking research

Calling the work ground-breaking, another spokesperson for the consortium said it "will lead to new standards for durum breeding... paving the way for production of durum wheat varieties better adapted to climate challenges, with higher yields, enhanced nutritional quality and improved sustainability."

"This is good news for durum breeders," said Dr Elias Elias, Distinguished Professor, J F Carter Durum Wheat Breeding/Genetics, with the Plant Sciences department of North Dakota State University (NDSU). "We do know much about the positive traits we want to express. Now, with the complete genome map,



Scientists have recently mapped the complex, polyploid genome of hard amber durum. This durum class produces semolina for premium pasta products, couscous and semolina bread. The class evolved from wild emmer wheat around 2000 years ago.

we will be able to identify the specific gene or markers for the genes responsible for the traits in a much more precise way."

For example, the team that decoded the genome said they had discovered the gene that causes the durum plant to take up cadmium, an undesirable trait. Elias said NDSU has already introduced durum varieties with low cadmium uptake.

With the specific gene identified, breeders can more quickly select for varieties without the undesirable trait for conventional breeding methods or, perhaps in the future, precisely alter an undesirable function through gene editing to bring improved varieties to farmers more quickly. ■

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## Canola blackleg breakthrough

**N**SW Department of Primary Industries (DPI) researchers have identified genetic regions which could be used to develop new canola varieties with durable resistance to blackleg disease. A three-year international study under field and glasshouse conditions led by DPI molecular scientist, Harsh Raman, found multiple genes throughout the canola genome can control resistance to blackleg.

"Eight regions on the canola genome with resistance to blackleg were detected across diverse environments including Australia, the United Kingdom and France," Harsh said.

"These identified genomic regions could be targeted to breed elite canola varieties with durable or long-term blackleg resistance and global application."

Blackleg disease is caused by the fungus, *Leptosphaeria maculans*, the most devastating pathogen affecting crops since 1970, which threatens canola production worldwide.

### Multigene resistance and a highly diverse pathogen

Harsh said identification of a durable source with multigene resistance is significant for Australian canola production systems, where the pathogen is highly diverse.

"Durable resistance genes offer opportunities for canola breeders to develop new varieties with quantitative resistance," he said. "We continually need to discover new sources of major

and quantitative resistance in canola and related species to minimise yield losses.

"Major resistance genes often do not protect canola plants in the long-term, as gene mutations in the blackleg pathogen render those genes ineffective over time.

"Given that quantitative resistance is difficult to select and is complicated by environmental factors, molecular markers linked with resistant loci could be used to enhance blackleg resistance in canola germplasm."

To manage blackleg disease farmers use a number of strategies including crop rotation, stubble management, seed dressing and resistant varieties. The use of resistant varieties is the most widely adopted, cost-effective and environmentally friendly approach.

**This research was funded through NSW DPI, GRDC, Victoria's DED, Jobs, Transport and Resources, University of Western Australia and INRA, France.** ■



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DPI molecular scientist, Harsh Raman.

# Haloxypop spray compliance is critical for continued use on canola

**N**ATIONAL Working Party on Grain Protection (NWPGP) chair Gerard McMullen is reminding canola growers to adhere to label application directions on herbicides containing haloxypop as part of an industry-wide effort to avoid unacceptable chemical residues.

## When and where NOT to use haloxypop

For herbicides containing haloxypop as the active ingredient, label directions stipulate they must not be applied to canola and other specified oilseed crops:

- After the eight-leaf growth stage; or,
- After the stem elongation growth stage has commenced (this may occur before the eight-leaf growth stage – so determine the crop growth stage before application); or,
- Under or between windrows (this is not a registered label use and could result in chemical residues).

Of the haloxypop herbicide products available in Australia, Verdict 520, Asset and Inquest herbicides are examples of those commonly used by canola growers.

Highlighting the importance of complying with label directions, Gerard says residue testing by the National Residue Survey has detected haloxypop residues above the Australian maximum residue limit (MRL) in canola traded domestically, which is of concern.

Also, the European Union – Australia's main canola export market – is implementing new, tighter import controls.



Canola at the leaf production stage, left (before the eight-leaf growth stage), and after the stem elongation growth stage has commenced, on right.

## EU to lower haloxypop MRL

Gerard says the EU has indicated it plans to lower its current haloxypop MRL for canola to 0.05 milligrams per kilogram.

Although still to be finalised, this revision reducing the haloxypop MRL for canola sold into EU markets is expected to occur before the 2019–20 harvest.

The haloxypop MRL for Australian canola exports to Japan – another major market – remains at 0.1 mg per kg.

"Australian grain growers have a very good history of compliance with product label directions and, as an industry, we need to ensure that haloxypop continues to be used in accordance with label directions," Gerard says.

"Growers are also encouraged to consider other herbicides containing products with different active ingredients for in-crop control of grass weeds in canola."

## Trade risks

To help tackle the trade risks that haloxypop residues pose to domestic and export canola markets, the Australian grains industry has established a Haloxypop Working Group. The need for this group was flagged at the annual NWPGP Conference in Melbourne in June 2018.

Also chair of the Haloxypop Working Group, Gerard says the new group has developed a series of steps, supporting previous industry measures, with the aim of further reducing haloxypop residues in canola.

GRDC crop protection officer – west, Georgia Megirian, reiterated the importance of adhering to label directions when applying herbicides containing haloxypop.

"Applying haloxypop to canola after stem elongation will result in chemical residues that exceed maximum residue limits," Georgia says.

"This, in turn, can lead to the rejection of canola shipments in export markets and create ongoing market access issues.

"Following label directions is not only a regulatory requirement, it is also important in preserving haloxypop herbicide chemistry as a cost-effective grass control option for canola growers across the country."

A more detailed article about haloxypop is available on the GRDC website at <http://bit.ly-2HoNrLC>



NWPGP chair Gerard McMullen is reminding canola growers to adhere to label application directions for herbicides containing haloxypop. (PHOTO: GRDC)



# 25 years of testing ryegrass resistance – it's a numbers game

■ By Kirrily Condon

**T**WENTY five years. 5308 samples. 26,517 tests. 12 million ryegrass seeds. That's 26,517 times Charles Sturt University (CSU) has sown, sprayed and counted annual ryegrass from around 12 million seeds submitted from more than 5000 samples sent in from across Australia since it started testing for herbicide resistance in 1991... and that's just ryegrass.

### Mind numbing stuff

But more than 5000 ryegrass samples? Most tested to five or six herbicides? Think about the value of that information!

Dr John Broster and Professor Jim Pratley from CSU have analysed the data from ryegrass samples sent to the testing service over the 25 year period from 1991 to 2015. It's important to note that these are samples sent for testing for a reason – mainly because herbicide resistance is suspected, but increasingly to determine the susceptibility of new or alternative herbicides.

In a snapshot, resistance was highest for Group A 'fops' (81 per cent), Group A 'dens' (81 per cent) and Group B (56 per cent). Group B also wins the gong for the fastest increase in resistance over the 25 years.

While these results aren't unexpected, there are some interesting relationships where multiple resistance occurs within herbicide groups. For example, 100 per cent of samples tested to Group A fops and dens had the same resistance status to both, while only 39 per cent had the same resistance status when tested to Group A fops and dims.

But, in a classic case of 'oils ain't oils', this ranged from 35 to 80 per cent depending on which dim herbicide was tested!

### Changes in resistance over time

Since the testing service began more than 80 per cent of annual ryegrass samples tested to Group A fops and dens have been resistant. While fop resistance has increased over time, pinoxaden (eg. Axial) resistance hasn't changed significantly since it was introduced in 2006 (Figure 1).

Group B and Group M resistance has also increased over time, while Group C and Group D resistance has declined. Group A dim resistance has not changed significantly.

Less than one per cent of samples have tested resistant to

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Group L (paraquat/diquat) and no samples have tested resistant to propyzamide (Group D), prosulfocarb + metolachlor (eg, Boxer Gold, Groups J & K) or pyroxasulfone (eg. Sakura, Group K) through the CSU testing service.

Note that resistance to these pre-emergent herbicides has been detected by the University of Adelaide – see AHRI Insight #105 'Alphabet cross-resistance in South Australia'.

**TABLE 1: Resistance overview and changes over time**

Herbicide Group	Subgroup	Example	Resistance %	Change over time (P<0.001)
A	Fops	Topik, Verdict	81	Increased
A	Dims	Achieve, Factor, Select	24	No change
A	Dens	Axial	81	No change
B	SU, imi	Glean, Intervix	56	Increased
C	Triazines	atrazine, simazine	1	Decreased
D	Dinitroanilines	trifluralin	7	Decreased
M	Glycines	glyphosate	4	Increased

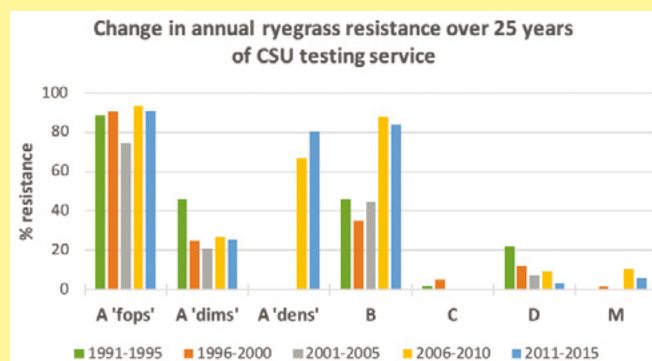
### Resistance to multiple herbicide groups

Over 3300 of the annual ryegrass samples were submitted for testing to the five standard herbicide groups (Group A fops and dims, B, C and D). Of these, only nine per cent were susceptible



Herbicide resistance testing at CSU, Wagga Wagga NSW.  
(PHOTO: J. Broster)

**FIGURE 1: Over 25 years, annual ryegrass resistance to Group A fops, B and M has increased**

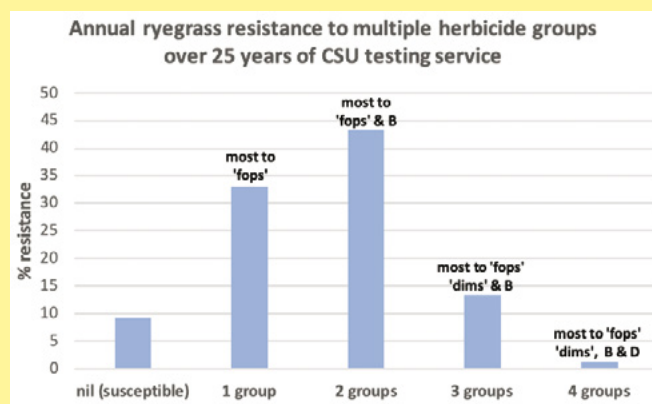


Group C and D resistance has declined, Group A dims and dens has remained stable (P<0.001).

to all groups, while just one per cent were resistant to four groups.

Most samples were resistant to one or two herbicide groups, typically Group A fops or fops plus Group B (Figure 2). Those resistant to three groups were commonly through the addition of dim resistance.

**FIGURE 2: Most annual ryegrass samples were resistant to one (Group A fops) or two (fops + Group B) herbicide groups**



### Resistance patterns within herbicide groups

All Group A herbicides carry a high resistance risk, with a strong possibility of cross resistance to other Group A herbicides.

#### Group A fop + den

Analysis of the CSU data showed a strong correlation between annual ryegrass that was tested to both Group A fops and dens, with all samples having the same resistance status to both. That is, any sample that was resistant to fops was also resistant to dens, and conversely, any sample susceptible to fops was also susceptible to dens.

#### Group A fop + dim

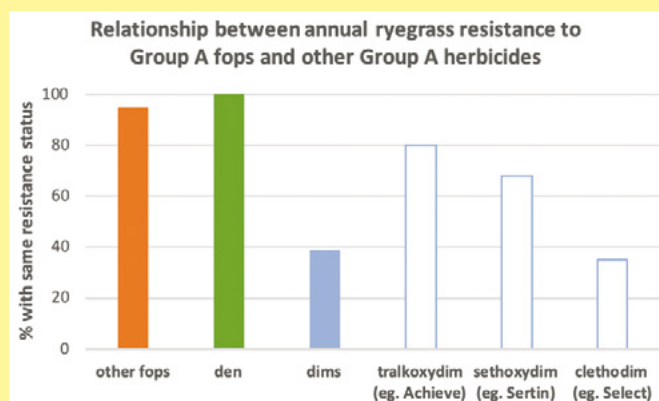
The relationship between the resistance status of fop and dim herbicides was weaker, but there were differences between the type of dim herbicide. For example, fops showed a much stronger relationship to the resistance status of tralkoxydim (eg. Achieve) than clethodim (eg. Select).

#### Group A dims

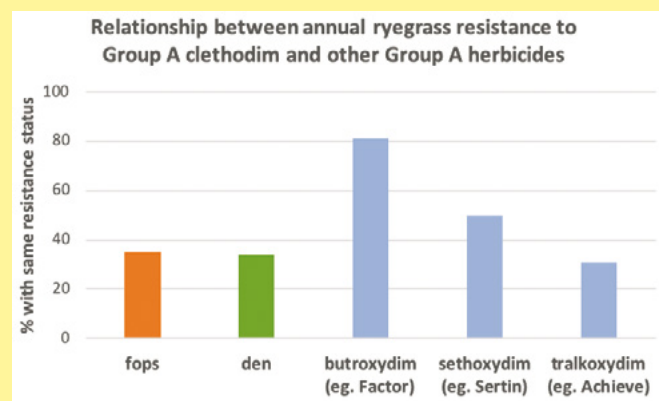
While clethodim showed a weak relationship to the status of



**FIGURE 3: There was a strong relationship between the resistance status of Group A fops and dens, but a weaker relationship to some dim herbicides**



**FIGURE 4: The relationship between the status of clethodim resistance and other dim herbicides varied significantly, with the strongest correlation being to butroxydim (eg. Factor)**



fop and den resistance, it varied in its correlation to other dim herbicides. Only 31 per cent of samples tested to both clethodim and tralkoxydim (eg. Achieve) had the same resistance status, but 80 per cent tested to both clethodim and butroxydim (eg. Factor) had the same resistance status. Food for thought when planning herbicide strategies for crop rotations and break crops.

#### Group B

Group B herbicides have the notorious reputation of being the group most likely to develop resistance, even higher than Group A. The testing results have shown that 70 per cent of annual

ryegrass samples tested to both sulfonylurea and imidazolinone herbicides had the same resistance status. Something to think about with the rapid increase in imi-tolerant crops in recent years.

We're constantly being told herbicide resistance is a numbers game. Lower weed numbers mean lower selection pressure. Strive for zero. But in the case of the CSU resistance testing service, 5308 annual ryegrass samples with 26 517 resistance tests on 12 million seeds over 25 years is definitely a good thing!

Broster, J., Pratley, J., Ip, R., Ang, K., & Seng, J. (2019). A quarter of a century of monitoring herbicide resistance in *Lolium rigidum* in Australia. *Crop and Pasture Science*, 70(3), 283-293. <https://doi.org/10.1071/CP18584>

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*Thousands of tonnes of commercial lucerne hay could be produced at Adelaide Airport each year as part of a project to reduce runway temperatures.*

# Flying high and cool with lucerne

■ By Andrew Spence

**T**RIALS at Adelaide airport in conjunction with state-owned utility SA Water, over the past three years have shown the cooling effects of lucerne can drop air temperatures by more than 3°C on warm days.

A business case is being finalised to extend the project from its current four hectare trial plot to up to 200 hectares of airport land. The lucerne is being irrigated by captured stormwater but will also include recycled water if the project is extended.

The trial site is 600 metres south of the airport's main runway. A number of grass species were initially trialled including tall fescue, couch and kikuyu. But it has been lucerne which has had the greatest impact on lowering ambient temperatures.

Growing lucerne has led to a reduction in average ambient air temperatures in and around the irrigation area of more than 3°C on warm days.

## Why is temperature important for aircraft?

In warmer, less dense air, planes must travel faster down the runway to produce the lift needed for take-off. When a runway lacks the distance required to reach these speeds, a plane's weight must be lowered by removing passengers, luggage and cargo. This reduces profit for the airline.

There is also a threshold temperature above which some smaller domestic aircraft simply cannot take-off.

SA Water Environmental Opportunities Manager Greg Ingleton, who developed the world-first Adelaide Airport concept, said there may be opportunities to extend the cropping concept to other airports in Australia and internationally.

"No other airport in the world has looked at it from a reducing air temperature perspective," Greg said.

"We're getting a lot more momentum now, there's a lot more airport interest and we've been contacted by some interstate and international airports."

Adelaide Airport has the potential for up to 200 hectares of lucerne and a further 50–100 hectares of irrigated turf around the main runway and other infrastructure.

"It's one of those projects where everybody benefits – SA Water will benefit from the sale of the recycled water, the airport will benefit from the sale of the lucerne and a reduction in energy usage, the airlines benefit because of the savings that can be achieved in fuel and maintaining payload on warm days," Greg said. ■

## news & new products

# Applications open for COGGO funding

**A**CALL for a new round of research projects to benefit West Australian grain growers has been announced by the Council of Grain Grower Organisations Limited (COGGO).

COGGO is looking to fund new innovative ideas for start-up R&D projects commencing in 2020 to benefit growers in the Western Australian grains industry.

In calling for Expressions of Interest, Rhys Turton the Chairman of COGGO said "COGGO is pleased to once again offer funding of local research and development projects aimed at improving the profitable growing of grain crops in Western Australia."

Projects funding ranges between \$20,000 up to \$75,000 per annum for a one or two year project and is allocated on a competitive basis to projects which offer clear benefits to Western Australian grain growers as a result of that research.

"For 2020 projects we have increased the maximum funding for the year from \$50,000 to \$75,000 offering more value to successful projects. COGGO receives a wide range of applications for projects from grower groups, universities, CSIRO, the State Government's agriculture department and agricultural consultants and has funded over 50 projects in the past seven years," Rhys said.

COGGO established the COGGO Research Fund to invest in innovative research and development projects across the whole supply chain that can demonstrate a direct benefit to Western Australian grain growers. It is focused on funding catalytic or start up "proof of concept" research that can lead to further development using government, grower or commercial funding.

The COGGO Research Fund is financed through a voluntary levy collected from Western Australian grain growers who are members of COGGO with the cooperation of grain acquisition and marketing companies. All WA grain growers are eligible to become members of COGGO.

The Grain Industry Association of Western Australia (GIWA) Inc administers the COGGO Research Fund on behalf of COGGO. Further information and an "Expression of Interest" application form is available from GIWA at [www.giwa.org.au/coggorsearchfund](http://www.giwa.org.au/coggorsearchfund) or by phoning (08) 6262 2128.

The closing date for expressions of interest is Friday July 5, 2019. ■



**The lucerne planting at Adelaide Airport has proven to reduce ambient air temperatures by more than 3°C on warm days.**



# Crop competition, herbicides and ryegrass control in canola

By Gurjeet Gill & Ben Fleet, University of Adelaide and Sarah Noack, Hart Field-Site Group

## Results at a glance...

- Atrazine pre-sowing followed by clethodim post-emergence reduced ryegrass plant density relative to the untreated control by 57 per cent. The use of propyzamide pre-sowing, followed by atrazine and clethodim plus Factor increased ryegrass control to 77 per cent.
- Canola variety had a significant effect on ryegrass head density. When averaged across the sowing dates and herbicide strategies, ryegrass growing in HyTTec Trophy produced 52 heads per m<sup>2</sup> as compared to 78 in ATR Bonito.
- Herbicide treatment application produced canola yields of around 0.8 tonnes per hectare, which was almost 50 per cent greater than the yield obtained in the control. These results highlight the competitive ability of ryegrass against canola, especially in a dry 2018 season.

## Why do the trial?

Farmers in the southern region have been gradually moving towards earlier sowing times for canola. In fact, many growers have been seeding canola into dry soil in mid-late April. Canola crops sown early tend to respond positively to the warm growing conditions and crop canopy closure can be rapid in such situations. Therefore, early sowing could be highly beneficial in achieving greater suppression of weeds such as ryegrass.

Previous research has shown there can be differences in early vigour between hybrids and open pollinated TT varieties, which could play an important role in weed suppression. It is important to investigate the combinations of sowing time x variety to identify best-bet cultural weed management tactics for canola.

The cost of conventional hybrid canola seed is high (greater than \$30 per kg) and many growers reduce their seeding rate to reduce production costs. Under weedy conditions, there may be a significant penalty for reducing plant density of hybrid varieties but this has not been tested experimentally. In Western Australia, French et al. (2016) showed that canola plant densities below 20 plants per square metre were more vulnerable to ryegrass competition

especially open-pollinated triazine tolerant varieties.

The aim of this trial is to investigate factorial combinations of sowing time, varieties and seed rate with herbicide strategies for ryegrass management.

## How was it done?

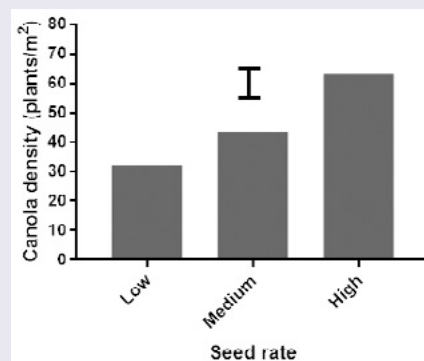
<b>Location</b>	Washpool (near Spalding)
<b>Plot size</b>	1.75 m x 10.0 m
<b>Fertiliser</b>	DAP (18:20) + Zn 2% @ 80 kg/ha Urea (46:0) @ 100 kg/ha in-season
<b>Seeding dates</b>	May 16, 2018 May 31, 2018
<b>Varieties</b>	Bonito (OP) HyTTec Trophy (hybrid) TT
<b>Seeding rates</b>	25 plants/m <sup>2</sup> 38 plants/m <sup>2</sup> 50 plants/m <sup>2</sup>
<b>Herbicides</b>	<b>Strategy 1</b> – Atrazine 2.2 kg/ha IBS + clethodim 500 mL/ha at GS14 of ARG <b>Strategy 2</b> – Propyzamide 1 L/ha IBS + atrazine 1.1 kg/ha (at GS12 of ARG) + Clethodim 0.5 L/ha + Factor 80 g/ha at GS14 of ARG <b>Strategy 3</b> – Control (knockdown treatment only)

## What happened?

### Canola plant density

Canola plant density was significantly influenced by seeding rate. Averaged across the two sowing dates, herbicide treatments and the two varieties, canola plant density increased from 32 plants/m<sup>2</sup> in the low seed rate to 44 plants/m<sup>2</sup> in the medium seed rate to 63 plants/m<sup>2</sup> in the high seed rate (Figure 1). Even though canola plant density in

**Figure 1: The effect of canola seed rate on its plant density**



The vertical bar represents LSD (P=0.05).



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**Region:** Since 1982, the Hart Field-Site Group has been conducting cropping trials at Hart in the Mid-North of South Australia. These trials are designed to focus on the most relevant issues facing the broad-acre farming community today and are conducted independently.



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HyTTec Trophy was greater than Bonito by 10–20 per cent, the differences between the two varieties were non-significant.

### Ryegrass plant and head density

The experimental site had a moderate infestation of annual ryegrass. In the control (nil herbicide) plots, ryegrass plant density was 88 plants/m<sup>2</sup> in sowing time one (May 16) and 100 plants/m<sup>2</sup> in sowing time two (May 31).

This result indicates that the two-week delay in sowing had no impact on annual ryegrass plant density.

The herbicide strategy was the only factor to have a significant effect on ryegrass density. Herbicide strategy 1 reduced ryegrass plant density relative to the control (nil herbicide) by 57 per cent as compared to 77 per cent reduction in Herbicide strategy 2 (Figure 2). But the differences between



**Annual ryegrass in Bonito and HyTTec Trophy (medium seeding rate) under three herbicide strategies. Photos taken September 11, 2018.**

these two herbicide strategies were non-significant.

Data on ryegrass head density revealed greater differences between the management factors investigated. Canola variety had an effect on ryegrass head density. When averaged across the sowing dates and herbicide strategies, ryegrass growing in HyTTec Trophy produced 52 heads/m<sup>2</sup> as compared to 78 heads/m<sup>2</sup> in Bonito (33 per cent reduction).

HyTTec Trophy is a new hybrid triazine tolerant variety from Nuseed, which is known for high early vigour. In contrast, Bonito is an open pollinated canola variety from Nuseed. It is possible these differences in early vigour may have contributed to the significant differences in ryegrass head density between HyTTec

Trophy and Bonito. But in a similar trial at Hart in 2018, we were unable to detect differences in ryegrass control in these two canola varieties.

The lack of differences at Hart, could be attributed to seasonal effects (reduced early vigour in general) and a lower ryegrass population.

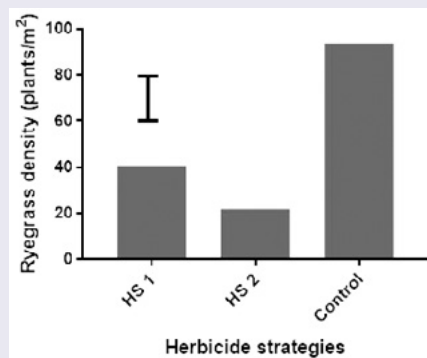
Herbicide strategies also had a significant effect on ryegrass head density. Ryegrass grown without any selective herbicide treatment (control) produced 128 heads/m<sup>2</sup> as compared to 40 heads/m<sup>2</sup> in HS1 and 29 heads/m<sup>2</sup> in HS2. This works out to 69 per cent reduction in HS1 relative to the control and 78 per cent reduction in HS2.

There was a significant interaction between the

time of sowing and the herbicide strategies. This interaction appears to be associated with greater ryegrass head density in time of sowing two, which may be an indication of reduced competitive ability of canola when sown later. But herbicide activity against ryegrass was greater in time of sowing two which may be associated with wetter soil conditions leading to better herbicide uptake and activity (Figure 3). For example, HS2 only had eight ryegrass heads/m<sup>2</sup> in the later time of sowing as compared to 50 heads/m<sup>2</sup> in time of sowing one.

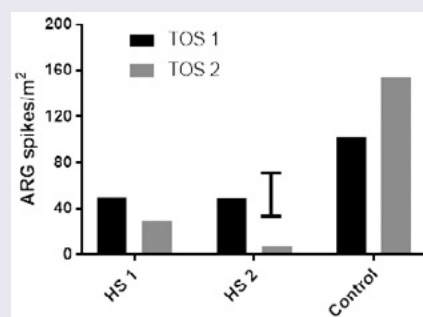
There was also an interaction between time of sowing, variety and herbicide, which was associated with superior weed competitive ability of HyTTec Trophy in time of sowing two. Ryegrass head density

**Figure 2: The effect of herbicide strategies on ryegrass plant density**



The vertical bar represents LSD (P=0.05).

**Figure 3: The interaction between sowing time and herbicide strategies (P<0.001) for ARG head density**



The vertical bar represents LSD (P=0.05).

**Table 1: The effect of three herbicide strategies on canola grain yield, averaged for both varieties**

Herbicide strategy	Canola grain yield (t/ha)
HS1 – Atrazine 2.2 kg/ha IBS + clethodim 500 mL/ha at GS14 of ryegrass	0.85
HS2 – Propyzamide 1 L/ha IBS + atrazine 1.1 kg/ha (at GS12 of ryegrass) + clethodim 0.5 L/ha + Factor 80 g/ha at GS14 of ryegrass	0.76
HS3 – Untreated control	0.39
LSD (P=0.05)	0.08



in Bonito increased from 100 heads/m<sup>2</sup> in time of sowing one to 193 heads/m<sup>2</sup> in time of sowing two.

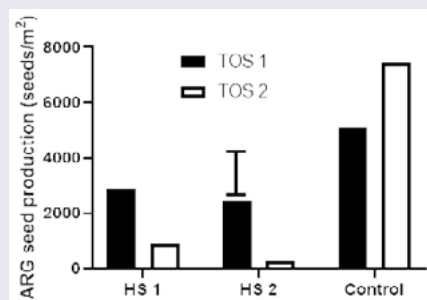
This highlights poorer competitive ability in later sown conditions. In contrast, ryegrass head density in HyTTec Trophy was similar across both times of sowing (103 heads/m<sup>2</sup> and 114 heads/m<sup>2</sup>).

## Annual ryegrass seed production

As was the case for ryegrass plant density, delayed sowing had no effect on ryegrass seed production.

But there were significant differences between

**Figure 4: The effect of interaction between the time of sowing and herbicide treatments for ARG seed production**



The vertical bar represents LSD (P=0.05).

the two canola varieties in ryegrass seed production. Averaged across the two sowing dates and herbicide treatments, ryegrass produced 3775 seeds/m<sup>2</sup> in Bonito compared to 2564 seeds/m<sup>2</sup> in HyTTec Trophy, a reduction of 32 per cent.

These results clearly highlight the potential for integrating vigorous hybrid varieties of canola for improving weed management.

Ryegrass seed production reflected the trends observed in head density data. There was a significant interaction between the time of sowing and herbicide strategies. Even though ryegrass seed set in the control was lower at the earlier time of sowing, when herbicide treatments were applied, ryegrass seed set was lower in time of sowing two (Figure 4). Greater herbicide activity in time of sowing two is likely to be due to better soil moisture at seeding time.

## Canola grain yield

As expected, canola grain yield was reduced by the two-week delay in sowing dates. Averaged across the sowing dates, seed rates and herbicide treatments, HyTTec Trophy produced 40 per cent greater grain yield than Bonito (0.50 t/ha Vs 0.83 t/ha). Canola seed rate also increased the grain yield – yield increased by 14 per cent as plant density increased from 32 to 44 plants/m<sup>2</sup> and by 19 per cent as density increased to 63 plants/m<sup>2</sup>.

Herbicide strategies had the largest effect on

canola yield. Herbicide strategies 1 and 2 produced canola yield of around 0.8 t/ha, which was almost 50 per cent greater than the yield obtained in the control (Table 1). These results highlight the competitive ability of ryegrass against canola, especially in a dry season such as 2018.

Gross margin analysis for the two varieties was undertaken based on grain yields averaged across the sowing dates, seed rates and herbicide treatments.

Based on the yield advantage of HyTTec Trophy over Bonito and taking into account extra costs related to seed purchase and end point royalty, the gross margin for Trophy (\$381) was \$115 per hectare greater than for Bonito (\$267).

As oil content of canola grain was not determined, it is assumed that both varieties had a similar oil percentage.

The authors thank the host grower and Clare SARDI team for assistance with trial management. We also acknowledge the investment from GRDC for the research into 'Cultural management for weed control and maintenance of crop yield' (9175134).



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# Testing tactics for improving rooting depth and crop yield on sodic soils

By Debbie Gillam, Mingenew Irwin Group

## Results at a glance...

- Gypsum is very soluble and a response from gypsum applied to gypsum responsive soils is generally observed in the first year of application.
- Treatments included rates of gypsum with and without ripping.
- There was no increase in soil water observed in any of the treatments in year 1.
- There was no trend in yield or grain quality in response to applied gypsum in year 1 of the project.
- Trials continue in 2019.

## Why do the trial?

The area of land directly north of the town of Mingenew is a mix of heavy clays and sandplain. Crop production on both soil types is vastly different. Our host growers who have been farming these soils for a number of years, have observed responses typical of sodicity and believe the problem is more widespread than just their property.

They recently took soil samples to depth – the test results confirmed they have an issue.

Sodic soils have an Exchange Sodium Percentage (ESP) greater than 6 within the root zone and the effect is reduced water infiltration, water storage, seedling emergence, root growth and crop yield.

Over the past decade, the climatic trend in the Northern Agricultural Region (NAR) has been one of less favourable growing seasons and declining rainfall. In this environment growers are aware of the importance of the plant accessing all soil water.

When plant root growth is restricted due to subsoil constraints the plant is not able to access all soil water, and particularly in low rainfall years, this means that yield potential is not realised.

This ongoing project aims to evaluate possible strategies for growing more grain on soils that have been identified as sodic at depth, specifically in the medium-low rainfall environments.

By trialling practices and products over a number of growing seasons, any treatment flaws will be identified.

Soil water levels will be monitored during the research period for changes because a plant that is able to access more stored soil moisture will have increased plant vigour, biomass and yield and result in more profitable cropping systems.



Debbie Gillam.

## Some background

Sodicity at depth is a subsoil constraint that restricts root growth and the amount of subsoil moisture the root can access. Like many other subsoil constraints, sodicity can severely restrict plant growth and development and result in lower grower returns from these unproductive sections of their paddocks.

Previous Western Australian research on managing subsoil sodicity has focused on the southern cropping regions of WA.

But our host growers have identified the same issue of subsoil sodicity on their property at Mingenew in the heart of the northern cropping region of the state. There was little crop yield difference in very wet years but in dry years they found that plant growth appeared constrained. Deep soil testing revealed that below 40 cm, the soil was high in sodium and magnesium.

An exchangeable sodium percentage over 6 and an exchangeable magnesium percentage over 25 is described as sodic and this soil was 11 and 25 respectively at 40 cm.



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**About MIG:** MIG is farmer community driven and covers approximately 300,000 hectares within the Geraldton Port Zone of WA. It is a positive and supportive environment where MIG constantly seek out insightful and stimulating research programs.

We strive to share, adapt and create a space where farmers can openly come together to learn through information and education programs/workshops.



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## Current projects:

- North South Beef Alliance
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- GRDC Sodic Soils
- GRDC West Midlands Group Ripper Gauge
- GRDC Liebe Group Legume Demonstrations
- DPIRD Internet of Things Project
- State NRM Feral Pest Control Program
- MLA Dung Beetle Project
- GRDC Barley Grass Project
- Pasture Legumes Research Project
- Range of MIG variety demonstrations (wheat, barley, lupins and canola)



**Table 1: Soil analysis 2018 – each plot will be sampled annually in the same position throughout the period of the trial**

Plot no.	Soil Type	10 cm						20 cm	30 cm	40 cm	50 cm
		pH	P	K	Total N	ESP	EMP	pH	pH	pH	pH
1	Clay	5.5	26	391	14	2.3	13.0	5.6	5.7	5.9	6.4
2	Clay	5.5	31	280	22	2.5	14.8	5.7	6	6.5	6.7
3	Clay	5.9	25	327	11	1.2	11.3	5.7	6.0	6.2	6.3
4	Clay	5.8	26	451	24	1.3	10.8	5.6	6.0	6.0	6.3
5	Clay	5.5	28	398	12	2.4	12.4	5.6	5.9	6.1	6.3
6	Clay	5.7	23	414	20	2.5	12.3	6.0	6.0	6.2	6.2
7	Clay	6.2	27	320	19	2.5	11.8	5.9	5.9	6.0	6.1
8	Clay	5.6	28	314	15	4.0	15.7	5.5	5.9	6.1	6.4
9	Clay	5.6	38	391	15	2.2	12.4	5.8	6.1	6.4	6.8
10	Clay	6	40	365	23	2.4	12.8	6.8	7.0	7.1	7.3
11	Clay	6.6	30	344	20	2.0	14.5	6.6	6.5	6.3	6.6
12	Clay	6.2	21	335	11	1.7	13.3	6.5	6.7	7.2	7.1
13	Clay	6.8	34	357	18	6.0	15.3	6.6	6.8	6.8	7.0
14	Clay	5.8	35	361	17	1.7	14.1	5.7	5.8	5.8	6.4
15	Loamy clay	6.1	28	367	16	1.5	11.6	6.6	6.8	7.2	7.4
16	Clay	7.2	29	382	17	1.8	14.3	7.3	7.4	7.5	7.8
17	Clay	6.6	25	333	19	1.6	11.9	6.7	6.7	7.5	7.5

**Notes:** ESP = Exchangeable Sodium Percentage; EMP = Exchangeable Magnesium Percentage; P = Phosphorus; and, K = Potassium.

**Table 2: ESP, EMP and pH at depth, 2018**

Depth	pH CaCl2	ESP	EMP
0–20 cm	5.7	3	16
20–40 cm	5.9	5	18
40–60 cm	6.3	11	24
60–80 cm	6.9	15	26
80–100 cm	7.3	17	26
100–120 cm	7.9	21	27

**Notes:** ESP over 6 defines sodic soil and affects root growth; EMP over 25 defines magnesic soil and affects root growth; Each individual plot will be tested for ESP and EMP at depth in 2019; Soil pH was high at this site (over 5.5) and Aluminium is not present at detectable levels.

## How was it done?

This trial was developed to investigate practices and products that have the potential to ameliorate the sodic soil and increase the plants' ability to access stored soil moisture and continue growing.

The practices used in 2018 included deep ripping to a depth of 20 cm and the application and incorporation of solid gypsum.

The treatments included the application of four rates of fine gypsum to develop a response curve.

Soil water levels were also monitored.

The 11 treatments were:

- Control (nil gypsum, nil ripping)
- 0 gypsum
- 0 gypsum ripped
- 1 tonne/ha gypsum
- 1 tonne/ha gypsum ripped
- 3 tonnes/ha gypsum
- 3 tonnes/ha gypsum ripped
- 5 tonnes/ha gypsum
- 5 tonnes/ha gypsum ripped
- 7 tonnes/ha gypsum
- 7 tonnes/ha gypsum ripped

For the trial layout the treatments were

randomised, and every third plot was a control. Rates of gypsum were set at 1, 3, 5 and 7 tonnes per hectare so that a response curve could be formed.

The area received summer rainfall in February,

2018 but the Tilco ripper used in the trial was not available until April and the profile had partially dried out. This meant that the surface was left cloddy when the ripping was eventually done.

This did hinder the seeding process and we think



A Nufab ripper was used for incorporating gypsum in the first year of the MIG sodic soils trial.

**Table 3: Harvest data from Year 1 of the sodic subsoils trial (2018)**

Treatment	Plants/m <sup>2</sup>	Yield t/ha	Protein %	Weight kg/hl	Screenings %	Input cost \$/ha	ROI \$/ha
Control	68	3.25	10.7	76.8	4.37	0	APW1 1209
0 gypsum	61	3.39	11.2	76.9	4.20	0	APW1 1262
0 gypsum ripped	39	2.86	11.6	77.4	5.11	50	AUH2 986
1 tonne/ha gypsum	89	3.31	10.1	79.3	2.49	49	ASW1 1108
1 tonne/ha gypsum, ripped	47	3.11	10.3	78.2	4.17	99	ASW1 990
3 tonnes/ha gypsum	69	3.19	9.9	77.1	3.56	127	AGP1 981
3 tonnes/ha gypsum, ripped	80	2.96	11.2	77.2	5.34	177	AGP1 852
5 tonnes/ha gypsum	102	3.37	10.9	78.2	3.53	205	APW1 1047
5 tonnes/ha gypsum, ripped	40	2.60	12.2	77.0	5.91	255	AUH2 686
7 tonnes/ha gypsum	93	3.21	10.1	79.0	3.01	283	ASW1 841
7 tonnes/ha gypsum, ripped	41	2.67	10.8	77.5	5.29	333	AGP1 595

**Notes:** Control is nil gypsum, nil rip (this is the same as the 0 gypsum except the control was put in every third plot to maintain a consistent comparison treatment throughout the trial).

ROI = Return on treatment after input costs removed; Deep Ripping Cost: \$50/ha; Gypsum cost: \$25/t; Gypsum application cost: \$10/ha; and, Freight: \$14 (Estimate from pit to Mingenew)

there will be more results to see in the second and third year of this trial.

The seeding bar was set on 254 mm spacings and the ripper spacing was 600 mm.

The trial was sown with Cobra wheat and 35 kg per hectare MAPS2C and 30 kg per hectare urea at seeding.

Nitrogen fertiliser was applied post emergent:

- 40 kg/ha urea, June 26
- 50 kg/ha urea, July 31
- 65 L/ha MAXAMFlo, August 13

Fortunately the 2018 season turned out to be a year with average rainfall in the Mingenew region and all treatments had a moderate to good crop emergence.

Soil moisture assessments and plant counts were carried out across the 11 treatments.

The gypsum used came from Cliffhead Gypsum and had a composition of 85 per cent gypsum and 15 per cent lime.

## What happened?

See Tables 1, 2 and 3 for a summary of the results gathered in the first year of this trial.

Gypsum is highly soluble, and we expected to see some results in the first year following application. There was no response to gypsum detected but the reasons for that could be associated with two factors:

- The quick dry finish to the 2018 season did remove some yield potential from the plots; and,
- The trial was ripped when the soil profile was drying leaving it uneven.

For these reasons we think differences may not be observed until the second or third year.

The soil moisture profile was full in July and each treatment was tested to 80 cm depth to observe any differences in soil moisture.

There was no trend or observational differences noted – all treatments held similar soil moisture at similar depths at this time (see photo).

## Ongoing research

The established trial will now be monitored for two more seasons. The plan is to be able to develop a response curve to gypsum on this soil type to assist growers in their decision making around the subsoil constraint sodicity.

Treatments in the trial include all the rates of gypsum ripped and un-ripped. We acknowledge the ripping has caused some issues in the first year, but it is expected it will be beneficial in the long term.

In year 2 we will again measure soil water to observe any difference in treatments and crop yield.

We will also soil test for sulphur to see where the gypsum is in the profile.

Sodic soils research in the Northern Agricultural Region is relatively new. So MIG will be working closely and comparing results with researchers in the southern cropping areas of WA where there is a longer history of sodic subsoils management.

### Acknowledgements:

Many thanks to the McTaggart family for their work in setting up, seeding and harvesting the trial.

Many thanks also to Neil Hebbiton from Cliff Head Gypsum for supplying and transporting the gypsum and Nufab for use of their Tilco demonstration ripper for the trial.

This research was conducted with investment from GRDC through the project *Tactics for Improving Rooting Depth and Crop Yield on Sodic Soils*, Ref: 9176012.



Soil moisture profile samples were taken at various depths up to 80 cm.





# Weather certificates: Affordable risk management for not so rainy days

■ By Peter McMeekin

**I**N recent decades, numerous weather and climate-related natural disasters have impacted agriculture across the globe. This has repeatedly demonstrated how vulnerable the industry is to extreme episodic events. Some research suggests that up to 70 per cent of agricultural risk is related to weather.

Given this recent history – and widespread expectations that the frequency and intensity of such events will increase – it is becoming even more important for farmers to proactively manage weather and climate risks in order to farm sustainably.

Local variables such as latitude, elevation, and proximity to water also have a significant influence on the weather and climate at individual locations. It is often reported that Australian farmers operate in one of the riskiest climatic environments on the planet.

While farming faces many sources of risk, the unpredictability of Australian weather is probably the most difficult of them to manage. And any decrease in income at the farm level has a downstream flow on effect to the entire rural economy.

Some farmers already apply a variety of strategies to help reduce the impact of weather uncertainties. These include farming in multiple locations to spread the exposure geographically, minimum tillage and chemical fallow practices to conserve moisture, diversifying crop types and varieties, spreading the planting period to minimise frost risk, seeking alternative sources of income, and purchasing crop insurance.

There is no greater reminder of the threat to domestic agriculture than the drought experienced in the eastern states of Australia last season. Grain production was impacted to such an extent that the east coast turned from a net exporter to a net importer of grain to satisfy domestic demand. That drought is yet to break in many regions and is threatening to severely impact production again in 2019.

## Affordable and simple risk management

So how can grain growers manage the most significant risk to their business? One weather risk management tool increasing in popularity in Australian agriculture are weather certificates (sometimes called weather derivatives).

They are relatively simple products that hedge against the risk of weather-related losses. They are based on an index representing a single variable, such as temperature or rainfall.

They are basically financial options that can be used to transfer some of the risks associated with weather variability away from the grain producer and local community and onto financial organisations that specialise in managing and trading risk and have the balance sheet capacity to absorb any loss.

Grain weather certificates allows the buyer to establish their weather risk versus their input investment and potential returns relative to the growing season. They can provide income protection against weather conditions such as a dry season, a wet season, temperature extremes such as frost at flowering, extreme heat at critical stages of crop growth, hail or excessive rainfall at harvest.

One of the big advantages of weather certificates is that they can be tailored to meet the individual growers' risks and requirements in the course of a season.



**Weather certificates can help manage the risk of abnormally dry or wet conditions at specified dates and locations.**

Conversely, crop insurance is a generic product that doesn't consider individual needs or geographic anomalies. Insurance tends to cover low-probability, catastrophic weather whereas derivatives can cover the buyer for higher-probability region-specific events.

## How weather certificates work

In a grain farm context, these certificates can be used to cover various weather-related scenarios.

For example, a grower may want to financially protect their business against an abnormally dry season. The weather certificate would payout if the in-crop rainfall was below a pre-specified amount over a pre-specified time period.

On the flip side, a farmer may wish to protect against the possibility of quality downgrading at harvest due to rain. The weather derivative would payout if rainfall was above a pre-specified amount over a pre-specified time period.

And unlike crop insurance, no demonstration of loss is required, and no assessment needs to be made. Once the event has occurred, payout of a weather certificate is automatic.

These payout 'trigger points' are based on a weather index derived from readings at the Bureau of Meteorology weather station nominated when the weather certificate is purchased. This is usually the weather station closest to the grower's property, as long as there is sufficient historical data to establish an index.

In recent years the cost of weather certificates has also been decreasing – relative to crop insurance – as the use of them increases across a variety of Australian industries. It is generally between 7.5 and 10 per cent of the value the buyer wishes to protect. The price will vary slightly by region depending on the likelihood of the nominated event occurring.

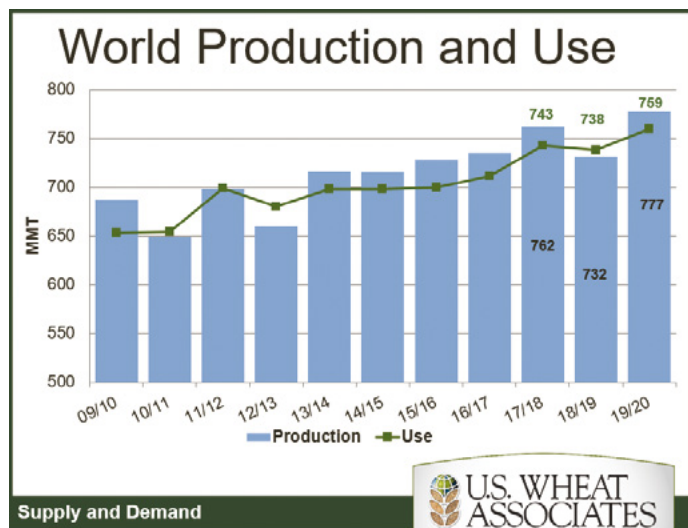
With the incidence of extreme weather events increasing and margins getting squeezed by rising input costs, farmers need to look at all options available to decrease exposure to the most significant risk they face each season.

**Call your local Grain Brokers Australia representative on 1300 946 544 to discuss your grain marketing needs.**

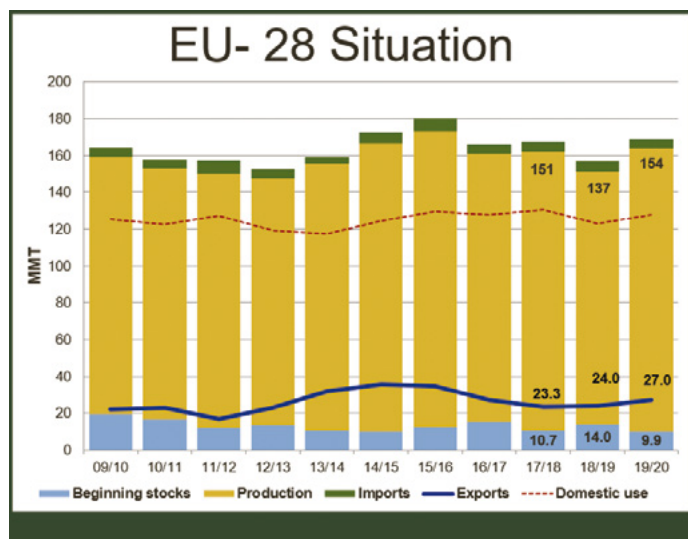
# First look at 2019–20 sees another record world wheat crop

■ By Claire Hutchins, US Wheat Associates Market Analyst

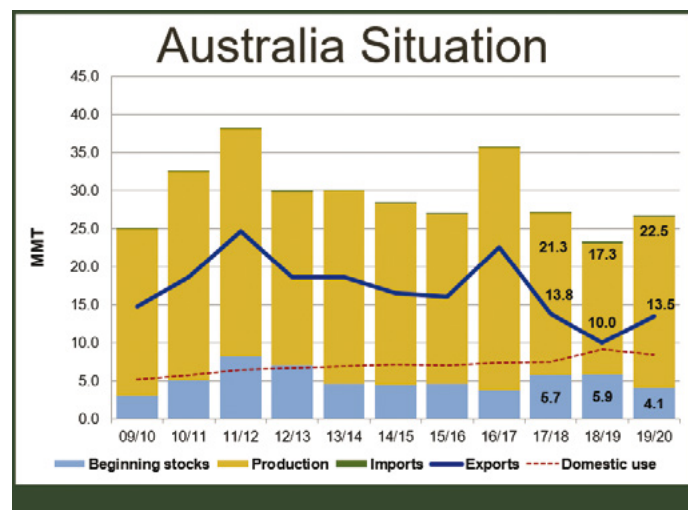
IN mid-May the USDA issued its first set of forecasts for 2019–20 in its World Agricultural Supply and Demand Estimates report. USDA expects global wheat production at a new record of 777 million tonnes (mt). This is a production level exceeding expected use again as major global suppliers rebound from last year's unfavourable growing conditions.



Droughts in the European Union (EU) and Australia last year cut production in both regions to 5-year and 10-year lows, respectively. Growing conditions in both regions are more favourable now and USDA expects total EU wheat production to rebound 12 per cent from last year to 154 mt.



Australian wheat production is expected by the USDA to reach 22.5 mt, up 23 per cent year-over-year but still three per cent below the five-year average of 23.3 mt.



USDA's initial forecast for Russian production shows a 6 per cent increase over last year's 72 mt to 77 mt in 2019–20 and a small decline in export volume. Notably, SovEcon, a Russian consultancy, pegs 2019–20 Russian wheat production closer to 83 mt, seven per cent higher than USDA's official estimate and 15 per cent higher than last year's total production, if realised.

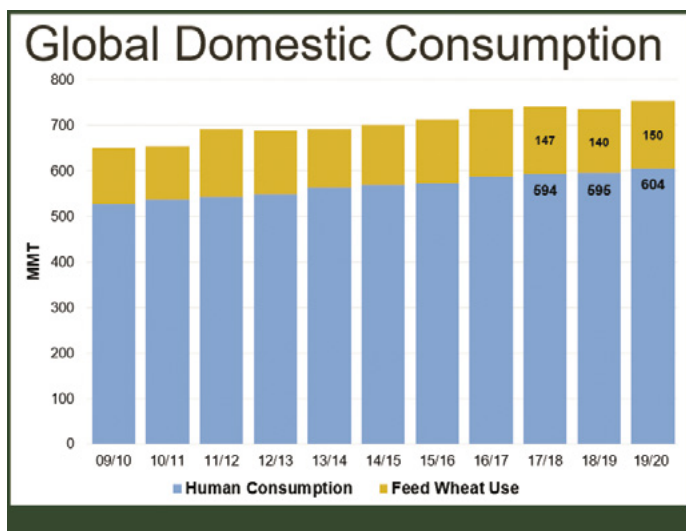


## The global scene

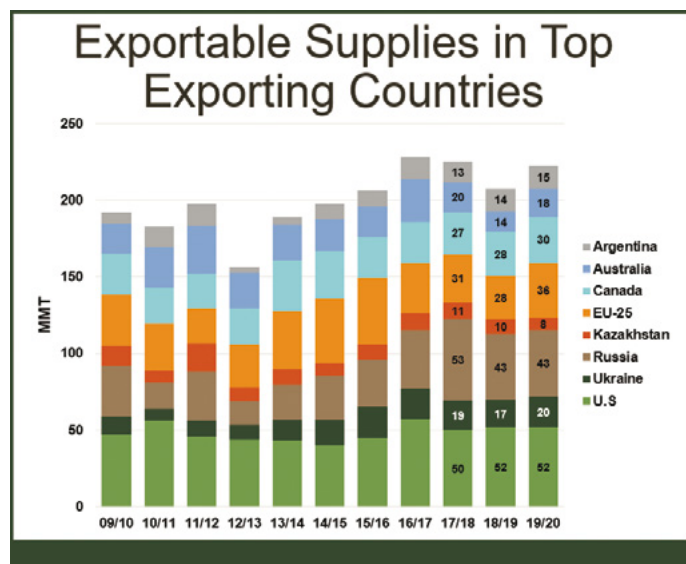
World beginning stocks of 275 mt – paired with the forecast for increased production – bring total supply in the new marketing year to a record 1052 mt. USDA says large supplies in 2019–20 will be met by increased global demand for feed wheat and food consumption.

USDA forecasts total global domestic consumption will reach a record 759 mt in 2019–20, compared to 738 mt the year prior. Global trade, at 285 mt, is 4 per cent higher than last year and five per cent higher than the five-year average of 176 mt.





USDA predicts US wheat production in 2019–20 will total 51.6 mt. Though down somewhat from last year, that volume and increased beginning stocks push US exportable supplies up to 52 mt – the largest in the world. ■



## Domestic grain production rebounds

■ By ABARES

**T**HE start of the Australian 2019–20 winter crop season has been mixed. The above average rainfall in key cropping regions of South Australia, Victoria and southern New South Wales during May replenished soil moisture levels and created favourable planting and growing conditions. Western Australian growers also enjoyed good opening rains in early June.

But autumn rainfall in most cropping regions in northern New South Wales and southern Queensland was lower than average and soil moisture levels remained low. The below average rainfall and low soil moisture levels in these regions constrained planting and hampered early development of dry-sown crops. Low soil moisture levels also mean most crops in these regions will need sufficient and timely rainfall to develop over winter.

### Winter crop production and area forecast to rise

Overall, the area planted to winter crops in Australia is forecast to rise by around 9 per cent to 19.6 million hectares in 2019–20. This increase reflects the significant area taken out of grains and oilseed production and cut for hay in 2018–19.

For the major winter crops, area planted to wheat is forecast to increase by 8 per cent to around 11 million hectares; barley by 12 per cent to 4.2 million hectares; and, the area planted to canola is expected to increase by 6 per cent to two million hectares.

Chickpea area is forecast to increase by around 22 per cent to 370,000 hectares, while the area planted to oats is forecast to rise by 17 per cent to 798,000 hectares.

Winter crop production is forecast to rise by around 20 per cent in 2019–20 to 36.4 million tonnes.

But this increase is from a crop last season that was adversely affected by frosts and drier than average seasonal conditions in many cropping regions, especially in the eastern states.

If realised, the forecast 2019–20 winter crop will be about 10 per cent below the 10 year average to 2018–19.

For the major winter crops, production is forecast to rise by:

- 23 per cent for wheat to 21.2 mt;
- 11 per cent for barley to 9.2 mt; and,
- 18 per cent for canola to 2.6 mt.

### Summer crop numbers finalised

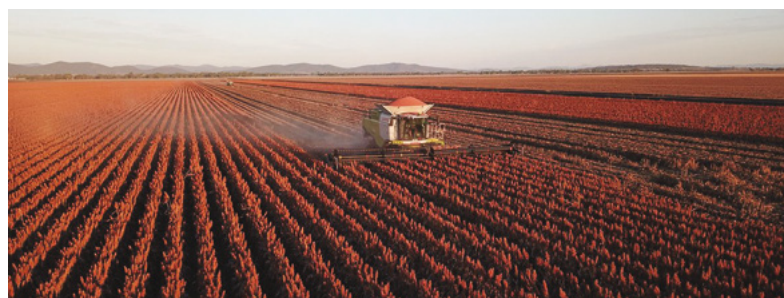
After a tough 2018–19 summer, production of our summer grain and oilseeds is estimated to have declined by 35 per cent on the previous season to 2.6 mt. This drop was driven largely by falls in the production and area of irrigated cotton and rice.

But the production of grain sorghum increased slightly to 1.3 mt, reflecting an increase in the planted area.

The 2018–19 cotton harvest is estimated to have decreased by 54 per cent to around 485,000 tonnes of lint (just over 2.1 million bales) and 685,000 tonnes of cottonseed.

Rice production plummeted by 91 per cent in 2018–19 to 59,000 tonnes. This reflects a 90 per cent decline in planted area due to reduced supplies of irrigation water.

Source: ABARES June 2019 Australian Crop Report. ■



**A slight increase on the previous year in sorghum production was one bright spot in an otherwise lacklustre, moisture-challenged, 2018–19 Australian summer crop.**



*This global pulse update has been prepared by Pulse Australia, and the Grains Industry Market Access Forum (GIMAF), with the support of the Australia – India Council, to inform the Australian pulse value chain about the trends and drivers in the global pulse market. The aim is to have a better-informed industry in order that grower decisions around pulse area and rotations can be made with more confidence, while the processing, trading and logistics sectors can better plan for the year ahead.*



# Global pulse update

■ By Pulse Australia and GIMAF

## AT A GLANCE...

- The Indian election outcome should result in a less interventionist approach to pulse trade by the Modi Government, despite ongoing farmer angst with low prices;
- The 2019 Monsoon prospects and pulse price inflation may be the trigger to begin easing Indian trade restrictions;
- Geopolitics is underpinning uncertainty impacting all commodities, globally; and,
- Wheat and pulse global supply is more than adequate, indicating more of a softer pricing outlook for pulses.

**A**T the recent Indian election 900 million people have voted, and the result is a resounding win for the incumbent Indian Prime Minister, Narendra Modi and his BJP.

In the largest democratic exercise in the history of the planet, spanning five weeks, around 900 million people have chosen from over 8000 candidates for 545 seats in the Lok Sabha or the Lower House of the Indian Parliament.

The significance of this process should not be lost on Australia which has historically relied heavily on India as both the major destination and price discovery point for Australian pulses.

### Impact on Australian growers

But what does a win and a strong majority by Prime Minister Modi mean for Australian pulse growers?

Probably, more of the same – but with less urgency. The next

election is now five years away, so the urgency in addressing what the opposition Congress Party termed “agrarian distress” has eased. But the issue of farmers receiving what they consider as “low remunerative prices” has not gone away, and combined with the very real growing farming household debt will continue to ensure the Government will maintain a very close eye on agricultural pricing and import policies.

The issue facing the new Government is that of food inflation, with the April wholesale price inflation rate hitting a 33-month high. Pulses, as a major staple, are part of the driving force with food inflation. The current pigeon pea (tur) harvest is reported to be close to 20 per cent down on expectations, and pigeon pea prices have been lifting for the past month. Price inflation in pulses is something the government cannot afford to let happen, and the expectation is that if prices continue to rise, tariffs on lentils may come back to relieve the price pressure.

But the greatest determinant on Australian pulse trade with India is out of the hands of politicians and, and in the hands of the annual monsoon.

The monsoon runs from June–September, and early indications are that the coming monsoon will be below normal. In early May it is already running two to three weeks late. This expectation could also be fueling pulse price inflation, placing further pressure on the Government to ease import restrictions.

## Global pulse scene

Geopolitics is dominating market fundamentals and becoming the ‘new normal’.

Globally, what historically may have been seen as one-off and isolated trade disruptions in the pulse world, are now more frequent and more widespread, and becoming the ‘new normal’.

We have China creating issues around Australian barley and Canadian canola and pork; India, as we know, is pretty much out of the market with trade-killing tariffs, quotas and bans; Iran’s decision 12 months ago to withdraw from the nuclear treaty, triggering the US to reimpose sanctions, is just adding to uncertainty and risk.

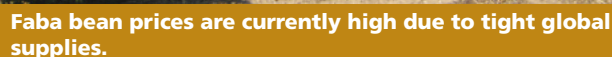
The ongoing US/China trade spat continues to threaten Chinese discretionary liquidity. Increased – or the threat of new – tariffs on Chinese exports will have the potential to curtail imports of key goods and services, thus harming Aussie exports, and would also see the AUD weaker – only exacerbated by the RBA anticipated rate drop. Equally the Easter Sunday bombings in Sri Lanka may bring ongoing political tensions in that country leading to a lack of market confidence.

Looking specifically at commodity implications, with global wheat prices still affected by sound competition from the Black Sea region, it is not likely that we will see a major loss of pulse

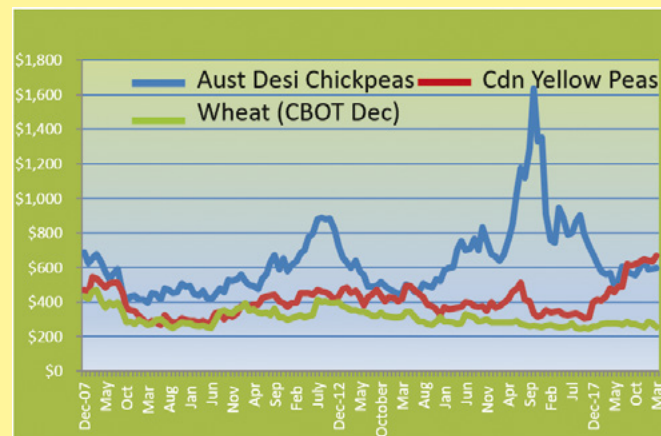


**The current pigeon pea harvest is reported to be close to 20 per cent down on expectations, and pigeon pea prices have been lifting for the past month.**





With nearly a 40 per cent stocks to use ratio there seems no



With the expectation that India will be 'open for business' by this time next year (hopefully earlier!), the 2020 Australian winter rotations should be much closer to the norm, as we, and markets globally, reset towards the norm. ■

# New 'no rules' trading environment unsettles Australian ag exports

**N**EW research shows uncertainty from ongoing bilateral trade wars between China and the United States have set the global trading environment back decades and undermined Australian agricultural exports.

A comprehensive AgriFutures Australia-funded report gives policy makers, industry peak bodies and primary producers a roadmap as to how a less predictable trading environment may impact export markets.

AgriFutures Australia Managing Director, John Harvey said the ITS Global analysis, *Bilateral trade wars, understanding the implications for Australian agriculture*, gives the industry a firm footing for policy creation.

"This robust analysis gives Australian exporters the knowledge they need to take a leadership role in attempting to restore stability for agricultural commodities in the current global trading environment," said John. "The findings show that unilateral moves by the Trump Administration to renegotiate existing trade agreements have threatened World Trade Organisation (WTO) principles of a rules-based trading system, creating uncertainty for Australian agriculture."

## Risks and opportunities

The report identified a wide range of risks and opportunities for Australia's agricultural interests arising from the current trade wars, finding some Australian products are likely to fare better than others.

AgriFutures Australia Senior Manager, Business Development, Jen Medway agreed that while some industries will prosper and others may feel the pressure from these trade wars, understanding the potential impact is fundamental to creating stability in an unsettled trade environment.

## Wheat and other industries

Trade policy actions are projected to have an overall positive impact on Australia's wheat exports, particularly to China. US access is currently restricted. But settlement of the broader trade dispute between the US and China could re-open or expand this market for US exports.

"Australia's dairy industry is another industry that could potentially benefit from trade opportunities with China on the back of additional tariffs imposed on US dairy products," Jen says.

"On the flip side, a prospective US-Japan free trade agreement (FTA) could negatively impact the dairy industry as US producers disadvantaged in the Chinese market could gain improved access to Japan.

"For the Australian wool industry, the bilateral trade wars may not have a noticeable impact, despite China implementing retaliatory tariffs on some US wool products. The relatively small size of the US wool export market to Asia will buffer any significant uncertainty for Australian wool exporters as a result of the increased tariffs," said Jen.

This is similar for Australian sheep and goat meat exports, primarily lamb, where the aftermath of the trade wars are expected to be minimal. These products have not been the focus of additional tariff actions, but a US-United Kingdom FTA (following the UK's exit from the European Union) would have a negative impact on some Australian markets.

"The UK is a leading sheepmeat exporter and the US is Australia's most important market, any improvement in access for UK product into the US would be damaging to Australia's export interests," said Jen.

Another area we may see increased competition is in Australia's fresh, chilled and frozen beef exports due to risks identified in Australia's two biggest beef export markets – Japan and the US.

"The US is increasingly eager to expand their export reach of beef products into Japan, with the US having very limited access to China and the EU due to a ban on hormone growth promotants. With the US and Japan edging closer to negotiating a bilateral FTA, Australian beef exports to Japan may suffer," said Jen.

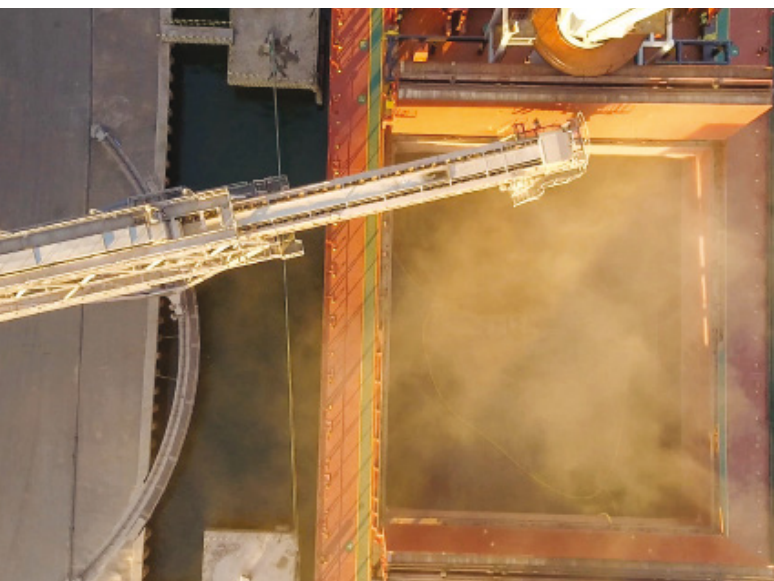
## Understanding the impacts

John Harvey acknowledges the importance of the report findings, noting they are critical to putting rigour around our understanding of the top line impacts for agriculture products as a result of the trade wars.

"It will inform Australian industry input on how best to ameliorate the detrimental side effects of current and possible future trade measures," John said.

John added that the take-away message from the research is that trade wars breed uncertainty. Uncertainty is bad for business and leaves agricultural producers, traders and buyers struggling to manage a shifting policy landscape.

"The longer this period of uncertainty lasts, the more commercial decisions will need to be made by Australia's agricultural stakeholders facing the prospect of sudden and unpredictable policy changes at the global level," John said. ■



**Asia takes the lion's share of Australia's agricultural exports. Seven of the 10 top export destinations by value are Asian nations. China leads the way, and in 2017 purchased 20 per cent of exports of Australian priority products identified for this study, valued at more than US\$5 billion.**



# Spray water quality is critical

## AT A GLANCE...

- Poor water quality can adversely affect many products. Always consult product labels about water quality requirements.
- Water testing should be done on a regular basis when using bore water, water from streams and rivers, reticulated (piped) water sourced from ground water, water stored in unlined dams and concrete tanks.
- Water tests should analyse: pH, total hardness (including a measure of bi-carbonate levels) and total dissolved salts or salinity.

**G**RAIN growers and spray operators are being encouraged to test water quality before using it for the application of herbicides and pesticides. The advice comes in the wake of a research project by the SOS Macquarie Valley group that investigated the water quality of 180 bores and assessed its suitability for use with farm chemicals.

The project found the water quality varied significantly with 78 per cent of samples more alkaline than desired and 80 per cent recording higher than ideal levels of bicarbonate concentrate, when used to apply pesticides and herbicides.

While the samples for this research project were taken from a relatively small geographic area west of the Newell Highway and north and east of the Bogan River in central western NSW, the issue of water quality is relevant across all farming areas.

GRDC Crop Protection Officer – North Vicki Green said the quality of water used with pesticides and herbicides had a significant bearing on their effectiveness in the paddock.

“Testing your water for parameters, such as, pH, hardness, bicarbonates and salinity can identify any quality issues and allow you to make amendments to get the best outcome when you use it with farm chemicals,” she said. “It is important you test all water sources that you are using for chemical application, including deep and shallow bores and dams.

“Understanding your water quality and knowing what you can do to make it more suitable for spraying can significantly improve your spray results, with both herbicides and pesticides.”

### Poor water quality: 25 per cent less effective spraying

SOS Macquarie Valley chairman Tony McAlary said his group was motivated to analyse bore water quality throughout the region to better inform growers and spray operators’ decision-making and ultimately improve spray results in the paddock.

“We felt poor water quality could be reducing our spray effectiveness by as much as 25 per cent, but we needed accurate testing to provide a better understanding of water quality and the impact it could be having on spray mixes,” he said.

“We also wanted to be able to inform growers and their advisers about what they could do to amend or adjust water quality.”

Tony said the research was also considered imperative after an SOS Macquarie Valley agronomist workshop survey revealed just 43 per cent of advisers ‘sometimes’ offered advice about water quality ahead of spraying.

“We felt this was an area worthy of research and potentially delivering information back to growers that could help them get



Growers and spray operators are being encouraged to test on-farm water quality to ensure its effectiveness as a carrier for herbicides and pesticides and maximise chemical efficacy in the paddock. (PHOTO: GRDC)

a better result from their spray applications, by understanding the impact water quality was having on chemical efficacy when used with common farm pesticides and herbicides,” Tony said.

### Testing bore water quality

In partnership with the NSW Environment Protection Authority, SOS Macquarie Valley engaged Pat Hulme from Sustainable Soils Management in Warren to test 180 bore water samples for pH, hardness, bicarbonate concentrate and salinity, as part of a wider campaign to increase awareness about off-target spray drift.

The research found most of the bore water sampled was alkaline, with elevated bicarbonate concentration and moderately saline.

Pat said in the majority of samples water quality could be ‘managed or amended’ to ensure it was suitable for use with most farm chemicals. For example, ammonium sulfate (known as AMS) can assist with water hardness, whereas alkaline waters can be acidified with a range of products, such as Li-700.

Unfortunately, highly saline water was generally unsuitable for spraying, unless it was diluted with clean rain water. Dirty water or water with suspended solids could also adversely affect products such as Spray.Seed and glyphosate so it should be filtered or settled prior to use.

“Our research showed water samples from bores in the Great Artesian Basin aquifer had consistent properties, but water chemistry from shallower bores was significantly more variable,” Pat said.

“Bore water also had the advantage over surface water of being free of sediment and organic compounds. It is more important to test the quality of water from each bore used than to repeatedly test water from a single bore, as bore water quality changes slowly.”

Vicki Green said accurate water testing could improve the efficacy of chemical application on-farm. “Most water can be amended to use for spraying, but the important thing is to test to understand what you are dealing with.”

For more information about water quality and or how to collect a water sample, where to get it tested and how to treat it when using different products go to GRDC’s recently updated fact sheet on Water Quality for Spraying Operations at <https://bit.ly/2vpFwaa>

## ASK AN EXPERT – DOES CHAFF IN A CHAFF LINE SUPPRESS WEEDS?

■ With Annie Ruttledge, weeds researcher, DAF, Queensland

**I**N the wake of rapid adoption of chaff lining – the newest harvest weed seed control tool developed by Australian farmers, a substantial research effort has been made to validate the efficacy of this practice.

Chaff lining involves depositing weed seed-laden chaff in a narrow line behind the header. Some growers using this practice have suggested that as the chaff in the chaff line rots away, much of the weed seed also decays in the process. Researchers have now gained a deeper understanding of what happens to weed seed in a chaff line.

Department of Agriculture and Fisheries, Queensland weeds researcher Dr Annie Ruttledge and several collaborating scientists have been looking into different aspects of weed seed decay and weed suppression in the chaff line.

“Non-herbicide tools like chaff lining are very important to help manage the onset and spread of herbicide resistance in weeds,” says Annie. “The idea with harvest weed seed control tactics is to collect any weed seed present at harvest height – usually above 15 cm. With chaff lining, these weed seeds are deposited in a narrow line of chaff behind the harvester.

“Burial in the chaff line can suppress emergence in some weed species, but it does not guarantee that no weeds will emerge from chaff lines,” she says. “Harvest weed seed control tools like chaff lining and chaff tramlining concentrate the weed seed into confined zones where emergence can be monitored and action taken as required, without treating the whole paddock.”

### Does the chaff line suppress weed emergence?

**Short answer:** Yes, if the weed seed is buried deeply enough in the chaff. Many weeds in no-till and reduced-till farming systems prefer to germinate on the surface where there is plenty of light.

**Longer answer:** Our trials investigated the effect of chaff on germination rates of annual ryegrass and common sowthistle. The sowthistle seed was more readily prevented from emerging than annual ryegrass seed, probably due to the different requirements of the species for light. Maximum suppression of annual ryegrass emergence was achieved with a chaff load of 42 tonnes per hectare, which can be feasibly produced in a 3.5 tonnes per hectare cereal crop. In contrast a chaff load of just 12 tonnes per hectare of wheat chaff was sufficient to suppress emergence of common sowthistle seed.

Work done by our collaborator Dr John Broster (Charles Sturt University), found that chaff from cereal crops generally provided better suppression of annual ryegrass compared to canola and pulse chaff.

For all chaff types the higher the rate per hectare the better the suppression.

### What's the difference in suppression in chaff lines compared to chaff tramlines?

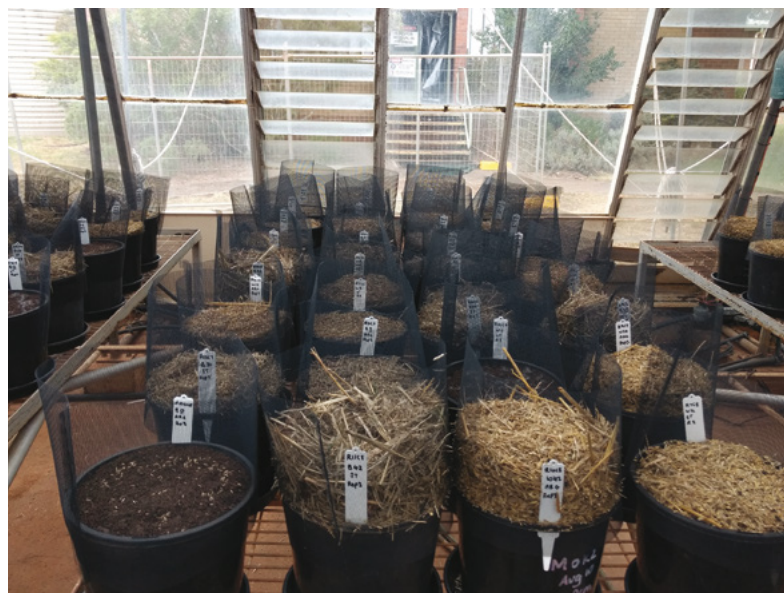
**Short answer:** Chaff tramlining effectively halves the amount of chaff in each line, potentially reducing the suppressive potential of the chaff.

**Longer answer:** Placing a single line of chaff behind the harvester (or directing all the chaff from a chaff deck into one tramline) maximises the amount of chaff and therefore the level of weed suppression. Different crop types, sowing rates and crop yield all influence the quantity of chaff produced.

In addition to looking at suppression of emergence, we looked at weed seed decay under field conditions. In these trials there was no evidence that weed seeds rotted more rapidly in a chaff line than on the soil surface. But we expect that environmental conditions play a large part in weed seed decay. So the results could vary according to season, with more rotting likely in a wet year than in a dry year. The depth and persistence of chaff



Dr Annie Ruttledge, DAF Queensland weeds researcher, has been investigating weed emergence from chaff lines.



One of the experiments involved determining the level of chaff required to effectively suppress emergence of annual ryegrass and common sowthistle.



cover and the type of weed species are other factors that would influence seed persistence in chaff lines or chaff tramlines.

### What are the options for treating the weeds in the chaff line or tramlines?

**Short answer:** Farmers are leading the way with practical solutions to manage weeds along chaff lines and chaff tramlines.

**Longer answer:** Some growers use an optical sprayer or a boom with nozzles only operating on the chaff line or tramlines to apply a mix of herbicides that may be too expensive to apply to the entire paddock. Weed seed that is collected at harvest and placed in the chaff line, may have survived in-crop herbicide applications and may be herbicide resistant. Susceptibility testing can help identify herbicides that can provide effective control.

Non-herbicide options are to wait for germination and chip or trample the weeds. In a mixed farming operation, sheep can graze the chaff lines, rendering most of the weed seed unviable.

Growers who have been using chaff lining and chaff tramlining for several years report that the high concentration of weed seed leads to a high level of competition between the weeds and this is compounded with competition from the following crop.

Over time, seed set reduces and any weed seed produced will be collected and returned to the chaff line the following year. When chaff is deposited on the wheeltracks, weeds that emerge face dry, compacted conditions and are often subject to frequent passes with heavy machinery.

### Does it matter if I use a draper or a stripper front?

**Short answer:** No, not in terms of amount of weed seed harvested, provided you set up and operate with weed seed collection in mind.

**Longer answer:** Our collaborators Dr John Broster, Dr Michael Walsh and Annie Rayner conducted trials with stripper and draper fronts at two trial sites.

The results at one site showed that it is possible to achieve the same level of weed seed collection with the two harvester front options. At the other trial site, the stripper front was not as effective as a result of wider row spacing, higher operating height and faster operating speed compared to the draper front at the same site.

The key to success with chaff-only harvest weed seed tools is getting the weed seed in the front and effectively separating the weed seed and chaff from the straw component. The *WeedSmart* website provides practical information about setting up different harvesters and operating them for effective harvest weed seed control.

Bear in mind that a stripper front will generate a lot less chaff than a cutter type front, and so this is likely to influence weed suppression and the rate of weed seed decay. ■

## HOW TO ASK A WEEDSMART QUESTION

Ask your questions about weed control in the chaff line on the WeedSmart Innovations Facebook page WeedSmartAU, Twitter @WeedSmartAU or the WeedSmart website <https://weedsmart.org.au/category/ask-an-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.



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**Take care. Stay line aware.**

Lines are all around us, yet powerlines are the lines that matter most.

During the harvest, use a spotter and look up to avoid contact with powerlines.

**Look up and Live**

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**ERGON ENERGY NETWORK**

# Global made local

**D**ENMARK'S Hardi may not sound like an Australian sprayer maker, but its Hardi Australia subsidiary has a substantial manufacturing facility in Adelaide.

In fact, the majority of Hardi sprayers sold in Australia and New Zealand are built locally. To put it in perspective, the company's local production consumes more than 7200 kg of welding wire and 8.4 tonnes of 'Hardi Red' powder a year.

Hardi International established Hardi Australia in 2002 and today the local business occupies more than 10,000 m<sup>2</sup> of production, testing, logistics and support space on a 10 hectare site that also has space for testing new machines.

Fluid systems are tested separately in a facility that can fit all Hardi sprayers, including the giant 9000-litre Rubicon self-propelled sprayer and its 48.5 metre boom. With a full water recovery system, Hardi is able to run spray tests for 24 hours and longer.

Hardi's Australian Product Development Centre (APDC) is a conduit for the latest sprayer technologies and innovations. One of Hardi Australia's big advantages is the global company's specialised expertise. Hardi Europe has an ongoing R&D commitment, and the APDC can rapidly bring the benefits of that research to Australian farmers.

## Australian innovations

At the same time, Australian innovations are fed back into the network to benefit producers overseas.

The Hardi Rubicon is a perfect example. It was developed locally to meet the unique needs of Australian broadacre farmers, but now it is Hardi's largest self-propelled sprayer and is offered worldwide.

Building on the Australian template, Hardi's global network contributed class-leading engine, boom, fluid control and guidance technologies to the Rubicon.

Its 6500 and 9000-litre stainless steel tanks are manufactured by a South Australian supplier, which also manufactures 6200-litre tanks for the Hardi Saritor 62 Active self-propelled machine.

It is one of more than 130 Australian OEM suppliers that benefit from Hardi Australia's manufacturing operation, along with more than 100 local employees.

Hardi Australia's production commitment has also helped develop local expertise. Making sprayers here means Hardi can configure machines to meet the specific needs of its customers. Plus the company carries an inventory of more than 20,000 different backup parts.

While Hardi local dealers and service technicians are generally a farmer's main source of information, Hardi Australia has specialist technicians for all of its sprayers.

Hardi technicians are also experts in aluminium boom configuration, which requires lots of local knowledge. Hardi Australia began importing Pommier aluminium booms years before anyone else and worked hard to adjust their performance for local farmers.

The process involved a lot of testing and significant deviation from the settings recommended by Pommier engineers in Europe.

Now, Hardi Australia uses its unrivalled know-how to manufacture aluminium booms in Australia from imported Pommier extrusions, under the Hardi Paragon brand.

The booms are integrated with Hardi's advanced AutoHeight and AutoTerrain sprayer centres at the factory, to provide the best possible height control and a smooth, accurate boom ride. Operators often marvel at the way Hardi Australia's booms 'float' across melon holes, lumps and slope changes.

Hardi enhances its local boom expertise with leading international technology, such as the H-Select nozzle control, which is offered exclusively on Rubicon aluminium booms. H-Select uses compressed air switching to control different combinations of up to four different nozzles at each nozzle body.

It can provide constant fluid pressure, application rate and droplet size across the Rubicon's entire speed range. Droplet size can even be adjusted on the move from an in-cab run screen, for better coverage and drift control.

Hardi installs and tests H-Select at the Adelaide factory, then 'fine tunes' the system final testing on delivery.

Mixing international technology with tailored production is called 'global made local', and it underpins every aspect of Hardi production and customer service. It means the next Danish sprayer you see is a lot more Australian than it looks. ■



The Hardi Rubicon has been developed locally and incorporates many Australian field-based innovations.



## The complete package

**F**ARMERS round the world are looking for ways to manage nitrogen fertiliser usage in order to increase the quantity (yield) and quality (protein) of their crops. Measuring protein in grain as it is harvested in the field, provides a direct measurement of the nitrogen availability and uptake by the crop.

By combining the protein and yield maps collected off a combine harvester protein/yield correlation quadrant maps can be generated for each field. These maps provide four performance zones for the crops – low yield/low protein; high yield/low protein; low yield/high protein; and, high yield/high protein.

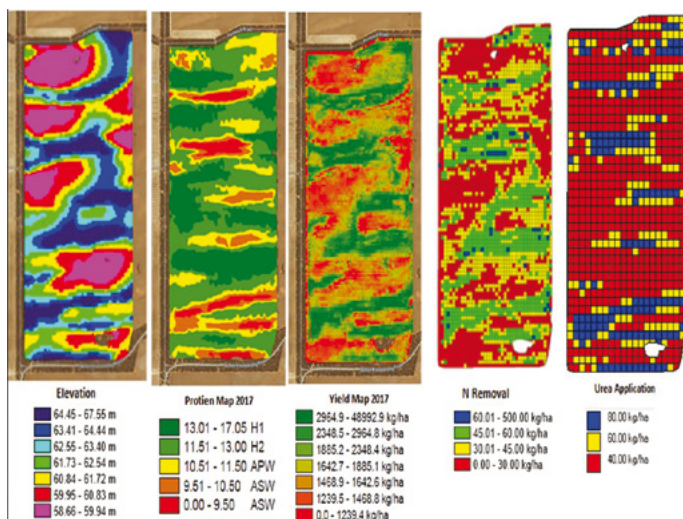
These four zones can be used to develop simple and reliable variable rate fertilisation prescriptions that produce a positive yield response to nitrogen fertiliser.

CropScanAg Solutions offers a complete package of hardware, data processing, mapping and VRF recommendations that provides a total Nutrient Management System. The package includes:

- CropScan 3300H On Combine Analyser to measure protein, oil and moisture of grains and oilseeds as they are harvested;
- Soil station with soil moisture probes to monitor rainfall, soil moisture and weather conditions;
- Management Tree and shape file setup prior to harvest;
- Field maps – protein, moisture, oil, yield, protein/yield correlation quadrants, nitrogen removal, sulphur removal, potassium removal, phosphorus removal, elevation and gross margin in each field – maps can be downloaded to the farmer's preferred platform;
- Analytics software that generates water efficiency and nitrogen efficiency data; and,
- Soil and nutrient advisory service to provide recommendations for VRF prescriptions and soil treatments.

CropScanAg Solutions is an Australian developed system based on six years experience and trials. No other service for farmers provides the complete picture on nitrogen availability and uptake by crops.

For more information on the CropScanAg Solutions, visit our web site: [www.Cropscanag.com](http://www.Cropscanag.com) or view our video on Youtube: <https://youtu.be/PMJIUvVMqUc> or contact us at [sales@nextinstruments.net](mailto:sales@nextinstruments.net), tel: 0428 988 090. ■



## Simplicity releases section control

**W**ITH the high cost of crop inputs, it is no secret that section control offers broad acre growers the opportunity to save significant amounts of money. By reducing overlap and minimising double application, the savings accumulate. Following a successful demo roadshow program across Southern and Western Australia, Simplicity Australia now offers section control as an option on their 30 Series Airseeders.

Simplicity's journey toward section control has been a long one, starting in 2008 with a wing shut off system developed for use within the rice industry. It was a simple system with manual operation, but it laid the ground work for what would become section control.

Simplicity's section control is based upon their renowned ground drive system – a system with a reputation for accuracy and reliability. By simply engaging and disengaging the drive to each metering spool, Simplicity has been able to retain the benefits of ground driven airseeders. Many growers will appreciate the comfort of knowing that the system can be manually engaged, should an issue arise within the electronic control system.

The metering spools are set in pairs, with each spool having an individual control and monitoring system. These units have been designed to be easily removed for inspection or replacement if necessary. Each spool operates separately but they can also be linked together to operate as a single section if required.

Another feature of Simplicity's section control system is an air damping system to balance the air pressure when a section disengages. This ensures that sufficient air remains within the active sections to deliver grain or fertiliser to the boot.

Simplicity is offering their section control option on any new 30 series airseeder.

Not only are Simplicity Australia's new 30 Series seeders the largest they have ever built, they are also packed with features to benefit growers now and into the future. ■



Development of the Simplicity 30 Series was a response to demand for larger capacity airseeders with innovative features.

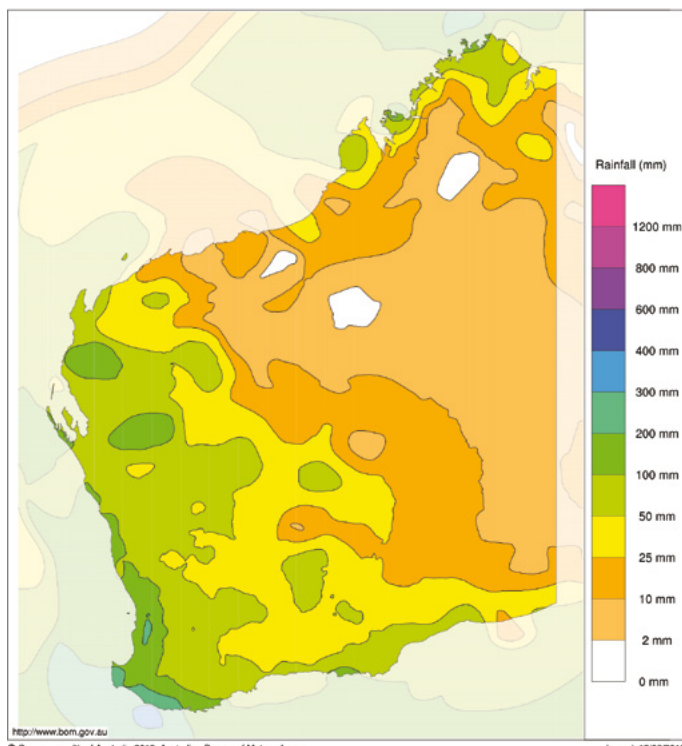
# District Reports...

May–June 2019

## Western region

Western Australia rainfall totals (mm) April 1 to June 12, 2019

Australian Bureau of Meteorology

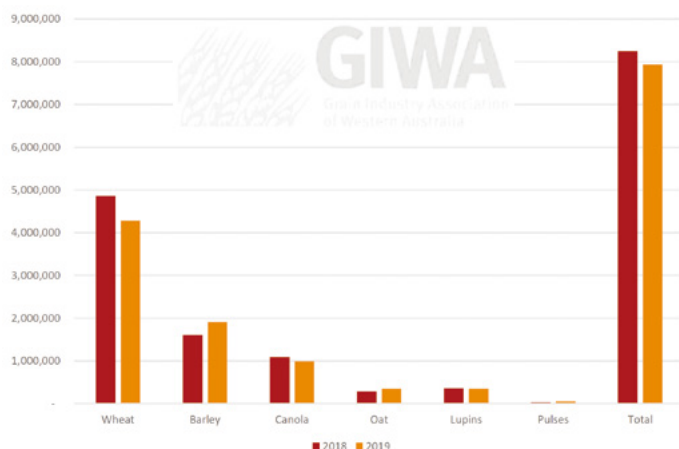


After an extremely dry start, the season 'break' finally arrived in WA in early June.

## WESTERN AUSTRALIA SUMMARY

The dust has finally settled from a long dry summer and autumn. With general rains across the grainbelt of Western Australia over the last few days (June 8 & 9) and more anticipated

GIWA Western Australia Crop Area Estimates (hectares)  
June 2018 -v- June 2019



to fall in areas that have received the lighter totals, crops are finally up and away. The long awaited break to the season has arrived!

The recent rain was not predicted until the last few days in May and at that stage it was looking like a mid-June break at best. Whilst later than many would have liked, the rain over the last three days has still been a welcome change.

The chance for average grain yields across the medium and lower rainfall regions has diminished in the last month as opening rains have only just arrived. The later than ideal start to the growing season for mos – and lack of sub-soil moisture – means that winter and spring are going to need to be better than normal to return average grain yields.

Many crops in the southern half of the state had germinated from the light mid-May rainfall and were sitting just under the soil surface when the rain arrived on the weekend. These crops will have the jump on those germinating now although with some reduced vigour.

Most crops in the north of the state have had no rain whatsoever until now and the transition zone between north and south has seen many crops that did germinate earlier fail, needing to be re-sown or left with low plant density.

### Intended crop areas (see chart)

The trend to increasing barley has eventuated in most areas except the north. Canola and lupin area is down, oats for hay are up in traditional hay areas and the pasture/fallow area is also up.

The wheat area has continued to be substituted by barley and due to the late start, country has been left out that was initially to be sown to wheat. Wheat area is likely to be historically low at less than 52 per cent of the total crop area in 2019.

This will also be the largest area of barley planted for the state on record.

The subtle shift to pasture from the late break – and the increasing profitability of sheep – has seen the total predicted area of crop drop to below 8 million hectares for the first time in many years.

GIWA gratefully acknowledges the support of DPIRD, CBH and contributions from independent agricultural consultants and agronomists in the production of this report.

GIWA Crop Report – June 10, 2019

## NORTHERN DISTRICT

It has been a very dry nine months across the Northern cropping region of WA. Our main service centre, Geraldton, has set a new record low rainfall for the nine months from September 2018 to May 2019. There was only 21 mm recorded for that period.

The west of our region is normally very dry through this period so it is not much of a problem. But the eastern areas usually get some summer rain so growers' confidence as we enter the 2019 growing season is down because of the lack of subsoil moisture.

There were some relatively small areas in the east of the region that did get some March–April rain but for most areas, it has been very dry.

Growers have been preparing as normal. Stubble burning has been a job on many farms with the big crop residues from previous harvest.

Dry sowing has been underway since mid April and many growers have finished – or are very close to finishing – their programs.

Growers in the medium and high rainfall areas have generally put their normal program in with the usual areas sown to lupins, canola, wheat and barley.

With no subsoil moisture, low rainfall area growers have



# District Reports...

May–June 2019

tended to drop off some or all of their lupin and canola programs. It is too late for these crops to be planted now and many have trimmed their program due to the dry conditions.

Generally, most growers are being patient and are still quite upbeat about the season ahead. On average, the break in the Northern region arrives by around May 24. So the first week of June – and still no break – is not considered too late.

There is a cold front and cloud band due on June 7 that should deliver significant rainfall across our region. We all hope for good rain to get the growing season underway.

Peter Norris

Agronomy For Profit and Synergy Consulting, Geraldton

June 5, 2019

## SOUTH COAST

Seasonal conditions on the South Coast have remained very dry for the past two months. Seeding commenced in early April with most crop going in dry until a timely southerly cold front crossed the region on April 29.

The rain from this front was generally good enough to germinate and emerge dry sown crops. It also allowed seeding to continue into varying degrees of soil moisture until the next southerly front came through on May 16.

Most growers in the South Coast region had finished seeding by the end of May. Areas within 60 km of the coast – except for the non-wetting sands and gravels – appear to have had reasonable crop emergence.



Rolling vetch immediately after sowing. This drone image was taken at the Mt Ridley area property of Scott and Jane Wandel, 75 km north east of Esperance.

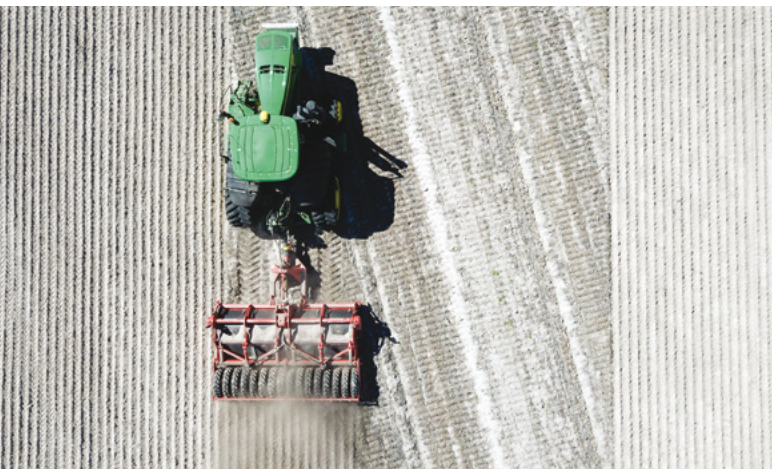
## Seasonal rainfall across the grain regions – 25 year averages and year to date

Brought to you in association with  JOHN DEERE	25yr Annual Average (mm)		2019 rainfall to date (mm)		Summer 25yr Annual Average (mm)		2018–19		Autumn 25yr Annual Average (mm)		2019		Winter 25yr Annual Average (mm)		2019 to date		Spring 25yr Annual Average (mm)		2018	
Emerald Qld	564		215		251		52		106		182		67		0		125		113	
Toowoomba Qld	679		263		276		73		138		232		86		6		180		184	
Roma Qld	579		138		256		36		119		133		75		4		134		106	
Goondiwindi Qld	619		133		253		66		123		110		98		11		147		174	
Narrabri NSW	621		124		217		69		119		111		123		0		162		149	
Gunnedah NSW	627		169		211		65		108		144		126		4		183		207	
Dubbo NSW	588		156		184		117		125		70		129		3		152		166	
West Wyalong NSW	437		150		118		84		79		85		120		1		122		86	
Wagga Wagga NSW	531		217		134		110		109		161		147		3		141		149	
Swan Hill Vic	308		77		69		57		64		58		87		4		88		41	
Bendigo Vic	490		102		100		60		105		78		158		5		128		61	
Horsham Vic	365		79		76		41		71		66		120		2		99		47	
Lake Bolac Vic	506		201		108		72		103		171		153		9		142		73	
Murray Bridge SA	358		62		66		30		80		53		120		3		94		47	
Kadina SA	327		73		60		9		76		70		110		0		82		58	
Cummins SA	390		6		51		6		89		115		174		1		76		48	
Esperance WA	618		102		90		37		136		95		251		5		140		146	
Wagin WA	391		80		50		7		90		51		165		29		85		61	
Northam WA	407		71		61		32		87		30		189		39		80		55	
Mingenew WA	347		57		33		0		86		4		171		43		57		40	
Moora WA	385		64		46		6		82		20		189		42		68		65	
Mullewa WA	320		68		56		12		90		37		131		31		43		24	

Last rainfall reading June 11, 2019.

# District Reports...

May–June 2019



**Incorporating delved clay by spading on non-wetting sand in the Beaumont region about 130 km east of Esperance. The property is owned by Viridis Ag.**



**A spectacular nighttime vista of burning canola windrows. These burns are just one of the ryegrass weed control strategies employed at the Scaddan district property of MKM Farming.**

But the mallee areas 60 km from the coast are still very marginal with varying degrees of crop emergence. Some growers in these areas are scaling back cropping programs this year. A number of growers have dropped canola from their rotations with such a late start and no stored subsoil moisture.

Water is becoming scarce for both crop spraying and livestock. Many growers are having to cart water to keep up with demand.

In those areas that have received sufficient rain, post-emergent grass weed control has commenced in the early sown canola and pulse crops.

Rain is the vital ingredient missing from this season. Hopefully some decent falls arrive soon.

**Quenten Knight**  
**Agronomist, Agronomy Focus, Esperance**  
**June 6, 2019**

## Southern region

### SOUTH AUSTRALIA SUMMARY

Rainfall in South Australia during March and April was below average and soil moisture levels were also below average when planting of winter crops commenced. Above average and timely rainfall in most cropping regions during May increased soil moisture levels and improved planting and growing conditions.

But parts of the northern Murray Mallee did not receive sufficient rainfall in May to germinate dry sown crops. Planting is now largely complete, except in the south east, where planting can continue well into winter.

Most cropping regions had average or better levels of soil moisture in May with significant parts of the Eyre Peninsula and lower Yorke Peninsula at well above average or better. The ongoing development of crops will be aided if winter rainfall is timely.

The area planted to winter crops in South Australia is forecast to be around 3.6 million hectares in 2019. Winter crop production is forecast at around 7.4 million tonnes, slightly above the average production in the 10 years to 2018-19.

Area planted to wheat is forecast to increase by about 8 per cent to 2 million hectares. Wheat production is forecast to increase by 46 per cent to 4.3 mt.

Area planted to barley is forecast to increase by 10 per cent to 900,000 hectares. This is a result of expected favourable returns from growing barley compared with production alternatives.

Barley production is forecast to increase by 37 per cent to 2.1 mt.

Area planted to canola is a forecast 210,000 hectares. This is 14 per cent below the 10 year average to 2018-19, reflecting an increase in the area planted to barley and pulses at the expense of canola. Canola production is forecast to be 290,000 tonnes.

*From ABARES June 2019 Australian Crop Report*

### VICTORIA SUMMARY

There was above average rainfall in many cropping regions in Victoria during May. This rainfall replenished soil moisture levels depleted by unfavourable seasonal conditions during March and April. But there was insufficient rainfall in parts of the northern Mallee in May to germinate dry sown crops.

Lower layer soil moisture levels in May were above average in central cropping regions and mostly average in other cropping regions. The notable exception is parts of the Mallee where it is below average.

Area planted to winter crops in Victoria is forecast to increase by 13 per cent – compared to the drought affected season in 2018-19 – to around 3.3 million hectares. Winter crop production in 2019-20 is forecast to be around 6.2 million tonnes, similar to the average production in the 10 years to 2018-19.

Area planted to wheat is forecast to rise by 11 per cent in to around 1.6 million hectares. Wheat production in 2019-20 is forecast to increase by 64 per cent to 3.2 mt.

Area planted to barley is forecast to increase by 10 per cent to 850,000 hectares, which largely reflects expected higher returns relative to production alternatives, particularly canola. Production is forecast to increase by 64 per cent on last year to 1.8 mt.

Area planted to canola is forecast to increase by 33 per cent to 400,000 hectares, largely reflecting significant area taken out of oilseed production and cut for hay in 2018-19. Canola



production is forecast to increase by a massive 80 plus per cent to 550,000 tonnes.

**From ABARES June 2019 Australian Crop Report**

## VICTORIAN MALLEE

Warm and dry conditions in the first four months of 2019 forced Mallee growers to dry sow to keep up with logistics and optimal sowing dates. Growers have focussed on vetch, oats and pastures for sheep feed – with regular checks of the weather outlook. When the rain finally came in early May (between 6 and 21+ mm), some growers changed their sowing program opting for more canola. This was prompted by the excellent subsoil moisture made available by December 2018 rainfall.

The rain has generally continued and with excellent crop establishment, optimism across the region is high. Growers have been keeping a keen eye on the performance of pre-emergent herbicides in the dry sown paddocks. Most growers have been happy with the pre-em results.

Now that sowing has concluded, growers are busy inspecting for insects, rolling lentils and applying early nitrogen or sulphate of ammonia. Some spraying is also underway for post emergent weed control.

The Mallee has experienced some cold temperatures – nearing zero in late May – but this has barely hindered crop development.

Bryobia mite were observed in cereal and canola crops in parts of the Mallee but damage so far is minimal.

Other activities include budgeting for nitrogen applications. The Bureau of Meteorology says all but one of the models surveyed suggest positive Indian Ocean Dipole (IOD) levels will be maintained throughout winter. Half the models suggest drier rainfall trends and warmer temperatures predicted for the next three months. Growers will be keen to closely match their inputs with yield potential.

Excellent sheep prices are providing some very welcome cash flow for livestock producers. Some producers are selecting lambing paddocks and are waiting for pastures to establish with enough root system prior to grazing.

**Louisa Ferrier**  
**Engagement and Member Services Leader,**  
**Birchip Cropping Group**  
**June 7, 2019**



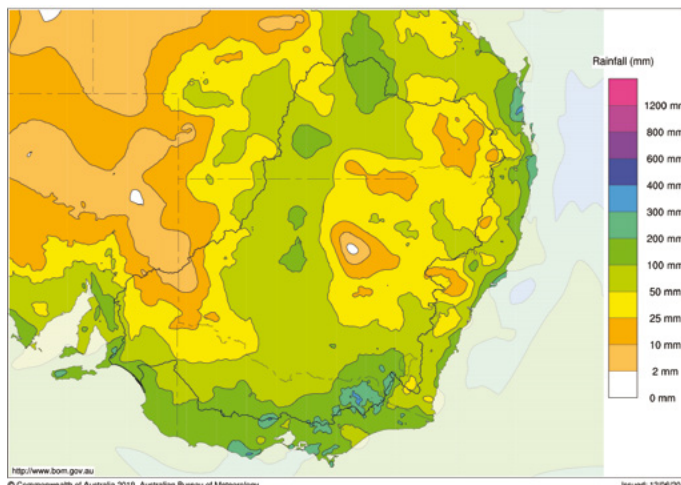
**With generally good rainfall across the Mallee, crop establishment has been excellent.**

# District Reports...

**May–June 2019**

**Murray–Darling Basin rainfall totals (mm) for April 1 to June 12, 2019**

Australian Bureau of Meteorology



**The southern states are generally away to an encouraging start to the 2019–20 winter crop while central-west and northern NSW and southern Queensland are still dry.**

## Northern region

### GRDC NSW SUMMARY

Tough is the word Lake Cargelligo grain grower, private consultant and GRDC Northern Panelist Andrew McFadyen is using to describe the current seasonal conditions across much of New South Wales' grain growing regions.

He says reasonable rain was needed in the next three to four weeks to give winter crops a fighting chance after a dry summer and autumn.

"In seasons like this, it is really important to remember we are all in this together and it's always rained. It will turn around this time too," says Andrew. "In the meantime, I believe we have to think outside the square, find ways to keep busy, create alternative incomes and reach out for help when we need it."

"Most panel members are involved in the grains industry either as growers or as farm advisers or researchers, so we know firsthand the challenges that come with a season like this one. We are also conscious that for many growers this is the second or third year they've struggled to get winter crop in," Andrew said.

"In the Lake Cargelligo region, the past 18 months have been incredibly dry, and we are now at a point where we need rain in the next three to four weeks to give winter crops a chance, or in some cases to get winter crops in the ground."

Further south, GRDC Northern Panel member Roy Hamilton, who owns a 4400 hectare mixed farming operation at Rand in the southern Riverina, said heavy rain in early May caused some soil issues and hampered the emergence of canola crops.

"We had 48 millimetres in one rainfall event in May and have had none since. This brings the total rainfall for the year to just 100 mm, with many growers opting for 'safer' cereal crops, such as wheat and barley, over canola this season," Roy said.

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"But the fact is all these crops need rain now and we haven't had any follow-up. We are also contending with a lot of damage from wildlife.

"The situation is similarly stressful for irrigators with the Hume and Burrinjuck dams at 15 and 29 per cent respectively."

Roy said the second dry season in a row had prompted many grain growers to consider trying to get livestock back into the system to spread risk, but this was proving difficult due to stock prices and infrastructure issues.

"In the north and west of the Riverina – which was 80 to 90 per cent cropping – this is now closer to 60 or 70 per cent as growers try to get livestock back in their systems. So there are some significant changes going on as producers work out the best way to adjust to the climate challenges," he said.

At Forbes, GRDC Northern Panel member Tony Hamilton said the season had been "very patchy" with reduced canola plantings, very little chickpea planted and some irrigation water available to carry over.

"Irrigators are definitely disillusioned. But the planting decision window could extend from mid-June to July if the price outlook is good and we get some rain," Tony said.

At Wyalong, grower and GRDC Northern Panel member Roger Bolte said it was a similar situation despite 70 mm in late March giving growers hope for a great autumn start to the season.

"We had another 50 mm in early May and that helped set up some growers across this area, but the conditions vary significantly through this region," he said.

"The south-eastern area has fared well and most of the crop is in the ground and range from just planted to established, again into variable moisture levels.

"Wheat and barley are the main crops this season at the

expense of canola and legumes. Canola could be back as much as 90 per cent this year across this district. A small area of chickpeas and lupins will really round out what's in the ground here."

Roger said the northern eastern part of the Wyalong region had largely missed out on falls and was 'patchy at best', while in the south east towards Barellan growers had planted opportunistically where rain had fallen but other areas remained unsown.

## We've been here before in the Central West

In central western NSW, grain grower and GRDC Northern Panel member Bruce Watson has a "dèjà vu" feeling that 2019 in the Parkes area could be a repeat of the 2018 season.

"We have missed out on most of the rainfall that was received in the Riverina and North West Slopes and planting here ranges from finished to not even started depending on who got under storms," Bruce said.

"Subsoil moisture is generally less than it was this time last year and we have seen a strong emphasis on cereals with very little canola or grain legumes going in.

"Without significant rainfall in the next two to three weeks, there will probably be a significant proportion of long fallow through this region, especially west and north into the Trangie and Nyngan areas.

"There is also a trend of moving back into sheep with a renewed focus on grazing crops."

Bruce said some growers in his region were entering their second year without a winter crop, which was virtually unheard of in country generally viewed as "safe".

"Others have been dry sowing and the dust has been unbelievable. This is very hard on discs/tynes, bearings, seals, staff and emotions," he said.

Further north on the Liverpool Plains, agronomist Pete McKenzie said there was limited subsoil moisture and minimal winter planting.

"Some crops have been planted and emerged south of Coonamble and down to Gulargambone, which really is the best area west of the Newell to date," he said.

"There has been some light rain of 25 to 50 mm in the Walgett area, but these were pretty patchy and not enough to make much difference. West of Moree and Rowena, growers have been using planters to create ridges to stop wind blowing topsoil and they have added some seed.

"But the 'golden triangle' is only 10 to 20 per cent planted and this has been on very long fallow paddocks or into recent fallows for ground cover only or really as a huge punt."

Pete said further cuts to groundwater allocations were also a risk, as water table levels dropped.

"This is the first time this has ever happened so these are challenging times and the planting window in this region is rapidly closing, so we need rain.

"I would say, at a conservative estimate just 15 to 20 per cent of the region has been planted. This is a major concern after a disappointing summer crop. But I think the message I keep telling my growers and the wider industry is that we are all in this together, and if we look out for ourselves and each other we can get through this."

**The GRDC will be running a series of Drought Management Workshops throughout NSW in July and August.**

**For more information or resources from the GRDC on Dealing with the Dry, go to <https://bit.ly/2WitQhO>. If you would like more information about mental health support go to <https://bit.ly/2I00XFH>.**



**On the Liverpool Plains, agronomist Pete McKenzie said there was limited subsoil moisture and minimal winter planting.**  
(PHOTO: GRDC)



## GRDC QUEENSLAND SUMMARY

Well-known American Will Rogers once said 'a farmer has to be an optimist, or he wouldn't still be a farmer'. In Qld, this season – and like much of the northern cropping region – Will's statement is proving to be pretty accurate.

Seasonal conditions remain variable across Qld as grain growers head into June still optimistically looking skyward for rain as the winter crop planting window narrows.

### Southern Qld

In southern Qld, Chinchilla grain grower and GRDC Northern Region panelist Arthur Gearon, says that for many growers this will be the second or third consecutive year without good rain and that starts to really impact on how you cope.

He says the season is a mixed bag for much of the western and inner Darling Downs and further south to the Queensland and New South Wales border.

"You can draw a line north from about Bungunya where most of the area to the west received either no or little rain in March and good falls in April, with exceptions as some growers missed out completely," Arthur said.

"To the east it was the opposite, with big rains in March and smaller (5 to 10 mm events) in April but again some growers missed out entirely.

"Put into the context of the preceding seasons, it is quite interesting. Most summer crop growers actually planted on limited moisture and crops struggled to yield anything at all.

"Whilst in the winter-prominent areas the biggest issue seems to be successive years trying to chase high chickpea prices which has meant there is very little ground cover and as a result an inability to store moisture."

Arthur said looking ahead, growers were predominantly concerned about ground cover and were evaluating the cost of planting barley or wheat even if they had limited chance of a reasonable yield, just to get cover on paddocks.

"Some optimistic growers chasing moisture have put in deep sown chickpeas – so there is a bit happening – but the reality is the planting window has not closed yet so if we get rain there is still time."

### Wide Bay Burnett

Meanwhile, growers on Queensland's coast and across the Wide Bay Burnett region are also battling dry conditions with minimal rain during the traditionally wetter summer months of December to February and late falls in March.

Maryborough's GRDC Northern Panel member and researcher Jo White said it was the third dry summer in a row for growers in the Wide Bay region.

"Maryborough received four per cent of its usual rainfall in January and 16 per cent of the average in February," Jo said.

"Conditions improved in March and April with 210 mm and 90 mm respectively and this pattern was similar for the South Burnett/Kingaroy region.

"Dryland peanuts suffered due to drought conditions with yields well below average in the Burnett. Rain in late March had little impact on improving the yield potential of peanuts in this region.

"The quality and quantity of peanuts were better under irrigation in the Bundaberg region. But issues with irrigation management due to lack of water availability and PKS (Peanut Kernel Shivel), has reduced overall quality."

Jo said the situation was better for peanuts in North Queensland where good rainfall and disease management produced high yields.

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**Maryborough-based researcher Jo White said it was the third dry summer in a row for growers in the Wide Bay region.**  
(PHOTO: GRDC)

"Soybeans fared better this season, coping reasonably well in the hot, dry conditions. December-planted crops fared worse than January-planted soybeans which yielded two tonnes per hectare," she said.

"Simply speaking, there just isn't enough water for crops so we really need some good falls to top up water supplies for irrigators, as well as replenish soil moisture levels."

### Central Qld

Central Queensland remains one of the more positive regions after receiving reasonable rain in three separate falls in March, April and early May.

Emerald-based private agronomist and GRDC Northern Panel member Graham Spackman said even within his region there were stark differences in soil moisture levels.

"Overall, it has been a good start to the season, with a significant amount of the Central Highlands and parts of the Dawson regions planted on good moisture. But the Callide area centred on Biloela is still very dry," Graham said.

"Late rain saved sorghum crops in the Capella and Clermont areas, although it did lead to a significant influx of *Helicoverpa*

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moths that growers had to manage. Growers are now harvesting but it is tricky as there is some re-tillering with 2–3 stages present in the crop.

“A large amount of winter crop has now been planted in the Central Highlands with many growers opting to grow wheat and restore stubble cover to paddocks. There has also been more barley planted than usual, and there is a significant planting of chickpea.

“The earliest planted cereals received in-crop rain and weed control programs are underway. Some early barley and grazing oats crops, and the occasional early wheat crop, have suffered infestations of armyworms and *Helicoverpa*.

“But despite a good start, many winter cereal crops in the region now need in-crop rain to establish properly and to prevent them maturing too early.”

Graham said those with irrigation in the region were also facing some challenges with Fairbairn Dam currently at 21 per cent which had resulted in reduced allocations.

“Allocations from July 1 are expected to be low, but there will be some carryover from the current year. Comet River irrigators were able to harvest substantial volumes of water following a 200 mm rainfall event over Carnarvon Gorge courtesy of Cyclone Trevor. This will enable a reasonable planting of primarily cotton for those irrigators in spring,” Graham said

For information and other resources such as farm business management advice, evaluating planting pros and cons in dry times and mental health resource links see <https://bit.ly/2WItQhO>

## DARLING DOWNS

### Weather conditions

After some rain in March, April was back to form with just one mm and May produced about five mm, leaving the first five months of 2019 with just 35 per cent of its average rainfall and already 180 mm behind where it should be. June to date has seen five to 30 mm in patchy falls across the Downs, and temperatures are rising to above average now after a cold spell with numerous frosts.

### Winter crop

There has been some dryland planting in the western areas with deep planted chickpeas and barley where some of the heavier falls occurred, but less than 10 per cent of the anticipated area is in the ground. Oats were planted on the March rains and after turning blue with the dry, have started to put some roots down and grow. There are also a few paddocks of faba beans planted around Dalby.

Deep planted chickpeas are going in on long fallow paddocks

## ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

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**Some Darling Downs' (bore) irrigators have dry sown barley and then watered up. Widespread rainfall would be a great relief for these irrigators – not to mention dryland growers still waiting for a start!**

where there is fair subsoil moisture. Wheat and barley will be the main crop if a planting rain falls in June, with many growers keen to have stubble cover to catch future rainfalls.

On the Eastern Downs the only paddocks being planted are those with some irrigation, where wheat and barley are being dry sown and watered up.

### Summer outlook

Growers are holding back some of the few paddocks with good stored moisture for summer crop. The irrigators are expected to stick with their usual cotton and corn, but dryland growers are looking at another large sorghum plant and hopefully mungbean plant. But some good rain is needed to fill profiles that are currently only 25–60 per cent full.

**Hugh Reardon-Smith**  
Agronomist – Landmark, Pittsworth  
June 7, 2019

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