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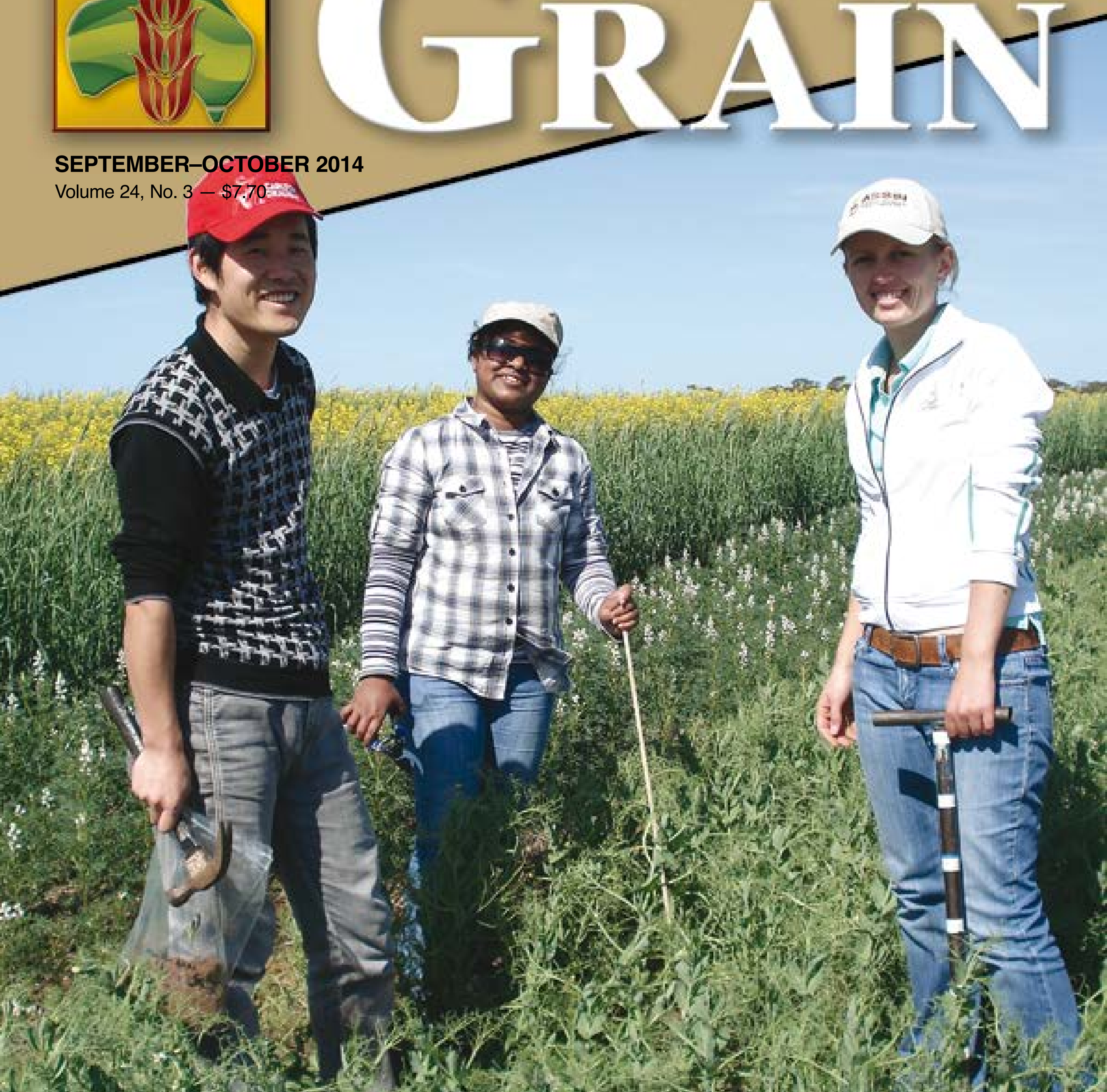
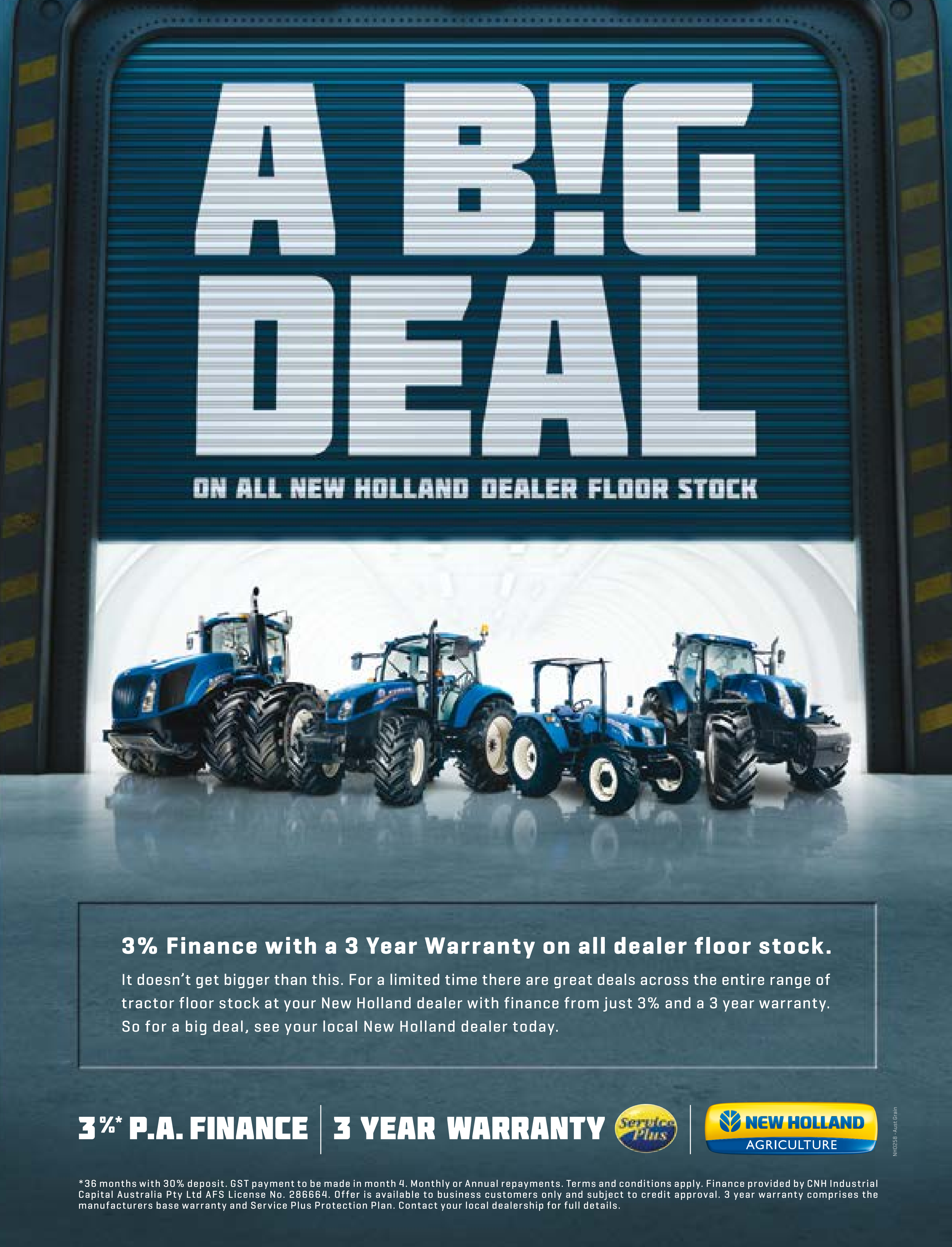


INSIDE

Break crops can 'unlock' P reserves

Is there value in adding late N for protein?

Soil residual herbicides come full circle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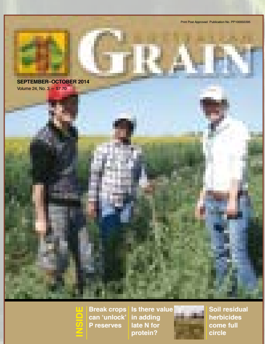
FRONT COVER



South Australian research has demonstrated how break crops can help take up 'lost' phosphorus fertiliser and increase yield in the following crop. See article page 6.
(Photo: Deanna Lush)

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Editorial…

Lloyd O'Connell

IT was in the boardroom of the Hamburg office of ADM (formerly Toepfer International) where our group of *Australian Grain* study tourists heard from the world's largest grain and oilseed processing company that the current global supply and demand situation was pretty much as 'uninteresting' as you could get. In other words, there is plenty of grain and oilseed washing through the global supply pipelines and no surprises or hiccups were expected in the foreseeable future.

Not exactly the news our group wanted to hear but given ADM has sourcing, transportation, storage and processing assets in more than 75 countries, we had to concede that their analysts have a better grasp than most on the fundamentals of the world market.

As our group travelled through the picture perfect farmscapes of northern Germany and into Denmark, Norway and Sweden, we learned for ourselves the grain supply situation in the breadbasket of western Europe. We were met time and time again by very big smiles from our wonderful farmer hosts. And the size of their smiles was matched only by the size of their average grain yields that (northern hemisphere) summer. Continued reports of 10 to 11 tonnes per hectare average winter wheat yields almost became tedious really, while eight tonnes was particularly ho-hum! And six tonnes of canola per hectare was a pretty 'common' result as well.

These incredible winter crop yields are due largely to plenty of reliable moisture and plenty of daylight hours turning sunshine into grain. With the winter crops sown in September-October – and hopefully before the first snows arrive – the plants can be in the ground for nearly a year before harvest comes around. Of course, good agronomy and soils also help. And thanks to continuing EU and individual country farm support programs, the farmers can afford to look after their crops well.

But there is a sting in the tail when subsidies become totally ingrained in agriculture. Land prices sky-rocket and with the imperfect market mechanisms at play on farm input costs and prices, it comes as no great surprise that the profit at the end of the year is generally about the size of the subsidies provided – currently around A$350 per hectare. Farm sizes are of course much smaller in Europe than here but this means there are literally hundreds of thousands of farmers wielding enormous political power. Combine that political strength with a continent-wide resolve never to have their citizens short of food again and it's plain to see that subsidies are not going to disappear anytime soon – on either side of the Atlantic.

Some spring-time joy

Back home, the Australian winter crop, us usual, has it's good and not so good stories to tell. A general October soaking rain, with no cold, hot or windy spring surprises (not asking for too much are we?) will no doubt put a relieved smile on many faces.

Hope you enjoy a nice soft end to the season in your patch.

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In this issue…

Break crops could hold key to soil P reserves

University of Adelaide research has demonstrated the positive effects of break crops on phosphorus uptake and yield in subsequent wheat crops. Application of phosphorus fertiliser is commonly required in Australia, but only 10–30 per cent of applied fertiliser is taken up by crops, meaning that a large proportion of the fertiliser costs are lost.

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The effectiveness of late N application for protein

A frequent issue in both the 2010 and 2011 winter cropping seasons was the harvest of wheat at yields well above expectation but with low to very low grain protein levels, not infrequently under 10 per cent. This of course resulted in downgrading at receival and consequently reduced economic returns.

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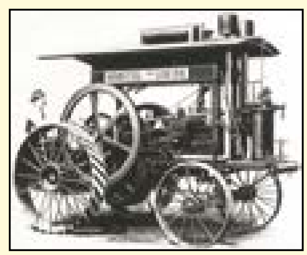
Jerome Increase Case – The man



The town of Faribault is located south of Minneapolis in the State of Minnesota. Since the middle of the 19th Century it has been the centre of a rich farming region, noted for its vast seas of golden grain floating in the soft early autumn winds. In 1884 it was to this place that a 65 year old industry legend was hastening, within the dubious comforts of a saloon carriage pulled behind a belching steam locomotive.

See article . . . . Page 21

Industry to change with new infrastructure investment

The Australian grains industry is set to undergo a dramatic transformational change, as new investment in grains infrastructure results in a move to differentiated supply chains and long-term commercial partnership between industry players, according to a new research report.

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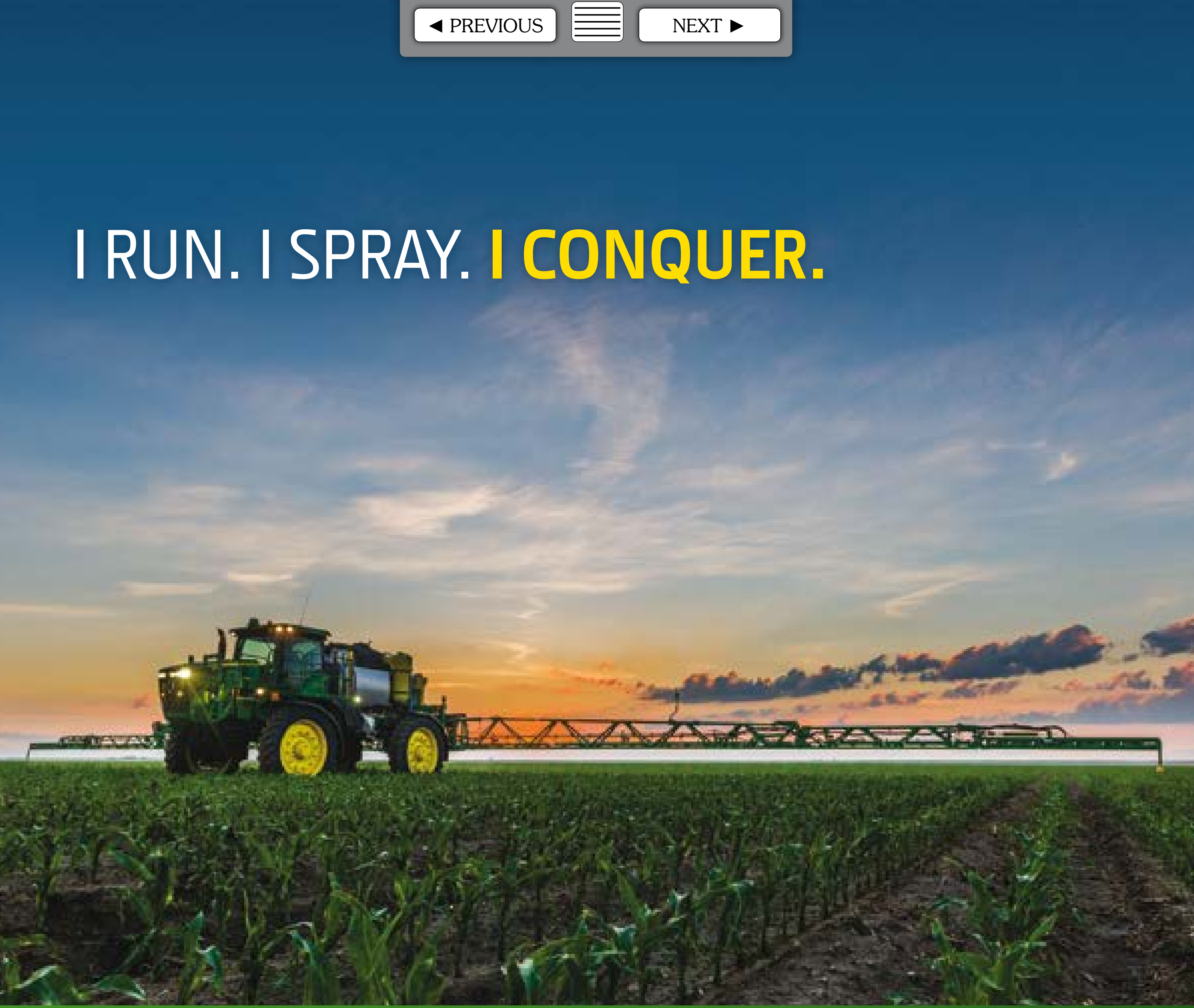

I RUN. I SPRAY. I CONQUER.

Break crops could hold the key to tapping soil phosphorus reserves

■ By Deanna Lush

AT A GLANCE…

- University of Adelaide research investigates break crop impact on phosphorus reserves and uptake.
- Wheat following a break crop has a greater P uptake and higher yield than continuous wheat rotations.
- Legume crops resulted in greater yield and phosphorus uptake compared with canola.
- There was no significant difference in outcomes between the different legume break crops.

UNIVERSITY of Adelaide research, funded by the GRDC, has demonstrated the positive effects of break crops on phosphorus uptake and yield in subsequent wheat crops.

Application of phosphorus fertiliser is commonly required in Australia, but only 10–30 per cent of applied fertiliser is taken up by crops, meaning that a large proportion of the fertiliser costs are lost.

University research fellow Dr Ashlea Doolette has spent the past three years investigating whether break crops can be used to 'unlock' some of the lost P in order to improve phosphorus uptake and grain yields of subsequent wheat crops.

The project studied GRDC established trial sites at Hopetoun in Victoria, Karoonda in South Australia and Junee in New South Wales as well as using a long-term field trial at Longerenong in Victoria. Crops of lupins, field peas, vetch, lentils, canola, cereal rye and wheat were sown in 2011, with different combinations at each site. They were either harvested or green or brown manured, where plant residue is returned to the soil, and then followed by a wheat crop in the next season.

The research team measured soil phosphorus before sowing, at peak vegetative biomass (growth stage 65) and at maturity of the break crop, and then before sowing and at maturity of the following wheat crop. The aim was to understand the effect of different break crops on microbial and available phosphorus in the soil as well as crop phosphorus uptake in the subsequent wheat crop.

Unexpected findings

There were three findings from the study:

- The effects of break crops on in-season P mobilisation;
- The lack of influence of break crops on pre-sowing available phosphorus in the subsequent season; and,
- The greater P uptake and yield of the wheat after break crops.

"We found that during the break crop phase, there was an increase in available P at some sites, but not others, while microbial P increased at one site," Ashlea said.

The in-season mobilisation of P by break crops ranged from

Dr Ashlea Doolette (pictured right soil sampling Kaspa field peas at Karoonda in 2011 with PhD students Foyjunnessa and Yulin Zhang) has found break crops might open up reserves of soil phosphorus for subsequent crops.

0 to 30 kg P per hectare, with no clear trend in P mobilisation with crop type. But large increases in mobilisation were observed in crops which were green or brown manured (12–17 kg per hectare) compared to harvested (1–7 kg per hectare).

"But when we sowed the wheat in the following season, we didn't see any difference in pre-sowing soil phosphorus – available or microbial – compared to the previous year, or between the different break crops," Ashlea said.

This showed that the increase in mobilisation observed in some crops in the previous year had not persisted in the soil, even following the high mobilisation seen from manuring.

Despite the pre-sowing measurements showing no P increase after the break crops, the third set of results – the performance of the wheat crop – provided some interesting findings.

Wheat benefits from break crops

"We found that if you had a break crop followed by wheat, the wheat crop had a greater uptake of phosphorus and significantly higher yield than if you had sown a continuous wheat crop."

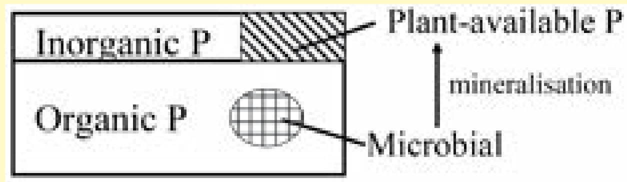
Phosphorus uptake in wheat was 0–2.5 kg P per hectare greater after canola than for wheat on wheat and 2.6 to 6.6 kg P per hectare greater after legumes (peas, lentil, lupin and vetch). Yield increases after break crops ranged from 0 to 2.6 tonnes per hectare compared to wheat on wheat. Legumes provided a greater wheat yield benefit compared to canola.

There was no significant difference in wheat P uptake or grain yield between the different legume break crops, even when the crops had been green or brown manured.

The reason behind this outcome is not yet understood. There could be other factors which may have contributed to a higher P uptake by wheat after break crops. Some theories include increased root length due to improved N availability and less root disease.

The next stage of the university's research will focus on better understanding what is happening beneath the soil surface. Glasshouse trials labelling break crops with phosphorus isotopes has so far found that wheat takes up about 19–26 per cent of the P input from canola or lupin roots. Further work with dual-label break crops (nitrogen and phosphorus isotopes) is underway to distinguish the relative contribution of these two nutrients to wheat growth and yield.

THE TWO MAJOR POOLS OF SOIL PHOSPHORUS AND HOW THEY INTERACT



- There are two major pools of phosphorus in soil – inorganic and organic.
- Not all inorganic P is plant available in soil solution, some P may become available but is temporarily stuck to the surface of soil particles, whereas some P is more permanently unavailable ('lost') as it is fixed to other minerals in the soil.
- Unavailable inorganic P may be 'released' and become available P by the action of exudates from crop plant roots.
- The amount of plant available P (as represented by the hatched box in the diagram) relative to the total inorganic P pool is influenced by soil type, especially clay content and mineralogy.
- Soil organic phosphorus is not directly accessed by plants, it is readily converted to plant-available forms of P by soil microbes during a process called P mineralisation. P in the microbial pool is one stage closer to being available to plants.

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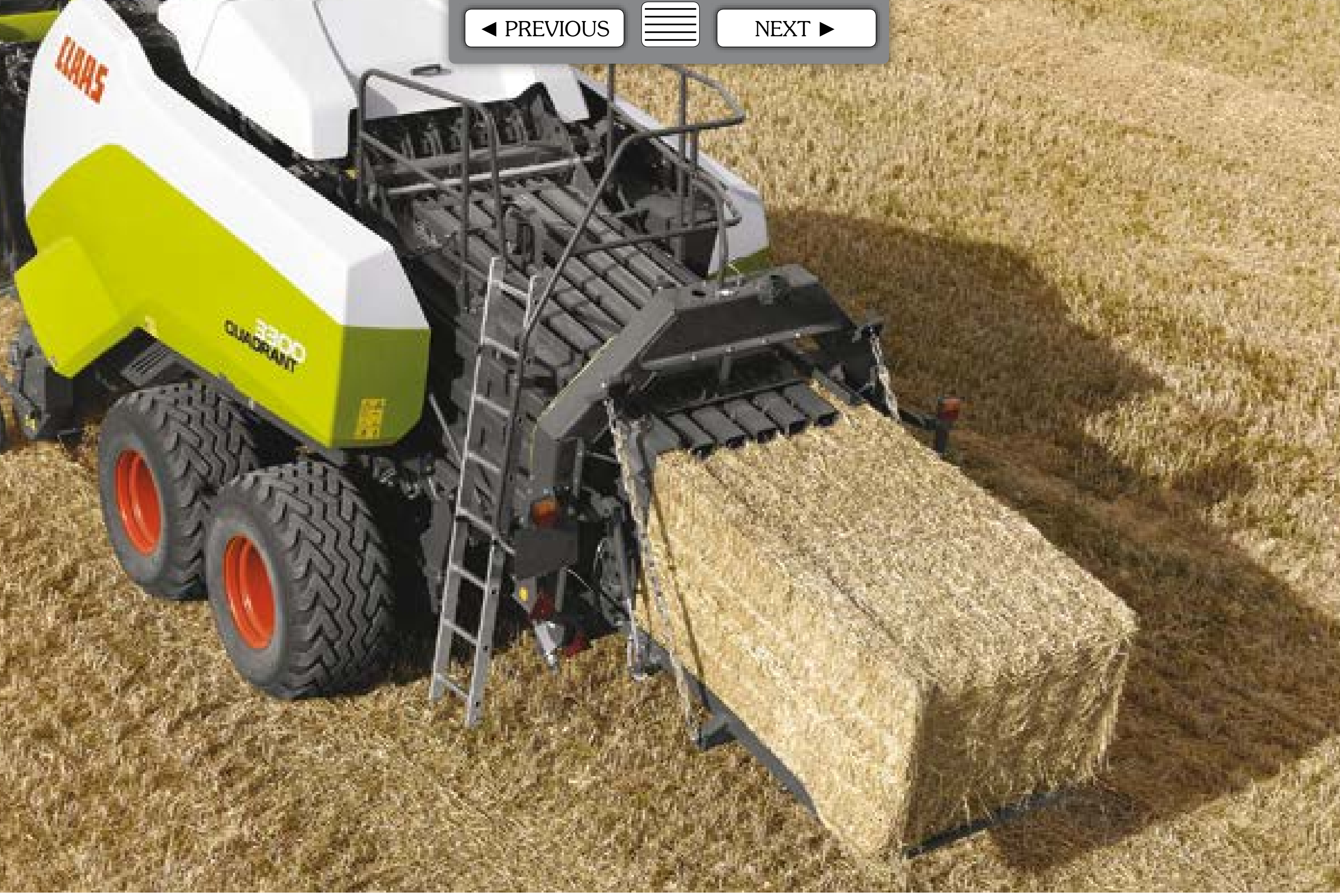
GRDC Phosphorus Fact Sheet:
www.grdc.com.au/GRDC-FS-PhosphorusManagement ■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The effectiveness of late nitrogen application for protein

By Richard Daniel, Rachel Norton, Anthony Mitchell, Linda Bailey and Rob Duncan – Northern Grower Alliance

AT A GLANCE…

- Foliar application of urea solution provided significant increases in grain protein compared to urea applied by *Streambar* or *Spread*, in a series of 11 trials during 2012 and 2013.
- The level of protein benefit was not sufficient to generate a net benefit in any trial.
- Timing differences were less clear, with best results generally from application during late head emergence through to the early milk stage.
- The highest level of nitrogen recovery in grain protein was 37 per cent in 2012 and 28 per cent in 2013.
- Grain grade price differentials of at least $20–40 per tonne are necessary to warrant foliar application for protein accumulation unless nitrogen recovery can be increased dramatically.
- Assessment of residual soil nitrogen showed total grain and soil recovery from *Spread* urea was over 85 per cent at Weemelah in 2013, despite generally dry conditions following application.
- Application of *Spread* urea at planting provided the most consistent and highest level of grain protein across the dryland sites.
- Targeting nitrogen budgets to maximise yield for soil moisture availability is expected to be more profitable than trying to manipulate protein with late nitrogen application.

A FREQUENT issue in both the 2010 and 2011 winter cropping seasons was the harvest of wheat at yields well above expectation but with low to very low grain protein levels, not infrequently under 10 per cent. This of course resulted in downgrading at receival and consequently reduced economic returns.

Although low protein was evident in a wide range of varieties, EGA Gregory was frequently of concern.

There were a large combination of factors causing the low protein achievement but a clear message from industry was the need to determine whether late application of nitrogen for protein manipulation was an effective management option under northern conditions.

This article reports on trials conducted in the northern region in 2012 and 2013, primarily to evaluate the impact of late nitrogen strategies on protein accumulation and to indicate the likelihood of economic benefit.

Why we did the trials

- To determine how effective and economic are late applications of nitrogen for grain protein achievement; and,
- Is there an optimal method or timing?

How the trials were done

A series of 11 *Application Method and Timing* trials were conducted in southern Qld and northern NSW during the two seasons, with nearly all sites under dryland conditions:

- 2012 – Inglestone and Bowenville Qld; Tulloona, Croppa Creek, Bellata and Walgett NSW.
- 2013 – Brookstead (irrigated) and Pilton Qld; Weemelah, Tulloona and Narrabri (supplementary irrigation) NSW.

All sites evaluated a combination of application methods and timings with urea applied at a standard rate of 40 kg N/ha (about 87 kg urea/ha). This rate was chosen to maximise the likelihood of achieving measureable differences in grain protein. This rate is at the upper end of commercially applied in-crop rates. Three application methods were used:

TABLE 1: Crop available nitrogen* and crop growth stages at 'late' application timings

Year	Site	Crop available nitrogen* kg N/ha	Mean crop growth stage at application				
			Timing 1	Timing 2	Timing 3	Timing 4	Timing 5
2012	Inglestone	Not tested	GS39	GS49	GS63	GS76	GS84
	Bowenville		GS41	GS51	GS74	GS78	GS86
	Tulloona		GS39	GS51	GS55	GS65	GS73
	Croppa Creek		GS45	GS59	GS67	GS74	GS85
	Bellata	160 (0–90cm)	GS41	GS51	GS69	GS83	—
	Walgett	70 (0–90cm)	GS39	GS61	GS69	GS83	—
2013	Brookstead	77 (0–90cm)	GS47	GS61	GS73	GS82	—
	Pilton	147 (0–90cm)	GS39	GS57	GS61	GS85	—
	Weemelah	84 (0–60cm)	GS39	GS60	GS71	GS77	—
	Tulloona	129 (0–60cm)	GS39-41	GS60	GS71-73	GS77–83	—
	Narrabri	141 (0–60cm)	GS39	GS45	GS65	GS73	—

*Crop available nitrogen = total soil mineral N kg/ha (to soil depth) plus fertiliser N kg/ha available across entire trial. It does NOT include any mineralisation credit.
Brookstead double-cropped in cotton stubble with soil mineral N of 16 kg/ha, received 111 kg N/ha at planting and 150 kg N/ha top-dressed as urea ~10 days prior to GS30.
Yield target at planting 6-7 tonnes per hectare
GS39 – full flag leaf emergence, GS49 – first awns visible, GS59 – head fully emerged, GS69 – anthesis complete, GS77 – late milk, GS87 – hard dough


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TABLE 2: Rainfall quantity and interval following nitrogen application timings

Year	Site	Timing 1	Timing 2	Timing 3	Timing 4	Timing 5	Total rainfall*
2012	Inglestone	8 mm, +8 days	—	5 mm, +7 days	—	8 mm, +4 days	21 mm
	Bowenville	10 mm, +3 days	—	—	41 mm, +4 days	—	51 mm
	Tulloona	2 mm, +11 days	—	—	9 mm, +9 days	4 mm, +5 days	15 mm
	Croppa Creek	19 mm, +15 days	—	5 mm, +3 days	15 mm, +6 days	—	39 mm
	Bellata	—	1 mm, +11 days	5 mm, +4 days	16 mm, +3 days	NA	21 mm
	Walgett	11 mm, +8 days	—	2 mm, +2 days	—	NA	12 mm
2013	Brookstead	38 mm, +8 days **30 mm, +0 days** **30 mm, +5 days**	7 mm, +9 days **30 mm, +3 days** **30 mm, +7 days**	3 mm, +6 days **30 mm, +2 days**	1 mm, +3 days	NA	65 mm rainfall **150 mm irrigation**
	Pilton	10 mm, +8 days	2 mm, +13 days	5 mm, +2 days	10 mm, +10 days	NA	34 mm
	Weemelah	—	19 mm, +7 days	8 mm, +8 days	—	NA	27 mm
	Tulloona	—	22 mm, +6 days	8 mm, +7 days	—	NA	29 mm
	Narrabri	—	19 mm, +5 days	6 mm, +7 days **30 mm, +2 days**	—	NA	25 mm **30 mm irrigation**

Eg at the Inglestone site, 8 mm of rain was recorded 8 days after Timing 1, there was no rain between Timing 2 and 3 with 5 mm received 7 days after Timing 3.
* Total rainfall = amount recorded between the Timing 1 application and 14 days after the last application.
All irrigation quantities and timings are shown in bold.

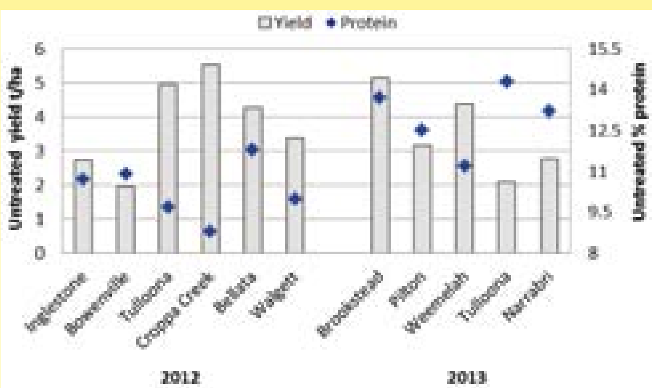
1. *Spread* – urea simply spread by hand.
2. *Streambar* – urea applied in an aqueous solution using BFS streamer bars in 2012 and Chafer streambars in 2013 (Promax 22 per cent urea solution used in 2012 and Ranger 24 per cent in 2013).
3. *Foliar* – urea applied in an aqueous solution using AIXR nozzles in 2012 and TTJ03 nozzles in 2013.

All sites had a minimum of four 'late' application timings. These timings commenced at about full flag leaf emergence (GS39) and then at 10–14 day intervals. The last timing was generally during dough development (GS83–87). Table 1 details the level of crop available nitrogen (soil level plus grower fertiliser program) together with the crop growth stages when additional nitrogen was applied.

Multiple timings were conducted in an attempt to generate a timing response 'curve' for protein accumulation with an expectation that applications around 7–10 days either side of flowering may result in the highest protein content. Yield responses to nitrogen applied at these timings are generally negligible.

Seven of the 11 sites were planted with small plot equipment. At these sites (Bellata and Walgett in 2012 and all sites in 2013) 'early' application of *Spread* urea at 40 kg N/ha was also evaluated. All these sites evaluated 40 kg N/ha as *Spread* urea applied at planting (IBS), applied at jointing (GS30) or split evenly between the two timings.

FIGURE 1: Yield and protein content of untreated grain at individual sites



The remaining four trials in 2012 were conducted in commercially grown crops.

All trials investigated the impact of additional nitrogen under conditions where yield and nitrogen supply were believed to be reasonably matched rather than targeting nitrogen deficient situations.

Wheat varieties evaluated

EGA Gregory was evaluated for nitrogen response at nine of the 11 sites. Suntop was evaluated at the two irrigated sites in 2013 (Brookstead and Narrabri).

Rainfall

Rainfall quantity and timing at each site, together with any irrigation, is shown in Table 2. Low levels of rainfall were recorded at most sites during August to October in both years.

Irrigations at the Brookstead site were well timed following nitrogen application and were expected to provide nearly ideal conditions for incorporation and uptake of Timing 1, 2 and 3 applications.

Site characterisation – yield and protein

Figure 1 shows the yield and protein levels of untreated grain at each site. Yields ranged from around two to five tonnes per hectare in both years but with the majority of sites greater than three tonnes. Protein levels were low to very low in 2012, ranging from 8.8 to 11.8 per cent with increased levels in 2013, ranging from 11.2 to 14.3 per cent.

Late season nitrogen application – key results

- **Leaf scorch –** The only treatment that caused any noticeable leaf burn or scorch was urea applied as an aqueous solution through a conventional nozzle (*Foliar* treatment). But the level of damage was not concerning at any site or application timing in this series of trials (the only concerning level of leaf scorch occurred in a separate trial in 2013 with UAN application at 40 kg N per hectare)
- **Yield –** There was a significant impact on yield recorded in only one of the 11 trials. At Weemelah 2013, the application at GS60 resulted in a significant yield benefit compared to both the GS39 and GS77 timings. Although statistically significant, the absolute level of yield benefit was only about

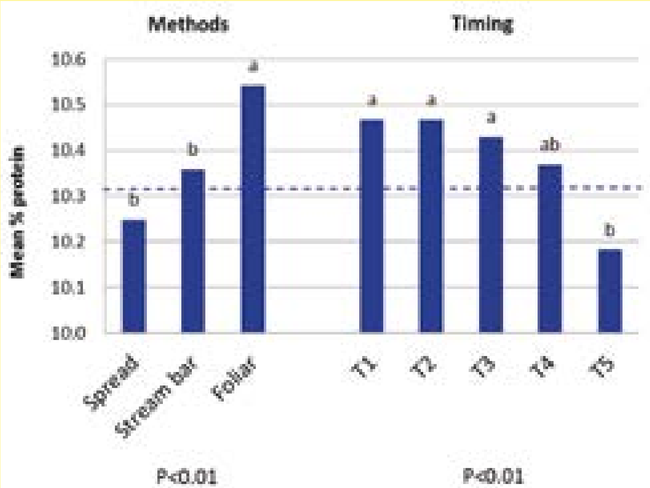
100 kg per hectare. The GS60 application received a 19 mm rainfall event, seven days after application.

- **Protein –** All sites were analysed individually with an overall analysis also conducted for both years. Figures 2 and 3 show the comparison of the three applications methods (across all timings) and the comparison of timings (across all application methods) over both years.
- **Test weight and screenings –** There was no clear impact from nitrogen application method or timing on test weight or screening level in any trial.

In both years, *Foliar* application resulted in a significant increase in protein compared to either *Spread* or *Streambar* for late season application timings. *Foliar* application resulted in significant benefits at two individual sites in both 2012 and 2013.

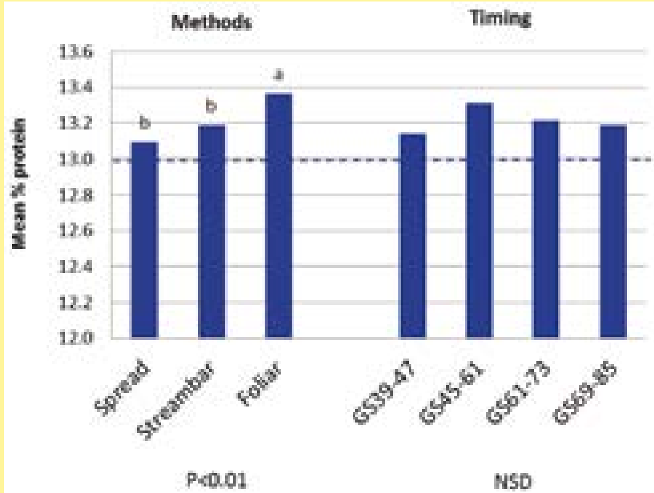
The largest protein benefit in 2012 was obtained at Tulloona using *Foliar* application at GS51 (1.2 per cent but NSD). In 2013

FIGURE 2: Mean per cent protein from addition of 40 kg N/ha, six sites in 2012



Treatments that share the same letter within the groups of Methods or Timings are not significantly different at p=0.05. Broken line indicates the mean per cent protein of untreated control (no additional nitrogen).

FIGURE 3: Mean per cent protein from addition of 40 kg N/ha, five sites in 2013



Treatments that share the same letter within the groups of Methods or Timings are not significantly different at p=0.05. Broken line indicates the mean per cent protein of untreated control (no additional nitrogen).

the largest benefit was obtained at Weemelah using *Foliar* application at GS71 (0.8 per cent, signif).

Nitrogen recovery in grain

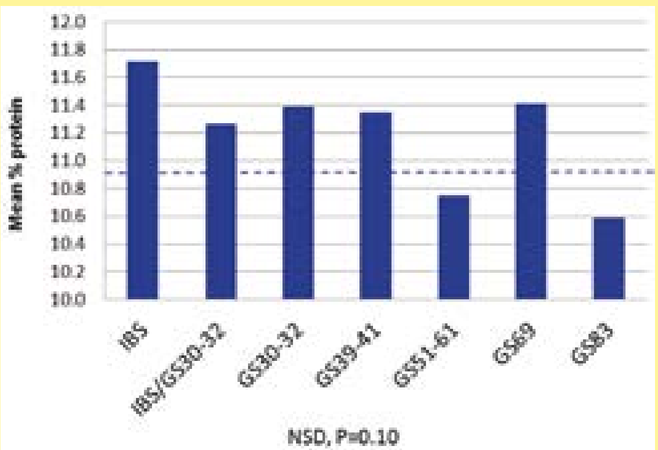
The nitrogen recovery in grain was calculated for all treatments (yield tonnes per hectare x protein per cent x 1.75).

Overall in 2012, *Foliar* application resulted in a significant increase in nitrogen recovery in grain compared to either *Spread* or *Streambar* but still only recovered a mean of around 3 kg N/ha from the 40 kg N/ha applied. In 2013 there was no significant benefit overall from *Foliar* application compared to the other methods although there was a non-significant trend to *Foliar* recovering an extra 4 kg N/ha compared to the untreated control. *Foliar* application resulted in significant benefits at three of six individual sites in 2012 but only one of five in 2013.

The largest nitrogen recovery in grain benefit in 2012 was obtained at Croppa Creek using *Foliar* application at GS45 (15 kg N/ha, signif). In 2013 the largest benefit was obtained at Weemelah using *Foliar* application at GS60 (9 kg N/ha, signif). The efficiency of conversion of applied nitrogen to harvested protein was disappointing in both seasons.

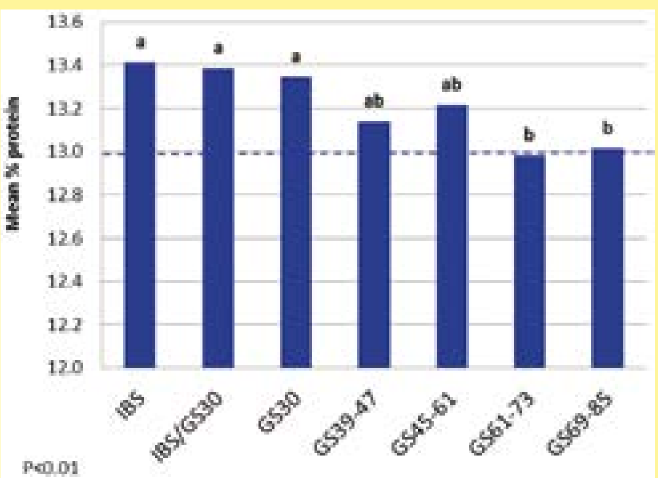
The mean of the highest recovery treatments in each trial in 2012 was 21 per cent (range 6 to 37 per cent) and also 21 per cent in 2013 (range 12 to 28 per cent).

FIGURE 4: Mean per cent protein from addition of 40 kg N/ha *Spread* urea, applied at varied crop stages, two trials 2012



Broken line indicates the mean per cent protein of untreated control (no additional nitrogen), IBS=Incorporated By Sowing operation,

FIGURE 5: Mean per cent protein from addition of 40 kg N/ha *Spread* as urea, applied at varied crop stages, five trials 2013



Treatments that share the same letter are not significantly different at p=0.05. Broken line indicates the mean per cent protein of untreated control (no additional nitrogen), IBS=Incorporated By Sowing operation.

How effective was early season application of *Spread* urea?

Application of the equivalent amount of *Spread* urea at planting or GS30 (or split between the two timings) was evaluated at six sites. The *Spread* urea at planting was incorporated by sowing (IBS).

The mean response to *Spread* urea at all timings is shown in Figures 4 and 5.

The early application of *Spread* urea resulted in equivalent or higher protein levels than *Spread* applications later in the season. Across all dryland sites, urea *Spread* and incorporated by sowing resulted in either the highest or second highest protein level of all treatments.

Did treatments perform better under irrigation?

The trial at Brookstead was planted on June 19 with flowering commencing the third week of September. It received five 30 mm irrigations during the crop development from GS47 to GS73 (over a period of 31 days). In addition it received 38 mm of rain during head emergence. Figure 6 shows the impact of nitrogen application on protein and nitrogen recovery, together with the protein impact from *Spread* urea.

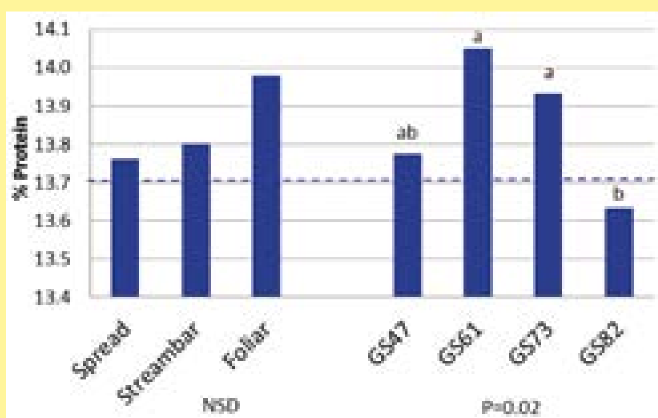
The results at the irrigated site were very disappointing with the best treatment only increasing grain protein in Suntop by 0.5 per cent with the highest level of actual nitrogen grain recovery only 28 per cent.

The poor grain recovery may have been influenced by the high background nitrogen (13.7 per cent protein in the untreated), but three other varieties achieved 15–16 per cent protein in the same trial with no additional nitrogen application.

Was the remainder of the late applied nitrogen lost?

At the Weemelah site there was sufficient rain post-harvest to sample for nitrogen to a soil depth of 30 cm in early December. The soil was dry below this depth and it was considered unlikely that nitrogen would have moved any deeper by this stage.

FIGURE 6: Per cent protein from addition of 40 kg N/ha under irrigation, Brookstead 2013



Treatments that share the same letter within the groups of Methods or Timings are not significantly different at p=0.05. Broken line indicates the mean per cent protein of untreated control (no additional nitrogen).


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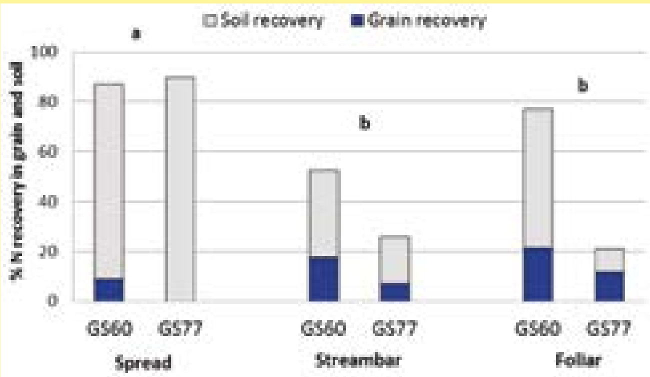
TABLE 3: Economic analysis of the highest net benefit treatments

Site	Treatment	Receival grade	Gross benefit	Fertiliser and application cost	Net benefit
Croppa Creek 2012	*Foliar* GS45	No change ASW	$69/ha	$84/ha	–$15/ha
Weemelah 2013	*Foliar* GS60	APW to H2 (+$9/t)	$77/ha	$84/ha	–$7/ha
Tulloona 2013	*Foliar* GS71-73	No change HPS1	$79/ha	$84/ha	–$5/ha
Narrabri 2013	*Foliar* GS69+	No change HPS1	$27/ha	$84/ha	–$57/ha

Granular urea $552/t ($48/ha @ 40 kg N), Urea solution $0.46/L ($76/ha @ 40 kg N/ha) Application costs: spread $25/ha, foliar $8/ha Grain prices: 2012 ASW $237, 2013 HPS1 $251, APW $256, H2 $265 25

FIGURE 7: Percentage nitrogen grain and soil recovery for late application methods at GS60 and GS77, Weemelah 2013



Treatments that share the same letter are not significantly different at p=0.05.

Soil samples were taken from the untreated and all methods of application at Timing 2 (GS60) and Timing 4 (GS77).

Timing 2 was selected as this was the most effective application with 19 mm of rain received seven days after application.

Timing 4 had the lowest level of impact and only experienced a total of 11 mm of rain in the six weeks following application with a single rain event occurring 15 days after application.

Figure 7 shows the level of grain and soil recovery of nitrogen expressed as a per cent of the total applied.

Although the nitrogen grain recovery from *Spread* urea was significantly poorer than the *Foliar* application, there were very high levels of recovery of soil nitrogen from *Spread* applications for both timings. This indicated that 'losses' from these applications were low despite the absence of follow-up rain for at least seven days following either application.

No assessment was made of the amount of nitrogen captured in leaf and stubble material.

The partial nitrogen recovery (grain and soil) from *Streambar* and *Foliar* application was significantly lower than from *Spread* urea but the remaining nitrogen may have been lost by volatilisation, captured in plant material or most probably a combination of both.

How the numbers stacked up

Economic comparisons were conducted on all individual treatments where there was a significant difference in either yield or protein content compared to the untreated. Table 3 shows the highest net benefit treatments from the four sites where significant yield or protein differences occurred.

Although there was a small but significant increase in protein from *Foliar* application, late nitrogen application did not provide a net economic benefit in any of these 11 trials.

Table 4 shows the grain price differential needed to generate a return on investment of one ($1 net benefit for every $1 spent), under a range of nitrogen recovery in grain efficiencies and varying protein increase targets.

The data from these two 'unfavourable' years only resulted in mean nitrogen recovery in grain of about 20 per cent. Under these conditions, a grain price differential of at least $36 per tonne would have been needed if a one per cent increase in protein was required and the grower was content with a $1 net benefit for every $1 spent.

For late nitrogen application to be a more viable consideration, consistent and high percentage nitrogen recovery in grain (40–60 per cent) – combined with grain price differentials of at least $10–$20 per tonne – would be needed.

At the Weemalah site in 2013 soil samples were taken to a depth of 30 cm to assess the amount of 'lost' N. There were very high levels of soil N recovery from *Spread* applications.

TABLE 4: Minimum grain price differential required to achieve a $1 net benefit for every $1 spent

% protein increase required/targeted	% nitrogen recovery in grain		
	20%	40%	60%
0.5%	$20/t	$12/t	$9/t
1.0%	$36/t	$20/t	$14/t
2.0%	$70/t	$36/t	$25/t

Urea solution $0.46/L ($76/ha @ 40 kg N/ha). Application cost: foliar $8/ha.
Assuming 5 tonnes per hectare yield (grain price differentials will increase by ~$2-3/t at 3 tonnes per hectare yields.

To sum up

- **Method comparison**
  With generally low levels of rainfall in both years, it was not surprising that *Spread* and *Streambar* application were ineffective in increasing protein. For these methods to provide a benefit, nitrogen must be both successfully incorporated into the soil but also reach a depth where roots are actively foraging. These approaches appear much more suited to early season application or use in years with frequent rainfall during spring.
  Foliar application resulted in significant protein increases compared to the *Spread* and *Streambar* methods. This strongly suggests that leaf uptake – in late season application – is capable of significantly increasing grain protein levels. But the magnitude of impact was generally disappointing.
- **Timing comparison**
  The impact from application timing was less apparent than expected. The clearest result was that application at late milk to mid dough resulted in significantly lower protein than from early applications.
- **Nitrogen recovery**
  The efficiency of conversion of applied nitrogen to protein was disappointing in both seasons. The highest level of recovery of any treatment was 37 per cent in 2012 and 28 per cent in 2013 with about 20 per cent nitrogen recovery more realistic across all sites.
- ***Spread* urea**
  Urea applied at planting (IBS) generally provided the highest protein result of all *Spread* applications. Although early application of additional nitrogen can cause canopy management issues, these results (in years with erratic or low spring rainfall) support the need to get nitrogen on early. In-crop applications are likely to have more benefit in seasons with more frequent and reliable spring rainfall.
- **Irrigated results**
  The pattern of results for method and timing of application was similar to the overall pattern at dryland sites but the protein and nitrogen recovery in grain levels were extremely disappointing.

What we found

This extensive set of trials was hampered by the low rainfall experienced during the springs of 2012 and 2013, but it clearly showed that:

- Significant increases in protein can be gained by late nitrogen application;
- But the level of increase was not sufficient to deliver economic benefits;
- *Foliar* was clearly the most effective method of application;
- Timing differences were less clear but generally supported application between late head emergence and early milk stages when targeting protein accumulation; and,
- Although late application of *Spread* urea was, as expected, the least effective method, the results from soil coring at two trials indicated a high level of recovery in the 0–30 cm samples.

These results suggest that trying to increase wheat protein with late nitrogen application is unlikely to be a very effective management tool in areas where spring rainfall is highly erratic.

Unless nitrogen in grain recovery levels can be increased dramatically, grain price differentials of $20–$40 per tonne are probably necessary before even considering this type of approach.

Supply of nitrogen requirements either prior to or at planting – or as a top up during early crop growth stages – would appear a much more reliable and effective strategy.

Economic benefits from nitrogen application targeting yield potential are likely to be far easier to achieve than when targeting protein increases.

More information: Richard Daniel, Northern Grower Alliance, Ph: 07 4639 5344 Email: richard.daniel@nga.org.au

Our thanks to the large number of growers and agronomists involved in these trials. Also thanks to David McRae, Yara Nipro for the provision of fertiliser samples and to Pacific Seeds and AGT for seed requirements. Thanks also to Graeme Schwenke for edits and comments. ■

Late N application trials created plenty of local interest at the irrigated Brookstead site, 2013.

Albus lupins provide the 'best fit'

By Cindy Benjamin, Pulse Australia

RED sandy loam and minimal risk of frost are a perfect combination for albus lupins. For 11 years Mark and Cherie Robinson have grown 300 to 400 hectares of albus lupins on their 2100 hectare property near Coonamble in northern NSW.

"In good seasons our lupins grow almost to shoulder height so this year's crop seems disappointing at only knee height," says Mark. "But that's what the season has been like. We have an average rainfall of 500 mm here and this year we have only had 214 mm. Many growers didn't plant because there was no significant rain over summer and the soil profile was fairly dry – about 40 cm – going into the season."

The Robinsons took the punt and planted, albeit later than they normally would. Mark usually aims to have the lupins in the ground by Anzac Day but this year he delayed planting by three weeks, sowing into sub-optimal stored soil moisture.

"In a good year the stored moisture is sufficient to grow the lupins with minimal in-crop rainfall needed," he says. "This season we are relying on in-crop rain and the 28 mm that fell in mid August was enough to keep the crop growing. Another 22 mm in late September came just in time and we hope the crop will realise its potential 1.50 to 1.75 tonnes per hectare yield."

The Robinsons have tried chickpeas in rotation with cereals and canola but have found that lupins are the best fit pulse crop for their farming system. Mark says the extra $100 per tonne paid for human consumption grade lupins exported to Egypt is well worth chasing. The market is relatively small and in good production years, there is always additional scrutiny of the grain quality.

"The 2010 season was particularly good with high yields following the excellent prices of 2009 at over $700 per tonne for human consumption grade lupins," he says. "But exceptional prices are just that. The drop in price for the 2010 season to $250 per tonne was dramatic but offset by yields of three tonnes per hectare. Average prices around the $400 to $500 per tonne – plus the rotational benefits of growing a legume – make lupins a very viable option."

Close attention to crop protection has been an important part of the Robinson's success with lupins. Their farm was formerly a grazing block and when they purchased it in 2003 there were serious weed challenges. Crop rotation and a summer fallow spray program were used to bring weeds under control. Each crop was set up with strong germination and residual herbicides such as simazine and diuron incorporated by sowing (IBS). Mark keeps an eye out for broadleaf weeds in the lupins and cleans them out in-crop if necessary.

"Pulses can be difficult to grow if there is significant weed pressure but it is possible to bring weeds under control through a planned and consistent program," he says. "Lupins are grown every four or five years in each paddock in rotation with canola, wheat and barley so we have opportunities to get the upper hand on broadleaf weeds leading up to sowing lupins."

Depending on soil tests, they often apply MAP at around 30 to 50 kg per hectare with a seeding rate of 80–100 kg per hectare. This year no fertiliser was applied due to a failed 2013 crop leaving enough residual nutrients.

Mark Robinson took a chance this year sowing lupins later than usual into sub-optimal soil moisture. So far his decision has paid off and recent rain has boosted his confidence in a respectable outcome for the crop in a difficult season.

Boost yield of the next wheat crop

The Robinsons avoid growing wheat on wheat and estimate that the lupins grown before wheat add another 0.5 to 0.6 tonnes per hectare to the wheat yield.

While diseases are not usually a problem it is important to monitor for pests. Helicoverpa are the main insect pest and must be controlled from flowering onwards. Their local Landmark agronomist, Graeme Proctor, plays a big part in their pulse crop success, and regularly monitors for insects during this critical period. Mice and feral pigs are also pests.

Mark says when it comes to harvesting lupins, the set up at the front end is critical. He uses a rotary header with a belt front rather than a conventional front with a table auger and sets the finger reel high and slow so that it is gentle on the pods to avoid shattering.

"Rotary machines are the most gentle on the grain, allowing good cleaning capacity whilst not cracking the seed. A poor sample can be downgraded to Lupin 2 with a substantial price penalty," he says.

The Robinsons save as much on-farm storage space as possible for their lupins. Their experience with marketing lupins is that prices always rise after harvest and there are usually other price spikes through the year.

"Buyers are looking for lupins all year," Mark says, "not just around Ramadan. So you can monitor the markets and sell when you think the price is about to peak. We aim to store 500 to 700 tonnes of lupins each year and can usually sell them at a couple of hundred dollars a tonne more than the price offered at harvest.

"And provided the grain goes into the silos at 13.5 per cent moisture or less, lupins store very well and are very easy to handle."

When it comes to handling stubble, the Robinsons avoid burning and use a 24 m K-Line 2700 stubble cutter to increase breakdown. The machine's vertical discs cut the stubble into 150 mm lengths that lay on the soil surface. At sowing the stubble is partially decomposed and flows easily through the seeder.

Mark does two passes with the stubble cutter over summer and can cover about 40 hectares an hour, making it a quick and efficient operation. He says the soil disturbance is minimal and soil moisture is preserved. Operating best in dry conditions it also handles roly-poly and galvanised burr very well.

The beneficial effects of lupins and stubble management have seen the soil tilth improve over time. ■

Chickpea growers urged to be on Ascochyta alert

ASCOCHYTA blight has reared its head in chickpea crops in parts of northern and north central New South Wales, prompting a warning to chickpea growers and consultants to be on the lookout for the disease.

New South Wales Department of Primary Industries (NSW DPI) senior plant pathologist Dr Kevin Moore said Ascochyta was first confirmed in the Grains Research and Development Corporation's (GRDC) northern region in a crop of Flipper chickpeas at North Star on July 8, 2014.

Since then it has been found in crops mostly in the Gulargambone, Armatree, Collie, Trangie region and around Yallaroi and North Star.

With the exception of the Flipper crop at North Star, all the infected crops are believed by growers to be PBA HatTrick which is rated MR to Ascochyta blight. There is also one report of Ascochyta in PBA Boundary (also MR) at Forbes.

Although purity and/or correctness of the variety identification still need to be ascertained, Kevin urged growers to submit samples of any crop where Ascochyta blight is suspected.

Samples from suspected crops are being sought as part of the GRDC National Chickpea Ascochyta project, which incorporates monitoring for any changes in the race/virulence of Ascochyta blight. This provides extremely important information for the chickpea breeding program.

"Having completed a trip through the central western region of NSW looking at chickpea crops, I've been surprised how widespread the incidence of Ascochyta blight is," Kevin said.

"In some cases, growers believed they had PBA HatTrick in the ground so further testing is being undertaken to determine the authenticity of the varieties or whether in fact the fungus itself has changed."

Where Ascochyta blight infection is suspected, growers are advised to have the disease positively identified. According to Kevin, they should also apply a registered fungicide based on chlorothalonil or mancozeb as close as possible to the next rain event. ■

IF ASCOCHYTA IS SUSPECTED PLANT SAMPLES SHOULD BE SENT TO:

- **New South Wales:**
  Kevin Moore, NSW DPI, 4 Marsden Park Rd, Calala NSW 2340.
- **Queensland:**
  Sue Thompson, Qld DAFF, PO Box 102, Toowoomba QLD 4350.

Samples should be wrapped in newspaper or paper towel and placed into an express post envelope (the plastic ones); ideally sent on a Monday or Tuesday not Thursday or Friday as they may be rotten after sitting in the post over the weekend. If need be, samples can be stored in a fridge over the weekend before sending.

The following information should be included with the sample – name, phone number and email address; location, nearest town, property name; and variety.

Ascochyta patch in PBA HatTrick, Yallaroi, August 1, 2014 – the orange stick is one metre long.

Leaf axil lesions usually extend along the stem above and below the axil, often causing the stem to break. A crop at Armatree, August 9, 2014. (Images supplied by Kevin Moore, NSW DPI)

Jerome Increase Case – The man

By Ian M. Johnston

THE town of Faribault is located south of Minneapolis in the State of Minnesota. Since the middle of the 19th Century it has been the centre of a rich farming region, noted for its vast seas of golden grain floating in the soft early autumn winds. In 1884 it was to this place that a 65 year old industry legend was hastening, within the dubious comforts of a saloon carriage pulled behind a belching steam locomotive.

The bearded gentleman in question was Jerome Increase Case, who was travelling from his vast industrial complex located in far off Racine, Wisconsin. His mind was certainly not focused on the rural scenery as it flashed past his compartment widow. Rather, a frown was upon his countenance as he concentrated on the purpose for his urgent mission to Minnesota.

The birth of an industrial empire

Back in 1842, Case had relocated his fledgling engineering business from Williamstown, New York State to Rochester, Wisconsin, where he introduced 'ground hog' threshing machines to the district's farmers.

The 'ground hog' in no way resembled the threshing machines that were to follow. Rather it was a crude wooden box affair, driven by an endless belt (or often by an unfortunate labourer obliged to wind a back-breaking handle) into which were fed sheafs of wheat, oats or barley. The straw was vibrated causing most of the grain to become separated from the stems.

It should be pointed out that in 1842 the alternative to the primitive 'ground hog' was still widely practiced. This was the tedious business of beating the wheat straw upon a flat floor with flails, and then removing the husks from the separated grain by means of waving a fan over the pile. This prosaic method had remained unchanged since the time of Moses.

Case improved the 'ground hog' design and his business flourished. But he had a falling out with the Rochester city fathers in 1844 over the water supply to his work premises. Being of

An 1842 'ground hog' threshing machine, the type Case began marketing in Rochester, Wisconsin. The wheat straw was inserted at one end before being riddled, the grain falling out below, and the 'clean' straw passing out the other end.

This 1880 illustration of a J. I. Case Ironsides Agitator Separator, is a graphic example of how the threshing machine evolved over a half a century. The upper platform located at the front of the machine, is where the band cutter received the sheafs, then cut the twine bands (or ties) before feeding the straw into the agitator cylinders.

Jerome Increase Case 1819–1891.

Pictured is a drawing of the very first Case tractor powered by an internal combustion horizontally opposed two cylinder engine, designed by William Paterson. It appeared in 1892, but the engine proved cantankerous. Paterson had been unable to efficiently co-ordinate the ignition and carburettor functions. It was not until 1895 that production of Case tractors really got underway.

resolute character, Case promptly moved his facility to the Lake Michigan shores of Racine, where he was welcomed and offered an abundance of water.

Within four years Case had expanded his business to the extent that he became Racine's largest employer! His threshing machines were by now high capacity, and in relative terms, sophisticated. The power source required to drive the threshers was supplied either by steam engines using endless belts, or horse treadmills.

By the 1860s, J. I. Case and Company had grown to become the world's largest manufacturer of threshing machines. A major milestone was reached in 1869 with the introduction of the first Case portable steam engine. In 1886, as with the threshing machines, the firm claimed it produced more steamers per year, than any other organisation world wide. (I harbour some doubt concerning the accuracy of this claim, when one considers British firms such as Fowler, Marshall and Clayton Shuttleworth and the German Lanz organisation).

By 1878, a Case thresher was entered in The Paris Exposition, where it was awarded the prestigious first prize.

Two years later in 1880, the organisation was given a new title – J. I. Case Threshing Machine Company. Continued design advancements were incorporated into the threshers with impressive improvement to the agitator mechanism.

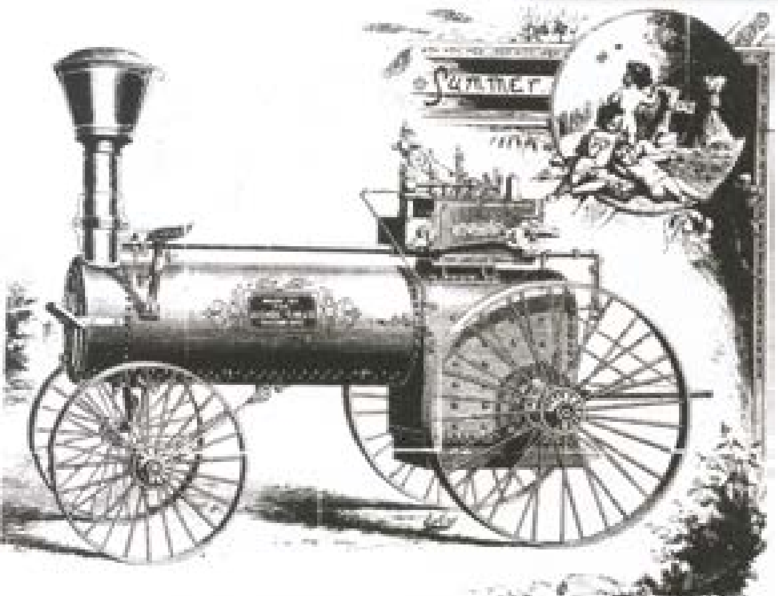
In 1892, the first of a long line of internal combustion engine powered Case tractors was released into the farming world.

A matter of principle

Jerome Increase Case was a gentleman of high moral fortitude. Whilst he fervently believed in the axiom of delegation, he also insisted that he be made aware of any serious or persistent problem that had the potential to adversely affect the fine reputation with which his products were blessed.

Accordingly, he was advised of a situation in the State of Minnesota which was causing considerable grief to a grain farmer of some repute. Apparently a new Case threshing machine had been delivered to the farmer by the local agent. Much to everyone's consternation, the separator was unable to cleanly thresh the straw resulting in a serious loss of grain.

The agent failed in his endeavours to rectify the situation. An urgent telegram was sent to the technical department at Racine. A few days later a factory expert arrived on the scene and spent many hours dismantling and reassembling the thresher. But to his frustration the big machine continued to pass unseparated grain out through the straw discharge chute.



An 1870s Case portable steam engine. Note; this steamer was not self propelled and was hauled to the work site by a horse, thus the pan seat alongside the chimney.

The elderly Case was outraged when he learned the situation remained unresolved. How could it be, he demanded, that one of his threshers was creating an embarrassing technical problem that even one of his company's highly qualified experts could not resolve? Especially when considering the J. I. Case threshers had been awarded numerous gold medals, both at home and abroad.

Jerome Increase Case was mortified. He believed the fine reputation for his products was in jeopardy! He instructed his secretary to send a telegram to the farmer at Faribault requesting that arrangements be made to meet him off the next train. The great man intended to personally resolve the distressing predicament!

A fiery spirit

And thus it was, one of North America's most respected industrial barons alighted from the railway carriage upon his eventual arrival at Faribault and was transported in a horse drawn buggy to the farm, at which the delinquent threshing machine awaited forlornly in a corner of the steading yard.

Following the removal of his top hat and frock coat, Case rolled up his sleeves and descended upon the machine, armed with an assortment of spanners. He toiled for some hours, during which time the thresher was started and stopped, the attending steam engine sighing patiently in between its required bursts of power. But alas, even a personality as illustrious as Jerome Increase Case proved as inadequate as the local agent and the factory expert, in his ability to identify and overcome the problem.

The farmer watched on with a growing anxiety. Case turned to him and requested that a large container of paraffin be fetched. Somewhat perplexed, the farmer rushed off and returned with a five gallon can of the volatile spirit. His eyes widened with amazement when old Mr Case sloshed the liquid all over the thresher, before barking a demand to stand back. With that, Case produced a tin of vestas, struck one and when it had flared, threw the flame into the heart of the thresher!

With a roar, the big machine was instantly enveloped in a conflagration. The flames soared high and devoured the timber

cladding. Within thirty minutes all that remained was a pile of smouldering embers and twisted metal.

Case nonchalantly clambered into his frock coat and placed his top hat aloft, before turning to the farmer, who was in a state of shock, advising him to expect delivery of a brand new thresher the following day. He bowed and strode off in the direction of the railway station.

FOOTNOTE…

It is interesting to contemplate that in the same era as Case became the undisputed leader in threshing machine evolvement, Cyrus McCormick invented the reaper and created an empire around the evolution of his design. Concurrently, John Deere perfected the mouldboard plough, which was the genesis of today's global farm machinery giant – Deere and Company.

Case, McCormick and Deere were truly great thinkers and innovators. Their conceptions occurred nearly 200 years ago, a time when metallurgy was in its infancy, and when most engineering was performed in a blacksmith's shop.

The three men shared a common philosophy, which was undoubtedly a major contributor to their achievement of greatness. They resolutely believed their most valuable asset was the men and women of their workforce! Accordingly, their workers were paid a higher rate than the prevailing wages of the time. Free medical clinics were established for employees and their families. In short, these factory people were treated as 'human beings' and not simply assets. In response, they gave of their best!

There is perhaps a message here somewhere?

Integrity

The resolve and integrity of Case was symbolic of the doctrine he insisted be adopted by each of his employees. He could not tolerate the fact that a machine with his name upon it was operating with anything less than 100 per cent efficiency. The thought that a farmer was disenchanted with his purchase of a Case product was untenable. Further, the fact that a Case machine was proving to be faulty and resisting all attempts to be repaired, meant that it should cease to exist by being dispatched to a Dante's Inferno!

In 1891 Jerome Increase Case died. The world lost an industrial giant, whose enterprise, ambition and moral rectitude were beyond reproach and remains today as an example to which all modern business leaders should aspire! Sadly, for many of today's corporate chief executives, it would seem the philosophy of 'the bottom line' is the sole driving focus.

Special note: The graphics used in this article are from the archives of the author and were originally obtained from Tenneco USA. ■

IAN'S CLASSIC TRACTOR QUIZ

1. A. H. McDonald was the founder of one of Victoria's pioneer tractor companies. What did the initials A. H. Stand for?
   Alfred Henry, Arthur Henry or Alfred Hancock?
2. Deere and Co manufactures a range of tractors at its German plant at Mannheim. The plant was purchased in the 1950s from which famous German tractor firm?
   Deutz, Lanz or Hanomag?
3. The 1963 1200 Traction King was a product of which company?
   Case, Oliver or White?
4. Which Australian tractor was produced at Welshpool, Western Australia?
   Howard, Chamberlain or Waltanna?
5. When Massey Harris purchased the Harry Ferguson organisation, what brand name was first given to the new range of tractors?
   Ferguson, Massey Harris Ferguson or Massey Ferguson?
6. The Fordson Power Major was followed by which model?
   Farm Major, Super Major or E27N Major?
7. The 'reddish' colour of the first post war David Brown tractors was known as what?
   Hunting Pink, Pepper Red or Sunset Orange?
8. Ursus tractors were a product of which country?
   Poland, Czechoslovakia or Romania?
9. Which famous tractor designer conceived and built a Formula One 4WD race car that won first place at its first outing?
   Harry Ferguson, David Brown or William Marshall?
10. Name the Italian vehicle manufacturer that introduced its first tractor – the model 702 – in 1919?
    Landini, Fiat or Breda?

A score of 8 or over indicates an excellent knowledge of classic tractors.
A score of 5 to 7 is not too bad.
A score of less than 5 is definitely ho hum!

Answers are on page 48.

NORTHERN FOCUS

COVERING NORTHERN NSW AND QUEENSLAND

THE RESEARCH VIEW

Weed seed control tactics help growers fight the resistance war

AT A GLANCE…

- Harvest weed seed control plays an important role in stopping weed seeds from entering the soil.
- Harvest weed seed control involves collecting, destroying or burning weed seeds that are present at harvest and is particularly effective in problem species such as wild radish and annual ryegrass.
- While extremely successful in Western Australia, harvest weed seed capture and destruction techniques are unlikely to be effective against the 70-plus weed species present in northern region paddocks.
- Further research into the effectiveness of various harvest weed seed control techniques in northern farming systems is required.

Consultants' Corner

Consultants' Corner is an initiative by *Australian Grain* highlighting current GRDC-funded research with a particular focus on the commercial implications of adopting cutting-edge research.

HARVEST weed seed control is shaping up as grain growers' next line of defence in the on-going battle against herbicide resistance in the northern cropping belt.

Herbicide resistance poses a major threat to the long term viability of the northern grains industry with resistance issues across a multitude of weed species and modes of action.

Its management is a key investment area for the Grains Research and Development Corporation (GRDC) which is funding trial work into the extent of herbicide resistance to weed types and multiple modes of action, the effectiveness of non-herbicide tactics in suppressing weed growth and driving down the weed seed bank and integrated weed management programs.

Addressing growers and advisors at the GRDC Updates earlier this year, Department of Agriculture, Fisheries and Forestry (DAFF) principal research scientist Dr Michael Widderick said while resistance to one mode of action herbicide was extremely common in the north, many cases of multiple or cross resistance was also now occurring particularly in problem weeds like wild oats.

He said driving down the weed seed bank was growers' best defence against herbicide resistance issues and that there were two primary considerations – dealing with the weed seeds already existing in the soil and stopping additional weed seeds from entering the soil.

"The initial component is really about controlling any new emergencies of weeds and not allowing them to set seed," Michael said.

"We have some really good tactics for that like the double-

Department of Agriculture, Fisheries and Forestry (DAFF) principal research scientist Dr Michael Widderick emphasises the importance of driving down the weed seed bank for effective herbicide resistance management.

knock tactic for key species like fleabane, feathertop Rhodes grass and awnless barnyard grass.

"The second component – stopping weed seed from entering the soil – has fewer control tools available but one of the new approaches is harvest weed seed control."

Harvest weed seed control was a tactic developed in Western Australia in the wake of escalating issues with herbicide resistance and centres on collecting, destroying or burning weed seeds that are present at harvest and has been particularly effective in problem species such as wild radish and annual ryegrass.

Wider weed spectrum in the north

But the wider spectrum of weeds found in the northern region – at least 70 different species with varying seeding traits – means that harvest weed seed capture and destruction techniques are unlikely to be effective against all species present in northern paddocks.

The greatest opportunity for harvest weed seed control lies with species that set seed above a harvesting height (at least 15 cm above ground level) and retain seed through the traditional winter crop harvesting periods.

"We certainly see that there's a fit for these tactics in the north but we also have a lot of questions over their effectiveness on our particular weed species.

"What we do know is that at harvest time in our summer and winter crops, there are a lot of weed species present that are setting seed.

"What's currently happening is that these weed seeds are going back into the soil during the harvest process."

If implemented regularly, the use of one non-herbicide weed seed control tactic every harvest will play a key role in keeping northern cropping land productive and extending the useful life of existing herbicide chemistries.

Control tactics include the use of narrow windrow burning, bale direct, chaff cart and/or the Harrington Seed Destructor.

One of the simplest tactics is narrow windrow burning which is best suited to non-cereal crops such as lupins, canola and field peas and cereal crops yielding less than 3 tonnes per hectare.

The bale direct method involves attaching a square baler to the harvester to collect and bale both the chaff and straw component.

Chaff carts are a relatively inexpensive option for collecting the weed seed bearing chaff while retaining the straw in the field, and the Harrington Seed Destructor crushes the chaff including the weed seeds and returns all chaff and straw to the paddock, maximising the nutrient and soil moisture benefits of these residues.

Trials are the next step

Trialling the Western Australian approaches to weed seed bank control within the northern farming systems will be the next step for industry, according to Michael.

"It's a simple process of seeing what weeds are present, collecting seeds at harvest and destroying them and then assessing weed emergence in the following season with and without those tactics," he said.

"That will give us a good picture of percentage reduction in certain species."

One of the quandaries facing industry in terms of effective weed seed control is whether growers are better advised to leave weed seed on the surface or bury it through strategic tillage.

Part of the answer lies with a seed's potential for persistence – the timeframe weed seeds survive within the soil.

Weed seed will persist for longer once it is buried below one to two cm, particularly for a number of the small seeded varieties present in the north.

"I believe we still have many effective herbicide options despite resistance issues and that it is better to leave the weed seed on the surface," Michael said.

"Then you know what you are dealing with, you know where the weed seed is and what environment it is in.

"In those instances, the key is that once you have a favourable season for emergence, control is implemented quickly when weeds are small and herbicides are going to be effective."

For more information on weed seed control and integrated weed management strategies, visit www.weedsmart.org.au/wp-content/uploads/2013/01/WeedSmart_SustainabilityGuide_V14-Northern_LR.pdf ■

THE GROWER VIEW

WINDROW BURNING A HOT TOPIC FOR CENTRAL WEST GROWER

A determination not to let weeds dictate the profitability of his farming operation has prompted central western NSW grain grower Chris Roche to adopt non-chemical control options to combat problem species like annual ryegrass and black oats.

A study trip to Western Australia two years ago convinced him that windrow burning would help manage weeds on a long term basis within his existing winter/summer crop rotation program.

Since then, Chris has introduced an integrated weed management program incorporating windrow burning for weed seed control and strategic chemical applications, and the strategy is proving a success.

Chris farms 3200 hectares in the Gulargambone district, producing wheat, barley, canola, lupins and chickpeas on a mix of red kurrajong and heavy myall basalt soils.

He has windrow burnt stubble from all crops except chickpeas post-harvest and pays careful attention to burn management to achieve an effective slow, hot burn.

While weeds have always been carefully managed within the Roche's cultivation country, an increasing reliance on zero till and continuous cropping combined with concerns over herbicide resistance prompted Chris to look for non-chemical control alternatives.

"You can't just use chemicals, you really have to use something else to control your weeds. Essentially anything that survives a spray is an issue so stopping weed seeds from being viable for the following season is our ultimate goal," Chris said.

All weed control decisions are made within the context of the wider farming system with full consideration given to the implications of any practice for control efficacy, planting opportunities and crop yield potential.

"Weeds create so many issues within a farming system – they cost yield, can force you to miss planting opportunities and can be extremely costly to control due to resistance issues – and this can force you to move to a less economic rotation," Chris said.

"We have learned through experience that breakouts can happen extremely quickly, even within a year, but the introduction of windrow burning has helped us turn that situation around.

Chris Roche, Gulargambone, says windrow burning is a cost-effective way to control weed seeds present at harvest.

"Although our farming country is fairly clean, we aren't complacent as we are focussed on maintaining a profitable cropping rotation and want to keep as many control options open as possible.

"It's really important that weeds don't make decisions for us within our operation."

More information on weed control practices is available at www.grdc.com.au/Resources/IWM-mini-manual

Moisture meter technology for in-shell peanuts

■ By Rosalie Marion Bliss, Agricultural Research Service – USDA

A NEW meter developed by USDA Agricultural Research Service scientists to measure the moisture of peanuts inside the shell, or pod, has been licensed by a manufacturer of agricultural-use instruments. The moisture-sensing meter was invented by engineers Samir Trabelsi and Stuart O. Nelson (retired) in the ARS Quality and Safety Assessment Research Unit, in Athens, Georgia.

"It is important that peanuts are dried to a kernel moisture content of less than 10.5 per cent for storage purposes, because higher levels can lead to fungal growth," says Samir.

The meter is based on patented low-power microwave sensing technology and an algorithm that produces a crop-specific moisture calibration equation – also developed by Samir. The equation is used to customise an individual meter for use with a specific crop type.

The components of the microwave meter include a peanut-sample holder, a power source, a 'mixer,' and two antennas facing one another. The mixer compares the microwave signal transmitted by the first antenna into the peanut pods with the microwave signal received by the other antenna, after the signal has passed through the sample material.

"The microwave circuit measures the loss of energy and the change in the speed, or velocity, of the microwaves as they pass through the pods," says Samir.

When a sample material is exposed to microwaves, part of the wave is transmitted and part is reflected, or not transmitted, providing the individual 'electrical signature' of the sample material being tested. "Our patented calibration method uses this information to produce a moisture calibration equation that is programmed into the meter," says Samir.

The road to market

Drying is an essential task that takes place at farms and at local peanut 'buying points' right before the grading process. US peanuts are required by the US Department of Agriculture to be inspected at these buying points, and farmers take their peanuts there to be weighed, cleaned, inspected, graded, and ultimately purchased. Local buying points are under contract to peanut product manufacturers and shelling plants, where further grading takes place.

ARS engineers Samir Trabelsi (left) and Stuart O. Nelson (retired) test a sample of peanuts for moisture content using the new moisture-sensing meter they invented in Athens, Georgia. **(Photo by Jerry Heitschmidt)**

Peanuts are normally dried to a moisture content of less than 10.5 per cent for storage. Higher levels of moisture can lead to fungal growth (left) compared to properly dried, fungus-free peanuts (right). **(Photo by Jerry Heitschmidt)**

During peanut grading, inspectors determine quality factors such as peanut size, shell size, peanut damage, foreign-material content, and kernel-moisture content.

Representative samples of harvested peanuts are taken from the farmers' transport vehicles, and the peanuts must be removed from their shells before moisture content is determined. If the kernel moisture content is too high, the sample is marked 'no sale,' and the corresponding lot of peanuts has to be taken to the drying shed for further drying.

"We have been exhibiting prototypes of this technology to farmers and inspectors in various states for a few years," says Samir. "This new meter is groundbreaking in terms of changing the way moisture has always been measured in peanuts and in terms of simplifying the process and reducing costs and labour."

During 2012, Samir worked under an agreement with Dickey-John Corporation, based in Auburn, Illinois, a wholly owned subsidiary of TSI Incorporated, based in Shoreview, Minnesota, to build a working prototype of the latest version of the patented in-shell peanut moisture sensor.

"The prototype, together with our marketing research, allowed us to evaluate the accuracy and effectiveness of the sensor and get a better sense of what we needed to do to bring the meter to commercial markets," says Beau Farmer, chief technology officer with TSI.

The technology allows government inspectors to skip the labour-intensive step of shelling peanut samples from lots prior

to measuring moisture content. "A version based on the same technology could also be developed for farmers who want to test their peanut pods before sending them off for grading," says Beau.

In addition to moisture content, the instrument can also reveal bulk density of the peanut pods. This is important because that measurement reveals the size and quality attributes of the peanuts inside the shell. "A higher density may indicate a higher peanut meat content," says Samir.

Other potential uses for grains

"The first generation of meters available commercially will be used to measure peanut moisture in cleaned peanut pods," says Samir. But the researchers have also been working for several years on developing a sensor system that rapidly and accurately measures moisture content and density of cereal grains, oilseeds, and tree nuts for use on production lines and in processing applications.

Samir's microwave moisture-sensing technology can be used to measure moisture in harvested grain, although the calibration equation will be different for cereal grains than for peanuts. The method can perform better than existing technologies and has the potential to benefit both the peanut and grain industries, according to Samir and Beau.

"The microwave moisture-sensing technology is a revolutionary application for in-shell peanut testing," says Beau. "We wanted to develop a portable system for moisture measurements of unshelled or shelled peanuts that can be used at peanut-grading stations and possibly in the farmer's field. We are working hard on the underlying commercialisation effort required to roll out these meters and satisfy market demand."

Samir Trabelsi is in the USDA-ARS Quality and Safety Assessment Research Unit, Richard B. Russell Agricultural Research Center, 950 College Station Rd., Athens, GA 30605; Ph: +1 706 546 3157. ■

Postdoctoral engineer Micah Lewis visually inspects peanuts for quality factors before checking the peanut moisture content using the meter behind him. (Photo by Jerry Heitschmidt)

Do I plant sorghum into marginal moisture?

■ **By Jeremy Whish, CSIRO/APRSU/APSIM Initiative**

AT A GLANCE

- Identify the target yield required to be profitable before planting
- Do a simple calculation to see how much water you need to achieve this yield
- Know how much soil water you have (treat this water like money in the bank)
- Think about how much risk your farm can take
- Consider how this crop fits into your cropping plan, will the longer-term benefits to the system outweigh any short-term losses.
- Avoiding a failed crop saves money now and saves stored water for future crops
- Not planting is sometimes the best decision.

RISK is personal. Some people are more risk averse than others and many factors influence how much risk an individual farm business can withstand. But there are some tools and approaches that can inform and aid the planting decision process and identify how much risk is associated with different decisions.

Why plant a summer crop?

The highly variable nature of dryland farming in the western margins of the northern grain region can often be the very reason people are looking to plant a summer crop. If the previous season was dry and winter crops were not sown, a summer crop is likely to be the best way to generate cash flow.

Alternatively, the summer crop may be part of a paddock management plan, a 'break crop' designed to rejuvenate the paddock.

It may be part of the farm plan – a phase in the cropping sequence where herbicides are rotated to reduce the chance of herbicide resistance, pest populations are reduced by growing non host crops, and farm operations and cash flow better managed by distributing work and returns between seasons.

Whatever the reason, the important points to consider are: what benefits will my system get by including a summer crop; what crop do I intend to plant after the summer crop – will this influence the herbicides I use and what can I do to ensure my crop has the best chance to be profitable?

What is my yield target?

Targeting yield is an important consideration when producing crops in a variable climate. Having a target to aim for improves the decision making process, allowing the risk associated with planting under current conditions to be compared against future planting opportunities when conditions may be less risky.

One approach is to look at the cost of planting a crop, how much it has already cost to keep the paddock fallow, and what yield is expected. I will give a brief example of how to do this and then concentrate on methods to estimate the final yield.

Question: Do we plant sorghum on October 15 or wait?

Background: The soil is a grey vertosol in the Condamine district, which has a maximum water storage capacity of 147 mm for sorghum. The paddock has been fallowed from wheat in 2013 and has good stubble cover, based on the online tool Australian CliMate the plant available soil water estimate is 120 mm.

Price	Sorghum price	$130/t
Costs	Fallow cost 5 sprays at $15/ha	$75/ha
	Sowing costs	$50/ha
	In-crop chemical weeds/bugs	$70/ha
	Harvesting	$45/ha
	Fertiliser	$90/ha
	Total	**$330/ha**

Many people don't fertilise summer crops so this total can be reduced by $90, but it must be remembered that an under-fertilised crop has a reduced yield potential, effectively capping returns.

This decision is up to the individual, but for this exercise fertiliser will be applied.

FIGURE 1: Long-term rainfall record for Condamine between October 15 and January 15 between 1900 and 2013

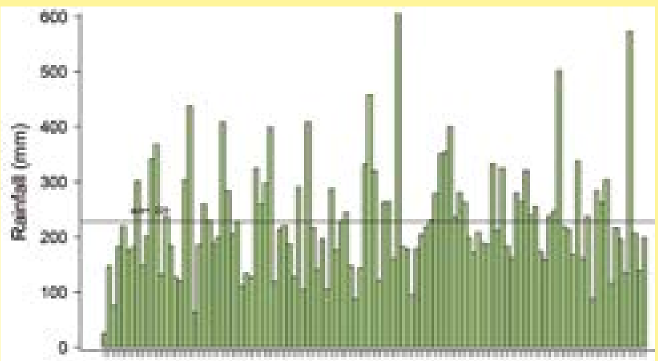
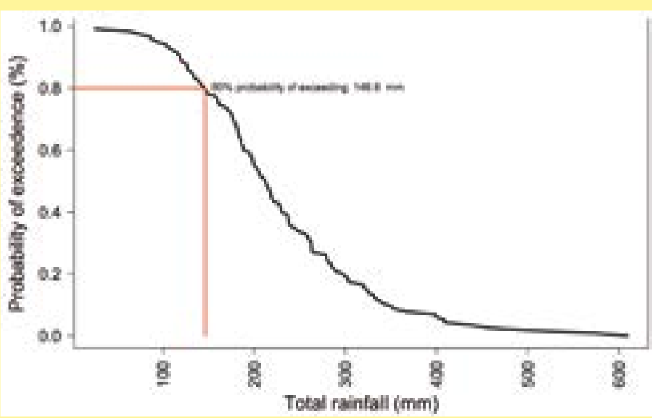


FIGURE 2: Probability of exceedence. Red lines show an 80 per cent probability of exceeding 128 mm of in-crop rainfall if planting occurs on October 15



With a sorghum price of $170 and an aim to return costs + 20 per cent ($400/ha) our target yield would be 2.4 tonnes.

While it is easy to talk about achieving a particular target yield, it is generally not that simple in practice. So what tools and information are at our disposal to make this a reality?

How much water?

For a growing crop there are two sources of water – water stored in the soil and in-crop rain. You have some control over the stored soil water and you can measure how much you have before you plant the crop.

But rainfall is out of your control.

Assuming that we plant on October 15, the long term record (from the past 113 years – Figure 1) shows that the average amount of rain that will fall over the following 100 days is 146 mm, but the seasonal rainfall range for this period is between 26 mm and 609 mm. Coefficient of variation (CV) is a statistical measure that describes how variable the data is – the larger the fraction the more variable – this period is quite variable with 0.44 variation about the mean.

A different way to look at this is via an exceedence plot. Figure 2 presents the probability of exceeding a particular amount of rainfall within a particular time frame. If we look at the y axis and select 0.8 (80 per cent or four in five years) and trace this across to the line and then down to the x axis, it indicates that there is an 80 per cent chance of getting more than 128 mm of rainfall across the growing season.

But it should be noted that this also indicates that there is a 20 per cent chance (one in five years) of receiving less than 128 mm.

The later the crop is sown the greater the chance to accumulate in-crop rainfall and the less risky the planting decision based on soil water. But Table 1 shows the probability of in-crop rainfall decreases with the January planting. Calculating potential crop yields based on total rainfall and soil water does not consider the impact of rainfall timing on crop demand, but it works well as a simple estimate and guide. But planting later has other flow on effects reducing options for double crops and reducing fallow length for the next crop.

TABLE 1: In-crop rainfall from different sowing dates assuming a 120 day crop

Sowing date	Mean in-crop rainfall (mm)	Rainfall range min–max (mm)	Coefficient of variation	80% probability of exceeding (mm)
15-Sep	191	48–514	0.46	113
15-Oct	146	26–609	0.44	147
15-Nov	244	95–588	0.41	158
15-Dec	237	51–649	0.46	158
15-Jan	157	16–453	0.53	89

Calculating a crop water use efficiency

Crop factors indicate how a plant converts water into grain, Figure 3a shows the relationship between the amount of water used by the plant and the final grain yield. The amount of water used by the plant is calculated as:

Plant available water + in crop rainfall (mm) =
water available for plant growth
Plant available water =
soil water at sowing (mm) –soil water at harvest (mm)

The data in Figure 3a begins around the 100 mm point. This suggests that a 100 mm is required to grow a plant to the point

that it produces yield and to account for losses from the system in the form of evaporation drainage and runoff.

So the amount of water used by the crop is:

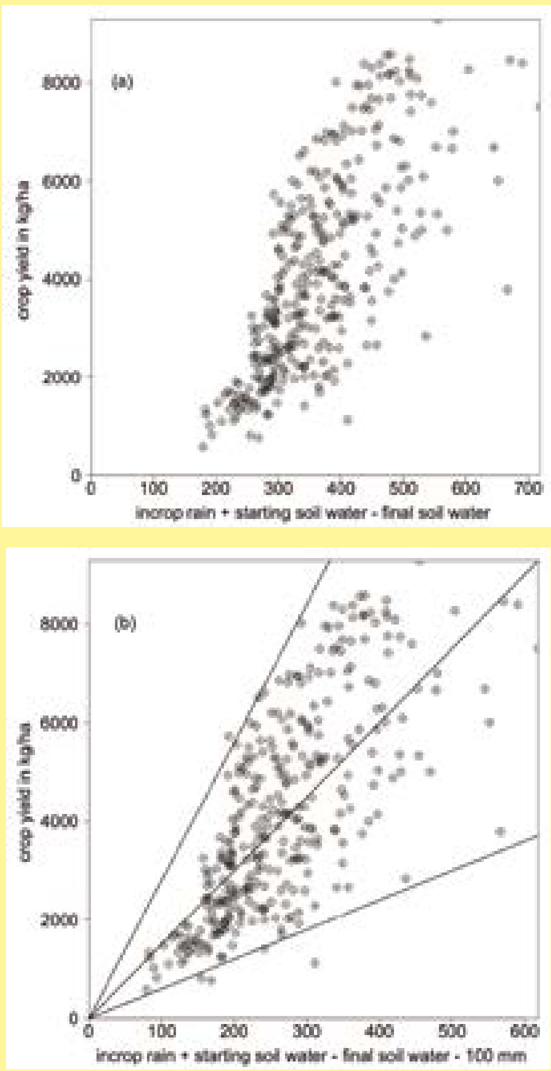
Plant available water + in crop rainfall (mm) –100 mm = water available for plant growth

I have used 100 mm as an average loss figure for a summer crop in this region. It will vary depending on soil type, and district but as a rule of thumb in this area, 100 mm should work well.

The 100 mm has been removed in Figure 3b and the data has been corralled within water use efficiency lines. There are many factors that influence the growth and development of crops and this approach does not attempt to capture these so for this region WUE lies between 6 mm/kg/ha and 28 mm/kg/ha depending on the season – around 15 mm/kg/ha is a good average.

The variation within this envelope is because the total amount of water is not all that determines yield. The timing and supply of water during different stages of crop growth also influences the efficiency of the plant and final yield.

FIGURE 3: (a) The relationship of yield to available water and (b) the relationship of yield to available water with 100 mm of water removed to account for initial growth and losses due to evaporation, runoff and drainage.



The WUE lines on figure b, from left to right are 28, 15 and 6 kg/mm/ha.

Converting water into grain

To convert water into grain we need to:

Calculate the total amount of water available to the plant and multiply by the crop factor *(Plant available soil water + in-crop rainfall –100mm) x 15.*

To work backward from our target yield of 2400 kg/ha *(2400/15)+100 = 260 mm of water made up of rainfall and soil water* – if we have an 80 per cent chance of getting at least 147 mm of rainfall then a starting soil water of 113 mm is required.

Water stored during the fallow as stored water is of higher value than rainfall, because it is available when the plant needs it, provided that reserves are sufficient. In terms of risk management, the greatest value of stored water is in knowing the quantity available for crop production, before the crop is planted, when decisions are being made. It is also why managing fallow stubble cover and weeds is so important.

This calculation is fairly rough assuming that the efficiency of production is at 15 kg/mm/ha whereas it may actually be a lot lower (or higher) depending on seasonal rainfall distribution and crop stage.

An alternative approach, which does take into consideration the vagaries of seasonal rainfall distribution and amount, temperature, radiation and soil condition, is to use simulation modelling tools like APSIM, or its derivatives *Yield Prophet* or *Whopper Cropper*. These tools all use probability to describe the riskiness of particular actions like planting on a particular date or sowing on a specific soil water content. Figure 4 shows an APSIM output prepared for Condamine looking at an October planting.

Figure 4 supports the back of the envelope calculation suggesting the 113 mm of starting water is the minimum required to achieve a 2.6 tonnes yield six to eight years in 10.

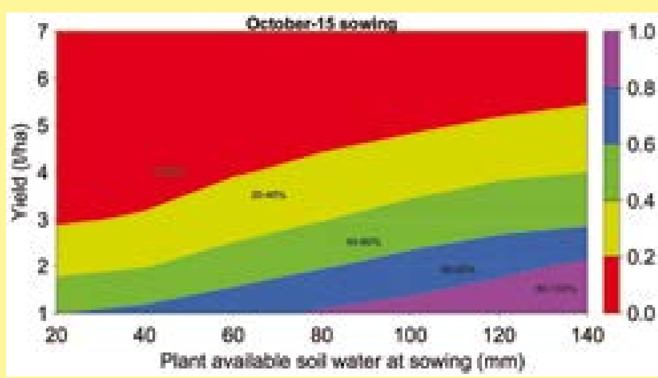
To sow or not?

Is it worth waiting to get more soil water? Within the Condamine region there is very little difference in yield between crops planted in September and December. So how much water would you expect to accumulate within the soil by waiting to plant in December compared to October.

Looking at rainfall the average amount to fall in this period is 131 mm, but you have an 80 per cent probability of getting at least 75 mm.

Using APSIM's soil water balance that considers runoff and drainage and assuming the soil profile held 100 mm on the 15th of October, There is an 80 per cent probability of accumulating 123 mm by December 15. But simulations over the past 100

FIGURE 4: Rainbow chart showing the probability (colours) of exceeding a particular yield (y axis) based on starting soil water conditions (x axis)



years show that by waiting until December if there is only 100 mm of soil water in October will increase the yield on average by 412 kg per hectare. The two month delay will increase the input costs by one or two herbicide sprays, but will also provide a better opportunity to control weeds.

This year

Thinking about this current year and assuming there is 120 mm of water stored in the soil as of July 1 (figures based on long fallow from wheat using a medium clay soil and CliMate Australia software, the old *Howwet*) then using historic data, there is an 80 per cent chance of having 102 mm in September and 123 mm in December (Figure 5). If a summer crop is missed there is an 80 per cent chance of having 127 mm and a 60 per cent chance of having full profile in May.

This suggests that considering a sorghum crop this year is a good option.

Historic predictions show the amount of water accumulated by October for all years (solid line), the wettest 20 per cent of years (dotted line) and the driest 20 per cent of years (dashed line).

If we consider the type of year we are having (Figure 6) and look at the historic probabilities, the solid line includes all years. The dashed line indicates those years that fall in the driest 20 per cent and the dotted line is the wettest 20 per cent of years. Current forecasts are anticipating this year to be dry.

Other tools

I have been conservative using 80 per cent as my level of risk. But a positive long range forecast, combined with a promising SOI signal, could be used to assess the scenario and accept a lower probability level to take a calculated increase in risk and sow on less soil water.

Alternatively, different sowing strategies could be used to reduce the risk of a failed crop. Skip row planting maintains a high plant density within the crop row, forcing the plants to experience early competition that limits tillering. As the plants approach grain fill the limited number of tillers are filled from the spared water in the skip, ensuring the crop is finished. The advantage of skip row is that it helps ensure a yield and prevents crop failure.

But the downside is that yield is capped due to the lack of tillers, so the crop cannot take full advantage of good rain and will yield less than a solid crop configuration when not under stress. Skip crops generally out yield solid configured crops when the season ends with terminal water stress. If there is early water stress followed by wet finish the solid crops will yield as well or better than the skip.

If the outlook is poor, reducing the area planted is also a way of hedging your bets and reducing the risk and expense of a failed crop. Making use of the long sorghum window is another strategy – planting some sorghum early and the remainder later – spreads the risk. Sorghum as a summer crop has many benefits to the system so in some scenarios on specific paddocks growing a non-profitable crop as part of a rotation can be tolerated, provided the benefits that crop provides to the over-all farm system are justified. Reducing weeds, managing herbicide resistance, and reducing disease inoculum are benefits of crop rotation that are not easily measured and often not considered when using simple water use efficiency calculations or crop model simulations.

To sum up

Deciding to plant or not is difficult – experience and gut feel are valuable components of this decision – but by following some of the approaches presented here the decision can be made more transparent and justifiable.

By thinking about the consequences of the planting decision on future crops – and how this crop fits into the overall whole farm system – the best decision will be made.

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This work was funded by CSIRO and GRDC.

FIGURE 5: Probability of accumulating water assuming 120 mm plant available water starting value on July 1

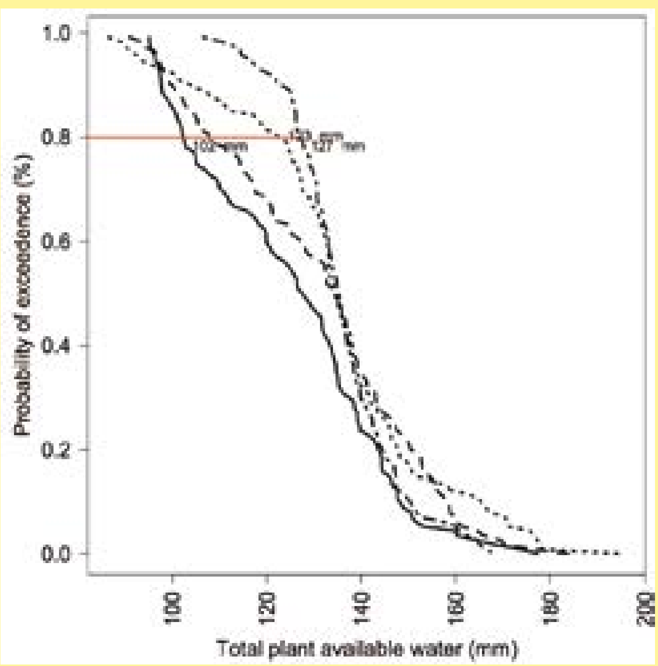
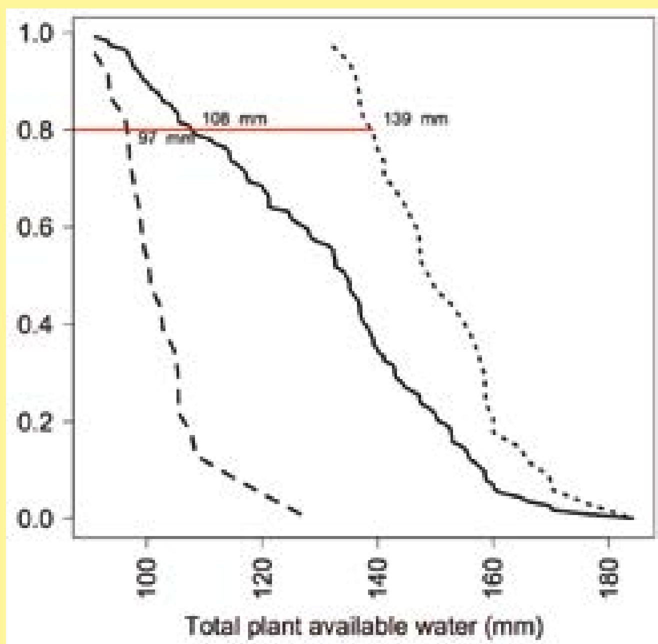


FIGURE 6: Probability of accumulating water assuming 120 mm plant available water on July 1



Historic predictions show the amount of water accumulated by October for all years (solid line), the wettest 20% of years (dotted line), and the driest 20% of years (dashed line).

SOUTHERN AUSTRALIA FOCUS

COVERING CROPPING SYSTEMS OF SOUTHERN NSW, VICTORIA, TASMANIA, SOUTH AUSTRALIA & WESTERN AUSTRALIA

THE RESEARCH VIEW

Managing soil biology to optimise nutrient availability

AT A GLANCE…

- Microbial communities vary greatly with small changes in soil depth.
- This stratification of active microbial communities in the soil, which affects hot-spots of nitrification and denitrification, is affected by tillage practices and previous rotations.
- Fertiliser placement should take this stratification of active microbial communities into account.

Consultants' Corner

Consultants' Corner is an initiative by *Australian Grain* highlighting current GRDC-funded research with a particular focus on the commercial implications of adopting cutting-edge research.

NITROGEN (N) fertilisers are the single largest variable input cost for grain growers, costing Australian producers more than $3 billion per year.

But up to 60 per cent of fertiliser N applied to any one crop may not be used by that crop. Some of the applied N is lost from the soil by leaching and denitrification, while some is locked up in the soil in chemical forms that are unavailable to the plant.

Soil microbial communities (bacteria, fungi, and archaea) control both the loss pathways and the pathways that release crop-available nitrate. These microbial communities are also

Soil microbiologist Lori Phillips, of DEPI Victoria: "Our research shows that hot-spots of microbial activity change with agronomic management."

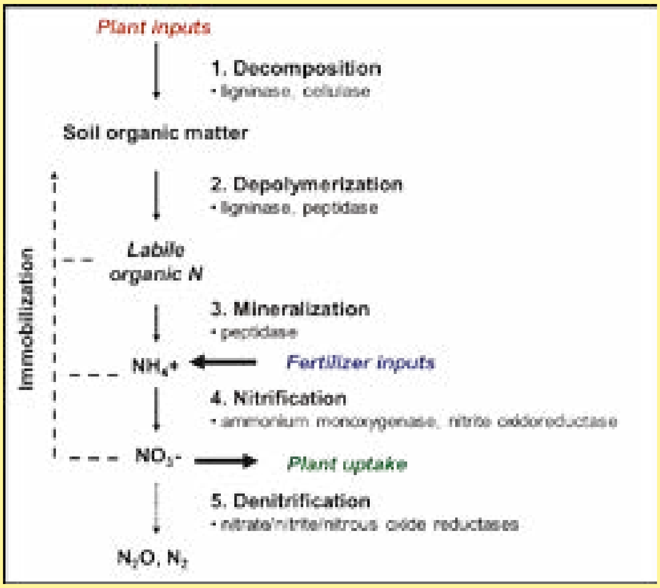
responsible for releasing crop-available N from soil organic matter and residue sources.

Previous research on N-cycling has typically focused on nitrification (change to a plant-available form of N), but it is important to note that N-cycle transformations are not independent processes.

Soil microbiologist Lori Phillips, who works for the Victorian Department of Environment and Primary Industries, says the incorporation of plant residues into soil organic matter will both influence and be influenced by downstream N-cycling processes, including nitrification.

Products of one transformation become substrates in another, and any of the downstream products may be re-bound to soil organic matter via the immobilisation processes (Figure 1).

FIGURE 1: Inter-related nitrogen cycle processes mediated by soil microbial communities



"Thus, the dynamics of the system as a whole are inter-related," says Lori, whose research has been funded by the Grains Research and Development Corporation (GRDC) through its Soil Biology Initiative II (2010–14) suite of projects.

"The overarching goal of our research was to develop and use molecular tools to evaluate these inter-related N-cycling processes performed by microbial communities in Australian cropping systems.

"Understanding what types of microbial communities are present, where and when these microbial communities are active, and how agronomic practices can influence that activity, are the first steps towards understanding how to manipulate those communities to improve N-use efficiency."

How it was done

Soil microbial communities use different enzymes to metabolise different forms of nitrogen (see the enzymes listed in Figure 1). Although a given community may possess the inherent genetic ability to, for example, convert fertiliser-N to nitrate, the community may not be actively doing so at a specific point in time.

"To determine both the potential and the actual activity of microbial communities, we developed a suite of DNA- and RNA-based assays to measure gene abundance and gene expression (genes code for enzymes)," Lori said. "These assays measure both the inherent potential and the actual activity of microbial communities involved with organic matter decomposition, mineralisation of N from organic matter, nitrification and denitrification (N loss to the atmosphere).

"The ability to determine what microbial communities were present and active during each step of the N cycle then allowed us to address more practical questions. Do common agronomic practices affect these crucial microbial activities? If they do, then can these same practices be used to modify or manipulate these activities for the growers benefit?"

Using both field trials and controlled environment studies, Lori and her colleagues asked:

- Does tillage impact where key N-cycling processes, such as nitrification, occur?
- Do previous crops have a longer term impact on microbial community functioning in subsequent cropping years?
- Are we targeting the right microbes with nitrification inhibitors?

What was found

Lori says specific community responses will differ according to soil type, climate, and cropping history, so the research outcomes are intended to show that microbial communities in agricultural soils are responsive to agronomic management and that they can be managed.

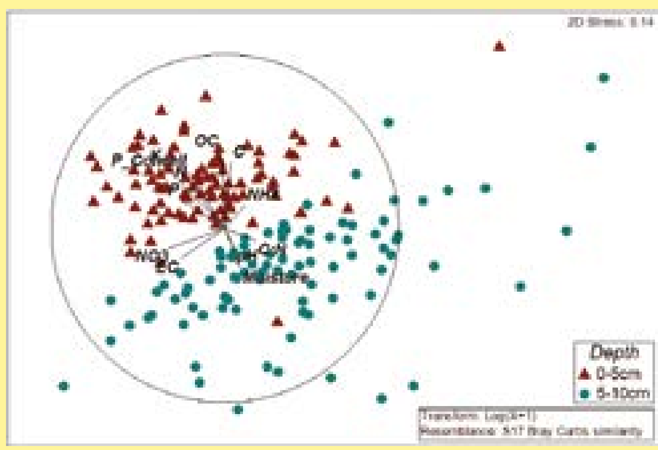
"If the inherent microbial potential to process nutrients can be managed, then this activity can also be manipulated to ultimately benefit growers," Lori says.

Research has shown that the activity of microbial communities changes as you go deeper into the soil. Even small differences in depth can have a substantial impact on overall microbial processes.

At the long-term Sustainable Cropping Rotations in Mediterranean Environments (SCRIME) trials at Longerenong in Victoria, microbial functions were assessed at 0–5 and 5–10 cm depths, across a range of treatments throughout the growing season.

Soil samples were taken from three crops (wheat, pea and canola) under two tillage practices (zero and conventional tillage) at five key cropping stages (sowing, germination, tillering, anthesis and harvest).

FIGURE 2: Active N-cycling microbial communities in a Wimmera vertosol are highly depth-stratified



Each point on this multivariate analysis figure represents eight separate N-cycling processes in a single soil sample, taken from different crops and tillage treatments at the DEPI SCRIME long-term field trial at different times of the year.

"When all of the microbial activities associated with organic and fertiliser-N turnover were assessed (listed in Figure 1), we found that depth was the primary driver of microbial activity (Figure 2)," Lori said.

"Small differences in soil environmental conditions at these two depths, including pH, moisture, and carbon and nitrogen availability, influence the overall potential of the microbial community to perform the N-cycling functions. At the same time, microbial activity changes their surrounding environment, influencing the amount of nutrients available for plant uptake.

"This depth-dependent localisation of microbial activities does not mean that there is always less activity at depth. Agronomic practices can significantly change what microbial activities occur at what depth. A good example of this is the microbial processing of mineral-N, which includes fertiliser-N."

Lori says tillage changes the depth at which nitrification (change to a plant-available form of N) and denitrification (N loss to the atmosphere) activities are highest.

As an example, Figure 3 shows these activities at sowing, germination and tillering in the canola treatment at the SCRIME experimental site. The previous crop in this rotation was pea.

For simplicity's sake, only one group of organisms involved in nitrification and one group of organisms involved in denitrification are shown. The fertiliser placement examples are reflective only of these two groups, and don't take into account other organisms in the system performing similar activities.

"At sowing, when some starter N is typically applied, the nitrification hot spot occurred at the 5–10 cm depth in both tillage treatments. At tillering, when the second of the split applications of fertiliser N might be applied, there were strikingly different patterns.

"In the no-till soils, there was 10 times more nitrification activity at the 0–5 cm depth than deeper in the profile. In the tilled soils, the reverse occurred, with substantially more activity at depth. Denitrification activity follows similar trends."

Benefits for growers

Lori says these differences in the location of high zones of microbial activity can be beneficially exploited. For example:

If starter N was applied at sowing in this system, then the fertiliser should have been placed below the 5 cm depth. Although denitrification activity was also highest at this depth, this placement into a nitrification hot spot should ensure that the applied N fertiliser is quickly converted into a plant-available form.

At tillering, when a slower and sustained release of fertiliser N might be desired, then placement should avoid nitrification and denitrification hot spots but still be readily accessible to crop roots. A strategic fertiliser placement at this time will help slow down nitrification, while at the same time minimise loss of N from the system by denitrification.

In this system at tillering, the best placement depth will depend on whether the system was under conventional or minimal tillage. In the no-till soils, fertiliser placement should be below the five cm depth. In the till soils, placement should be closer to the soil surface.

Lori says the location of these nitrification and denitrification hot spots is also impacted by the type of previous crop.

"The in-depth example discussed in Figure 3 only shows the impact of tillage in the plots coming out of a pea rotation. At this same site, in plots coming out of a wheat rotation, the hot spot at sowing occurred at 5–10 cm in conventionally tilled systems, but at 0–5 cm in no-till systems.

"In the future, strategic fertiliser placement should take into account how different agronomic (eg. tillage and crop sequence) and environmental (such as soil type) factors interact to influence the location of microbial hot-spots versus not-spots."

When asked whether these nitrification hot-spots can be used to determine whether nitrification inhibitors will be effective, Lori says there has been a growing interest in some farming systems about the use of nitrification inhibitors to reduce N losses.

"The group of nitrification microbes shown in this example, which belong to the Kingdom Archaea, are not affected by most nitrification inhibitors, such as dicyandiamide (DCD) and 3,4-dimethylpyrazole phosphate (DMPP).

"Therefore in this soil type at least, inhibitors might slow the conversion of fertiliser-N by bacterial communities, but would have no impact on this other dominant group."

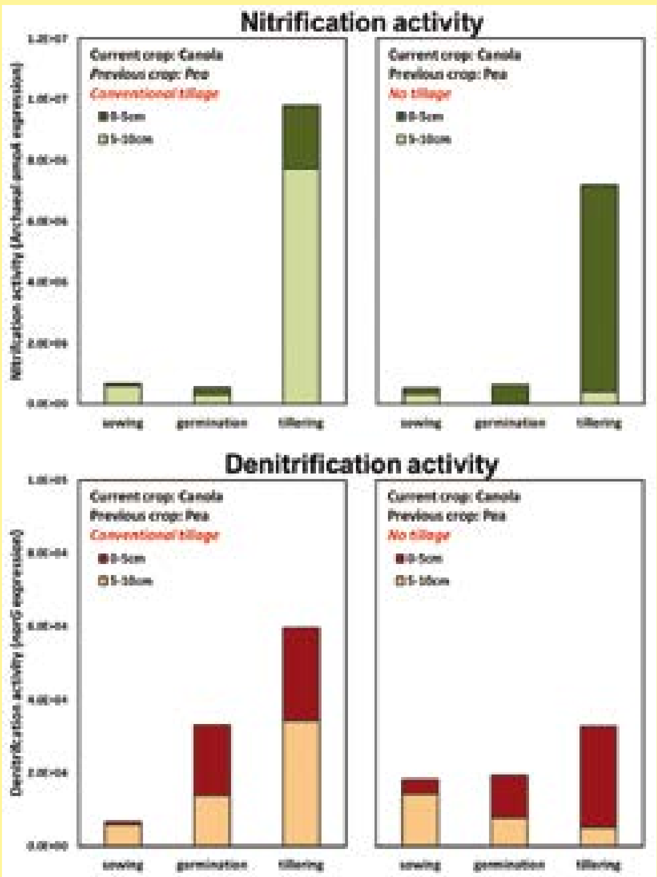
To sum up

Lori says the scientific tools are now available to assess how soil microbial communities respond to their environment.

"Our research shows that hot-spots of microbial activity change with agronomic management. At the Longerenong DEPI-SCRIME field experiment, the combined influence of tillage and crop sequence shifted the depth at which hot spots of nitrification and denitrification activity occurred.

"In order for us to make generalised management recommendations, we need to develop a broad scale

FIGURE 3: The impact of tillage on the relative nitrification (change to a plant-available form of N) and denitrification (change to gaseous form of N that will be lost from the soil) activities in the canola phase of a wheat-pea-canola rotation at the DEPI-SCRIME field experiment (Longerenong, Victoria)



understanding of where and when these microbial communities are active, across a range of regions and climates.

"The 'four Rs' of nutrient management recommend that growers apply the right fertiliser source at the right rate at the right time and in the right place.

"Our research shows that this strategy should also consider the nature and location of soil microbial activity.

"Ultimately, to achieve the highest nitrogen use efficiency, we may need to include a fifth R – 'for the right microbial community' – to fertiliser management strategies."

Contact details: Dr Lori A Phillips, Ph: 03 9032 7141, E: lori.phillips@depi.vic.gov.au

THE CONSULTANT'S VIEW

NITROGEN MANAGEMENT

Nitrogen management is one aspect of grains production agronomy that constantly challenges Agrilink consultant Mick Faulkner and his clients.

"Nitrogen is a big expense for farmers. Other than water, it is the single biggest driver of yield and therefore has a large impact on profitability," Mick said.

"But dealing with nitrogen is not quite as easy as managing a herbicide, for example, where we have a label, a set of guidelines and a target – and we go and spray it.

"The science of nitrogen is not fuzzy but by the time it comes to application or understanding at the paddock level, it does become less straightforward because there are so many things that have an impact."

One of those factors, according to Mick, is what is happening in the soil.

"When it comes to nitrogen application, we tend to simplify it down to how much is needed and when should it be applied. That's usually an economic decision, or it's based on rainfall or perceived yield.

"We know about mineralisation, immobilisation, nitrification and denitrification, but we don't know much about the processes behind these and whether the particular microbial population is having an impact. This is something we often don't consider," Mick said.

"If we can understand the mineralisation and immobilisation better, then we will all make better decisions and reduce the amount of nitrogen losses through denitrification.

"Given that nitrification inhibitors don't universally work, then we have to look at the science and fundamentals behind soil biological processes to make more accurate and timely investments in applied nitrogen and soil-derived nitrogen."

Contact details: Mick Faulkner, Agrilink, Ph: 08 8843 4282

Mick Faulkner.

Warmer weather alert for BWYV spread

By Rebecca Barr

AT A GLANCE…

- Weather patterns earlier this year provided ideal conditions for BWYV.
- A 'normal' summer will reduce aphid populations, meaning the risk next season is no higher than usual, despite this year's outbreak.
- Where there are symptoms across a paddock, no control measures applied now are likely to be useful.
- Where there are no symptoms, or only patches, growers should observe aphids regularly – at least weekly – to identify when they are ready to fly.
- Insecticides should be applied as soon as the aphids take flight.

BEET Western Yellows Virus (BWYV) has caused unprecedented damage to canola crops in south-east Australia this season, causing the GRDC to fund emergency research to analyse the outbreak and limit potential damage in future seasons.

The green peach aphids (pictured) spread BWYV. Growers need to look out for winged aphids and spray insecticide as soon as they are observed. **(Photo: A. Weeks, Cesar)**

But this year's outbreak does not indicate a higher chance of infection in future years according to SARDI senior pulse pathologist Jenny Davidson.

"Green peach aphids (GPA), which spread the disease, require green plants to survive. This year there were ideal conditions for the development of this disease with unusual February rain, coupled with a very mild autumn providing a green-bridge," Jenny said.

When there is average spring and summer temperatures and rainfall this causes most weeds to die off, resulting in the aphids not being able to survive in any great numbers, meaning next year's risk is the same as any year.

For growers who have severely infected crops and will suffer significant losses this year, this means no more measures can be taken to address the outbreak in those crops.

"Where crops have symptoms all the way across the paddock, there's no point in applying insecticides now," Jenny said.

"The aphids have already done their damage, and should die off over summer."

Close observation

But where growers have only patches of infection, or have crops not yet affected, Jenny recommends close observation of the aphids.

"Growers can use a sweep net, and look for the presence of wings, or put up sticky traps to catch flying aphids. As soon as flying aphids are observed, at-risk crops needs to be sprayed. The aphids will take flight once the weather warms up. This timing will depend on the region, but will generally be after a few days of around 17°C. This isn't a fixed rule though, so growers should be checking the crop at least once a week, and twice a week as soon as the days start to get warmer."

Once the aphids are on the wing, spraying should be performed as soon as possible to limit any further damage the aphids can cause in further spreading of the disease. While infection after the mid-podding stage (growth stage 5.5) is less likely to cause significant yield losses, oil quality can still be affected. Withholding periods for canola should also be considered in deciding when to spray.

Only use registered insecticides

Only insecticides registered for use against aphids on the crop and crop stage should be applied when spraying for aphids.

Application of unregistered use patterns of insecticides is likely to leave residues greater than Australian and overseas MRLs which will cause problems in marketing grain. Care should also be taken to ensure there is no off target damage to non-target organisms particularly bees.

Integrated pest management strategies can be used to help manage GPA populations, including management of summer weeds, to reduce potential hosts over summer, and rotation of insecticide chemical groups to reduce the risk of resistance development.

More Information: Jenny Davidson, 08 8303 9389, jenny.davidson@sa.gov.au ■

Cosmick to star as new AH wheat

COSMICK, a new Australian Hard wheat launched in August by leading Australian cereal breeding company InterGrain, looks set to offer South Australian and Victorian wheat growers a viable variety alternative to Mace, Correll, Corack, Derrimut and Scout.

The high yielding, early to mid maturing wheat – formerly known as IGW3423 – has performed exceptionally well in InterGrain trials in the past few years and in National Variety Trials (NVT) in 2013, with its yields equivalent to Mace in SA.

Cosmick offers strong stem rust (MR-MS) and moderate stripe rust resistance (MS). It has an intermediate plant height, similar to Gladius.

Cosmick has a moderate grain size, similar to Yitpi and offers test weights similar to Wyalkatchem.

According to InterGrain CEO, Tress Walmsley and InterGrain Marketing Manager Ash Brooks, who jointly launched the new variety at the BCG Industry Field Day in Horsham, Victoria, Cosmick extends InterGrain's wheat variety portfolio reach in eastern Australia.

InterGrain Wheat East breeder and breeder of Cosmick, Chris Moore, said the new variety gave Victorian and South Australian growers a high yielding, early-mid season AH variety alternative for their programs and, with its high yields, AH classification and effective yellow leaf spot resistance it would be ideal for a first wheat following a canola, field pea or lentil crop.

From a SA perspective, Cosmick is yield competitive with Mace, which currently comprises about half of SA's typical wheat plantings and it offers growers another AH option to spread their varietal risk.

According to Chris, Cosmick will also provide growers with an alternative to spread their disease risk due to its good stem and leaf rust resistance, coupled with its useful stripe rust resistance.

"For those growers, particularly in the southern Eyre Peninsula, Cosmick has an MR-MS powdery mildew rating, which is also an advantage," he said.

Although considered susceptible to cereal cyst nematode (CCN), Cosmick is an effective varietal option when used within a well-managed rotation, through the integration of CCN break crops and/or CCN resistant barley varieties, such as La Trobe.

Richard Verner, who this year has sown 1500 hectares of his 1800 hectares farm at Mallala, SA, said Cosmick would give Mace, Gladius and Corack "a run for their money, particularly in the medium rainfall areas where higher protein for AH premiums, lower rust risk and good yellow leaf spot resistance are all hallmarks of a successful variety."

Mallala, SA farmer Richard Verner in the 23 hectare InterGrain Cosmick crop he planted on May 14.

A farmer and seed grower, Richard this year sowed 23 hectares to Cosmick on May 14 into medic pasture at 85 kg per hectare, a little lower than the usual 90–100 kg per hectare, to allow a larger sowing area.

"Cosmick has kept pace with the season this year and looks on track for a good yield, so I reckon it's written in the stars," Richard quipped.

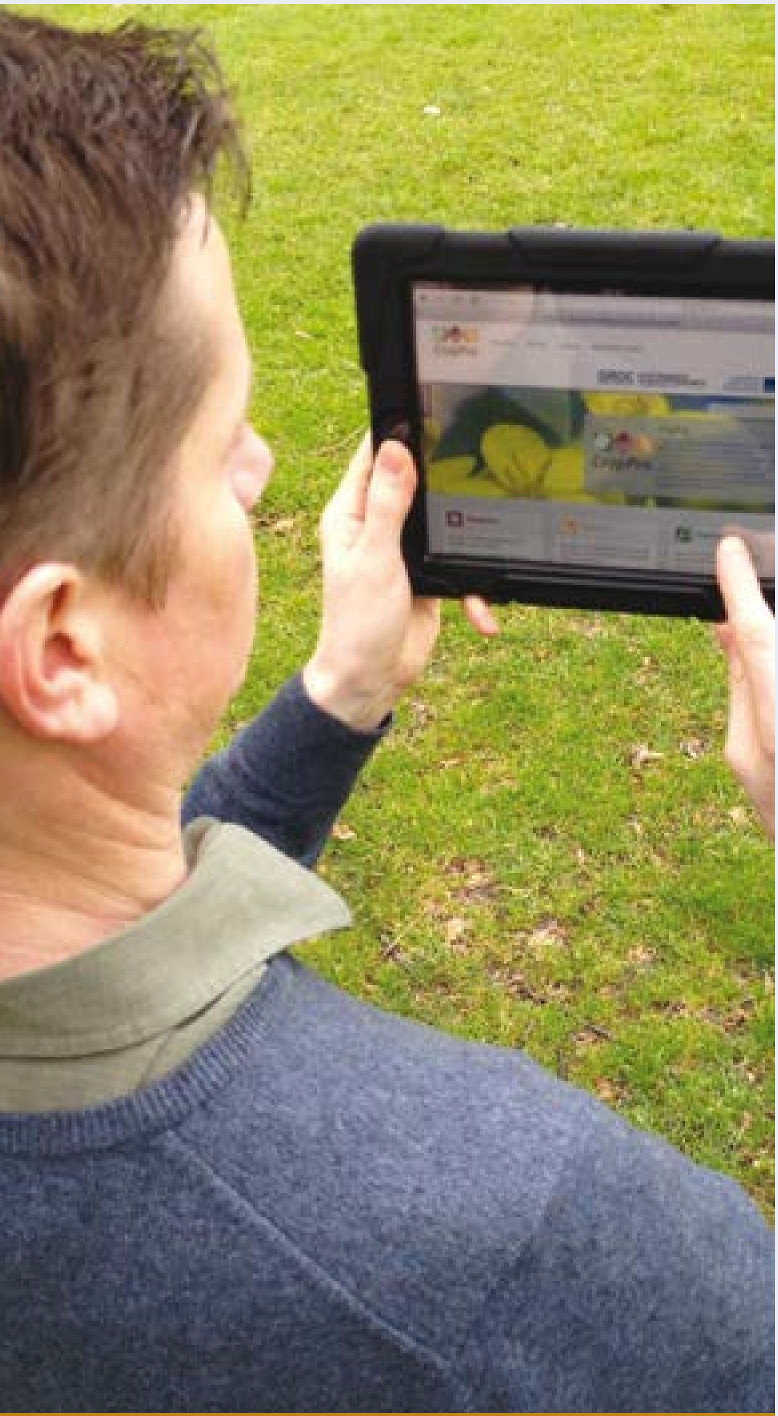
Cosmick seed is available for sowing in 2015 and can be purchased from registered InterGrain Seedclub members or your local reseller. For more information, please contact InterGrain, Tel 08 9419 8000 or visit the website www.intergrain.com ■

Dodgshun-Medlin consultants and Longerenong College students visited the InterGrain Cosmick plot during its launch at the August 20 BCG Industry Field Day at Horsham.

Crop diagnosis and response a click away for agronomists

A NEW web-based diagnostic tool to assist agronomists in identifying and managing cropping constraints was unveiled in August.

Designed for use in the southern cropping region and developed through the Grains Research and Development Corporation-funded Diagnostic Agronomy Southern program, CropPro was launched at the BCG industry adviser day in Victoria and is now available at www.croppro.com.au.



CropPro has been designed to assist agronomists to identify specific crop constraints, or short list likely constraints, based on agronomic observations. *(Photo: DEPI)*

Project leader Dr Chris Pittock, from the Victorian Department of Environment and Primary Industries (DEPI), says CropPro has been designed to assist agronomists to identify specific crop constraints, or short list likely constraints, based on agronomic observations.

"CropPro delivers diagnostic and economic tools for efficient identification and management of constraints to crop productivity," Chris says.

"The three core functions of CropPro are to diagnose the cause of crop problems, support risk analysis and to provide evidence-based information for management of crop constraints."

Diagnostic tools

CropPro offers wheat and canola diagnostic tools, economic calculators for the management of most constraints, explanatory videos, and in-house browse-able content and search functions.

Chris says the 'diagnose' component uses observations about an underperforming crop and shortlists likely underlying constraints based on this data.

"Each constraint has an information page that provides short-form summary information and links to key resources on identification, cause and management of the constraint."

Economic considerations of constraint management are explored through the 'option$' page. Users can test different management actions against the default 'do nothing' option.

"An economic analysis of likely net return of each option and preferred option is provided. Accompanying videos explore concepts of such as risk and sunk costs as well as economic considerations highlighting management practices that may manage risk into the future," Chris says.

Key information resources

The 'explore' function presents key information resources in browse-able form – such as the Crop Disease Manual and a set of nutrient review articles. This function also provides a customised search portal to locate recent, evidence-based information from trusted sources.

Minister for Agriculture and Food Security Peter Walsh said the development of CropPro was another example of positive collaboration between government and industry.

"The Victorian Coalition Government has set a target for our state's farmers to double food and fibre production by 2030 and tools like this will help them to achieve that," Peter said.

GRDC Manager of Delivery Platforms, Tom McCue, says the launch of CropPro represents a major advance in the delivery of practical and useful resources to assist in the protection of crops in the southern region.

"Agronomists are at the frontline of the provision of advice and information to the region's grain growers so it is important that they are equipped with cutting-edge technology that enables rapid diagnosis of crop issues and response," Tom says.

Agronomists in the southern region were involved in a trial of CropPro before its launch.

More information about CropPro is available from Dr Chris Pittock on 0458 620 759 or email Chris.Pittock@depi.vic.gov.au ■

Low dollar helps support grain and oilseed prices

Profarmer AUSTRALIA
www.profarmer.com.au September 25, 2014

Australian dollar continues downward slide

The Aussie dollar has continued it's move lower over the last week with values settling at 88.77 USc on Monday night, September 22. The A$ has now lost over 5 USc in a little over two weeks.

The currency moves bode well for the competitiveness of Australian exports. At current values, a 1 USc move in the exchange rate is worth about A$2.20 per tonne to the Aussie dollar equivalent value of CBOT wheat futures. This means weakness in the A$ has been worth over $11 per tonne to Aussie wheat values over the last two weeks of September alone.

The falls against the Canadian dollar have been less pronounced, but the A$ lost 4 CAc in the last three weeks of September. At current values, a 1 CAc move in the exchange rate is worth around A$4 per tonne to Aussie dollar equivalent value of ICE canola futures.

Canadian harvest progress improves

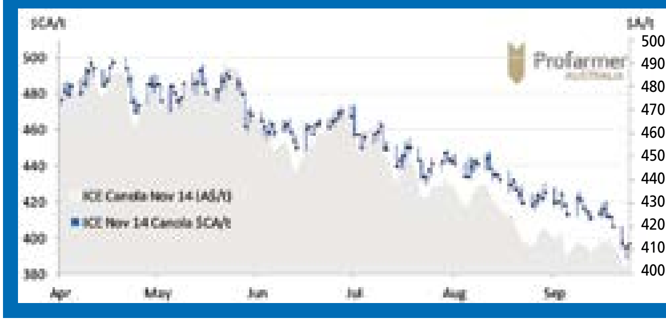
Improved weather for Canadian growers meant harvest accelerated in late September. However, some areas received as much as 25 mm of rain in the last weekend of September which has re-ignited quality concerns.

By the end of September, CWB MRS put harvest of all crops at around 50 per cent complete. This was still far behind the average of 71 per cent complete for that time of the season. Hence, whilst harvest will roll-on, quality etc will continue to be discussed in the market.

Although, canola harvest progress to date is running behind that of wheat, Canadian canola is starting to hit the market which is putting selling pressure on ICE canola values. We would typically intend to stand aside from the canola market during this time, in order to allow Canadian harvest pressure to wash through the market.

Across the border in the US northern plains, spring wheat harvest was nearly completed by the end of September. Hence the market was much more certain about production and quality prospects from this region.

ICE canola forward



Western Canada harvest progress

AT A GLANCE…

- A weaker A$ continues to support Aussie values;
- As Canadian canola hits the bins we're starting to see grower selling in Canada pressure ICE canola futures values;
- Black Sea wheat missing out on sales – does this mean Black Sea is no longer the reference for international pricing?

The full extent of weather damage of the US spring wheat crop remains unclear, but premiums on Minneapolis grain exchange – relative to Chicago Board of Trade – closed by the end of September as the market became more certain about supply and average quality.

Black Sea loses export business to US

In late September, US SRW wheat won an Egyptian GASC export tender, out-competing Black Sea and EU wheat.

GASC makes offers to their tenders public, hence providing considerable transparency around the prices being offered by competing nations.

From June 21 to September 22, US SRW wheat futures have fallen US$52/t. Over the same period, the offer price of US wheat in the GASC tender has fallen by a similar amount (just shy of US$50/t CNF). Over the same period of time, Russian offer prices in the GASC tender have fallen by around US$10/t. This has allowed US wheat to become more competitive into this market.

What does this mean?

We've been flagging for a while that at some point – either due to government or market intervention – the available supply of Russian wheat in the export market would tighten. However, it is unlikely that we are there yet. In fact, Russia's federal statistics agency announced that Russian stocks of all grain at September 1 were 39.4 million tonnes – 19 per cent higher than last year.

Perhaps grain traders perceive there is less risk in the Black Sea now and they're focusing on other origins.

Whatever the reason, the market expects that Russia has capacity to drop their prices in order to move grain if they want to. This is not yet perceived as a trend, but rather an anomaly. ■

The global wheat harvest is another big one but there are quality issues.

Quality concerns over large world wheat supply

■ **By Casey Chumrau, US Wheat Associates Market Analyst**

NORTHERN Hemisphere farmers are close to finishing their winter wheat harvest and beginning to cut spring wheat. While persistent drought reduced hard red winter (HRW) production in the southern plains of the US, it is evident that better-than-expected yields around the world so far will likely lead to a record wheat crop.

USDA has significantly increased its 2014–15 world production projection to a record 720 million tonnes in its September report.

While there is little doubt that world supplies will be plentiful, the quality of the world crop has been variable. While Russian quality is mostly good, excessive rain considerably diminished wheat quality in Ukraine. Analyst group ProAgro estimates about 35 per cent of the total wheat harvest in Ukraine will not meet food quality levels – up from 25 to 30 per cent last year. But a local flour milling association estimates the percentage of feed wheat will be much higher, going as far as sending a letter on August 14 to Ukrainian President Petro Poroshenko asking him to stop wheat exports temporarily to protect the domestic market.

Quality concerns in France and Canada as well

Concerns regarding wheat quality are also high in France, the EU's largest wheat producer and exporter. In July, frequent and abundant rain just before harvest resulted in sprouting and reduced test weight. Reports suggest the country's overall protein content will average around 11.0 per cent, which would be the lowest since 2001.

Worries about the Canadian crop quality had diminished with favourable late summer weather. But mid-September snowfalls and rain have re-ignited quality concerns for wheat yet to be harvested.

US quality varies across the classes

Reports concerning US crop quality have been as diverse as the growing regions. In many parts of the southern plains, severe drought conditions stunted hard red winter (HRW) development, but resulted in high protein, and untimely harvest rains added to the woes by affecting quality in some cases.

The northern plains HRW crop improved the average quality for the class, despite suffering some late disease pressure. White wheat protein levels are also running higher this year – not ideal for low-protein uses. Drought conditions and hot weather stressed winter white wheat, which accounts for 83 per cent of all white wheat acres this year.

Wheat quality variations can have a serious impact on the milling and baking qualities of the commodity, but the geographic diversity of US wheat growing regions helps to balance out regional fluctuations.

More information: www.uswheat.org ■

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Grains industry set to undergo transformational change

THE Australian grains industry is set to undergo a dramatic transformational change, as new investment in grains infrastructure results in a move to differentiated supply chains and long-term commercial partnership between industry players, according to a new research report.

The report, *Australian Grains – Infrastructure Growing Pains* by agribusiness banking specialist Rabobank, says this structural shift – going from a monopolistic supply chain structure in most regions towards multiple grain export supply chains competing side by side – will impact all industry stakeholders, from farmers and grain marketers through to supply chain operators and export customers.

New grain port infrastructure on the eastern seaboard and in Western Australia is anticipated to change how market participants interact with each other and signals a move towards exclusive supply chains and long-term service agreements.

And this will likely be good news for grains farmers, resulting in increased competition for grain at farm gate level and overall higher prices.

"As the industry moves towards a more fragmented and competitive grain supply chain system, the formation of long-term supply chain partnerships will be crucial," the report says. "Partnerships between growers, marketers, supply chain operators, capital investors and export customers will dictate how grain infrastructure is utilised and will influence the winners and losers throughout the chain."

Graydon Chong.

Report author, Rabobank senior grains analyst Graydon Chong says recent development of port infrastructure around Australia has already resulted in partnerships between multinational companies who have co-invested in the infrastructure, while at the same time creating competition for the incumbent supply chain operators. This investment includes the new terminals at Newcastle and Port Kembla, in New South Wales, and Bunbury, in Western Australia.

'Feeding' over-capacity

The report says competition for grain to 'feed' a port system which is already significantly over-capacity is one of the key drivers of the new dynamic in grain.

"Australia's new grain port infrastructure investment is expected to exceed $A150 million over the 2012 to 2015 period, resulting in additional grain export capacity for the nation," Graydon said.

"Average annual Australian grain production over the past five years has been 38.9 million tonnes, peaking at 43.8 tonnes in the 2011–12 marketing year, and this was already significantly less than the 55 million tonnes of up-country and port storage which existed in the storing and handling networks prior to this latest round of port infrastructure investment.

"With this significant overcapacity in the system, supply chain operators are likely to face strong competition for grain."

In this way, Graydon said, co-investment in port infrastructure had raised the incentive for supply chain operators to form partnerships along the supply chain to maximise the utilisation of infrastructure assets. "And particularly in a model which is heavily reliant on throughput of volume for economic returns," he said.

Up-country investment

The investment now being seen in port infrastructure is also expected to result in further investment in 'up-country' infrastructure and in the rapid growth of both on-farm and privately-held storage facilities, the report says.

"Further development in supply chain infrastructure – whether in logistics, up-country storage or further port investment – will create more opportunities for strategic partnership for all supply chain participants, from farmers to end users," according to Graydon.

This new system will likely see growers being incentivised to store and treat grain on-farm for longer periods of time before delivery, allowing a reduced capital requirement for the end 'accumulator' and providing financial gain to growers with on-farm storage.

But storing large volumes of grain on-farm instead of in the bulk handling system will result in quality and safety risks being shifted to the farmer, the report warns.

"Looking forward, grain growers will need to weigh up the costs associated with storing grain on farm against delivering grain into the bulk handling system. These costs will need to be inclusive of the risk associated with quality, safety and pest management," Graydon says.

Higher prices

More competition for grain at the farm gate level will likely result in overall higher prices for grain growers, according to the report.

"Supply chain operators looking to maximise throughput will come under increasing pressure to attract grain to achieve optimal asset utilisation," Graydon says. "As a result, the Australian grain industry is likely to see a dramatic shift in the pricing of grain."

Other findings

Other key findings in the report include:

- The expected end of centralised marketplaces for grain buying and selling – with the decentralisation of bulk handling systems to dramatically change the way the domestic grains markets operate, particularly in export-oriented states such as WA;
- Opportunity for specialised product development to service niche markets due to the flexibility in storage and segregation in a fragmented supply chain; and,
- An increased importance in cooperative grower-to-grower partnerships to increase market power, provide economies of scale, reduce operational risk and boost overall profitability for farmers.

Rabobank's report *Australian Grains – Infrastructure Growing Pains* is the third in a series of keynote research report being released in 2014 to assist clients address competitive challenges and opportunities in their agricultural businesses. ■

Up close and personal with tiny, beneficial wasps

By Jan Suszkiw, Agricultural Research Service – USDA

USING specialised digital photography methods, Agricultural Research Service scientists and their collaborators are producing high-resolution images of members of the wasp superfamily Platygastroidea. Their goal is to improve the identification and taxonomic description of these tiny insects – including species with potential to biologically control important crop pests.

Of particular interest are one to two mm long Trissolcus wasps that parasitise stink bug eggs. The larvae of such wasps hatch inside and devour the interior of the bug's eggs, killing them in the process. Some species attack the eggs of the brown marmorated stink bug (BMSB), *Halyomorpha halys*, an invasive species from Asia that's become established in 39 US states and inflicting damage to corn, soybean, grape, and other crops (BMSB has not been detected in Australia).

"One of the challenges of taxonomy for such small creatures is that taxonomists have had to rely on written descriptions and illustrations to understand what they have not seen firsthand," explains Elijah Talamas, an entomologist with the ARS Systematic Entomology Laboratory (SEL) in Washington, D.C. "In some cases this has worked very well, and high-quality illustrations are extremely useful. But illustrators simply cannot capture all of the detail that a photograph can."

Toward that end, Elijah, together with ARS entomologist Matthew Buffington, has begun a project to photograph the collection of Platygastroidea wasp 'holotypes' managed by colleagues at the Smithsonian Institution's National Museum of Natural History (NMNH) in Washington, DC. Holotypes are the reference specimens on which species names and descriptions are based.

Highly detailed image of the wasp *Trissolcus japonicus*, a primary candidate for biological control of brown marmorated stink bug. The actual size of the wasp is just 1–2 mm long. (Photo by Elijah Talamas)

It starts with a slice

The process begins with positioning a holotype specimen under a specialised camera with a single-column lens

A *Trissolcus euschisti* wasp (about 1.5 mm long) that has emerged from a stink bug egg. This wasp species is a promising biocontrol for brown marmorated stink bug. (Photo by Elijah Talamas)

In Newark, Delaware, ARS research specialist Ashley Colavecchio uses the stacking system to produce high-resolution images of wasps to improve the identification and taxonomic descriptions of the insects. (Photo by Kim Hoelmer)

attached to a vertical joist and taking stacks of photographs throughout the depth of the specimen. Each photograph contains a small part of the insect in focus, due to the small depth of field at high magnification. These 'slices' are then combined into a single, highly detailed, digital image magnified up to 100 times the specimen's original size. The image is then uploaded to online databases, operated by Ohio State University (OSU) collaborator Norman Johnson, and linked to a description of the holotype and other information about it.

"Making the images freely available online makes it possible for anyone with an Internet connection to assess the morphology of the holotype specimens," says Elijah. "Each specimen has a unique collecting unit identifier (CUID) – which allows a user to determine the specimen's origin on a species-distribution

An image of a Calotelea wasp in amber that is about 20 million years old. (Photo by Elijah Talamas)

map. Taxonomists can refer to a particular specimen via its CUID without ambiguity."

Such capabilities are especially important in validating or correcting holotype names or descriptions that were made long ago. Elijah and colleagues published one such correction for *T. halyomorphae*, a promising biocontrol agent for BMSB, in the Journal of Hymenoptera Research. This species was described as new in 2009, but it was actually described more than 100 years ago by US Department of Agriculture entomologist William Ashmead, and it is now called by its proper name, *T. japonicus*.

As an OSU graduate student under Norman's mentorship, Elijah produced over 3000 digitised images of Platygastroidea wasps, and he has produced hundreds more since joining SEL in March 2013.

Searching for biocontrols

The documentation of Trissolcus species provides invaluable taxonomic support to a team headed by Kim Hoelmer at the ARS Beneficial Insects Introduction Research Unit in Newark, Delaware. There, under quarantine conditions, Kim's group is examining the host specificity and safety of several Asian Trissolcus species with potential use in biocontrol-release programs against BMSB. (See "ARS Works Toward Control of Brown Marmorated Stink Bug," *Agricultural Research*, January 2013, pp. 18-20).

Being able to tell the Asian species apart from one another and from native Trissolcus wasps will be critical on several fronts, including monitoring the purity of numerous research cultures, tracking the wasps' spread from introduction sites, monitoring their behavior patterns in new environments, and gauging their effectiveness as biocontrol agents.

In a side project, using the NMNH collection, Elijah has begun photographing Platygastroidea wasp specimens entombed in amber dated 20–30 million years of age. There are many questions about the diversity and origins of the wasp superfamily, as well as its co-evolution with host insects, that are relevant to modern-day biocontrol pursuits.

"Right now, we don't have enough specimens in amber to show the co-evolution of Platygastroidea with stink bug hosts," says Elijah. "But we can begin to learn what groups were prone to extinction, which were more diversified, and conversely, which are present today but are not in the fossil record."

Elijah Talamas is with the USDA-ARS Systematic Entomology Laboratory, National Museum of Natural History, 10th St. & Constitution Ave., N.W., Washington, DC 20560; Ph: +1 202 633 0998. ■

The tiny size of the wasp *Trissolcus japonicus* is apparent from this dime, which has several of the insects sitting on it.
(Photo by Ashley Colavecchio)

Farming in Foreign Fields...

Enough power to ensure a long useful life in the 'vege' patch

RALF Herzog is a vegetable and grain farmer from Schmedeswurth in the region of Dithmarschen in the north-west of Germany. He is a typical north German business owner. Quiet and relaxed – perhaps even a little reserved.

The Herzog family has farmed in the Dithmarschen region for four generations. It is now one of the largest cabbage growing areas in Europe. Farmers here grow white cabbages and other vegetables over an area of more than 2800 hectares. The area also boasts specialists in carrot and potato cultivation.

The farms were originally very small businesses, but over the last few decades they have gathered a wealth of expertise – which helps with marketing – but especially in the preparation of vegetable specialities.

Almost all farm businesses are highly specialised in the region. The same applies to the Herzog family business.

Highly specialised

From February to July the entire cabbage harvest is stored in special refrigerated warehouses, erected by the family, and distributed to Germany's grocery chains via specialised cabbage merchants.

In addition to their round cabbage crop rotation, the Herzog family has two other crop rotations for rapeseed and sugar beet – rounded off in each case with winter cereals.

Much revolves around cabbage when it comes to the technical equipment too. A great deal of manual work is associated with the harvest in particular, but also with storage, and above all, preparing the vegetables for distribution.

"This is why we need maximum efficiency for our entire farming operations," says Ralf. "For years, we have been striving to draw on our reserves. We are interested in any concepts that offer greater performance – for example in fertilisation and maintenance or in plant management – which can help to free up labour time for the various tasks and possibly for new projects."

Ralf Herzog.

Any increase in efficiency is welcome

Ralf recently purchased a Case IH Magnum 370 CVX – a very large tractor for both the region and type of mixed farming enterprise. But why a heavy-duty tractor like the Magnum 370 CVX on a farm like this?

"We rely on our machines having a long useful life. In other words, when we purchase a new product, performance is of utmost importance," explains Ralf.

"We chose the Magnum ultimately because of one key event. When installing a power cable, which crossed a large section of our field area, we found compaction levels, some extensive, in soil layers below the tilled horizon. This gave me the idea of further optimising the tillage operation – for example, by reducing the amount of surface that is driven on.

"But this requires larger working widths. We also want to loosen the soil over time – up to 60 cm deep in places – using a 7 cm blade width to loosen root areas. Of course, this is a longer term measure to improve soil quality. But ultimately one thing is clear – we need more drive power! And that's where a heavy-duty tractor like the Magnum comes into its own.

"Compared to the alternatives the 370 CVX is a more cost-effective solution with an excellent price/performance ratio."

Starting in the 2014 cultivation season, the Magnum 370 CVX will assume all tillage operations. New tillage equipment was also purchased, such as a deep subsoiler and a new 6-blade plough.

"We hope that this will generate greater efficiency, free up more labour and lead to reduced operating costs in our processes. As for free capacities, I'm fairly sure that I will be able to deploy these throughout the business and perhaps even create some breathing space for new projects." ■

IN PURSUIT OF CLIMATE AND ECOSYSTEM RESEARCH

It is the only one of its kind in the world: Ten giant steel constructions in which future climate changes can be simulated and their effects can be analysed. The Global Change Experimental Facility (GCEF) – part of the Helmholtz Centre for Environmental Research (UFZ) in Leipzig, Germany – incorporates a total of 25 coverable and 25 noncoverable test areas.

In designing the facility, the researchers were not just concerned with simulating the effects of climate change, but noting the impacts of land use itself.

Tracking climate change and land use impacts

This is why five of the steel complexes with a total of 25 plots can be covered; as soon as the sun goes down, the sheet roofs and the side walls close automatically. As a result, the night-time temperatures are up to three degrees Celsius higher than the areas in the other five complexes, also with a total of 25 plots, which remain open overnight.

In addition to the change in temperature, it also means that different precipitation behaviour can be simulated – such as increased dryness in summer – and compared with the actual weather conditions at the site.

In terms of land usage variants, conventional cultivation, eco-cultivation, intensively and extensively farmed grassland, and sheep meadows can be compared – both coverable and non-coverable in each case.

Dr Martin Schädler, the scientific coordinator of the project is confident: "We will be able to observe the effects of climate change and land use under relatively realistic conditions."

This does not just apply to the growth and composition of the plant stock, but also, for example, the soil life – the many organisms that help in the composition and breakdown of the topsoil. Even their composition and activity could be subject to greater or less extensive change as the framework conditions change.

Big enough for 'real' agricultural technology

Many plots of land for precise scientific trials are only a few square metres in size. Often this is because there's no other option – and is a disadvantage for many reasons because it's almost impossible to replicate large-area processes on just a few square metres. Small areas also are more prone to boundary effects and interferences, and researchers in different disciplines cannot work unhindered on plots that are too small.

Without all of these often quite common restrictions, the facility in Bad Lauchstädt offers almost luxurious working conditions. At six metres wide and 24 metres in length, the individual plots are so big that "conventional" agricultural machines can be used. This means that it is possible to use a Case IH Maxxum 5130 as the 'farm work-horse' allowing real-life conditions to be replicated as closely as possible rather than the conditions of scientific experiments.

As far as the technical equipment of the GCEF is concerned, the Maxxum is in excellent company:

Much of the data and information that will be recorded at this site in the coming years will be entered into a self-organizing sensor network developed at the UFZ. This includes a number of small stations that will record elements such as humidity and temperature of the air and ground, and even the radiation intensity. The data is automatically sent to the project's database via a router.

"This is a truly high-tech test field for us," enthuses Martin who is also quick to point out that the observable technology is only the start, and that the remaining technology is buried in the ground or exists in the air as a 'data cloud' enroute to the nearest router.

But it doesn't come cheap

A facility like this offers extraordinary opportunities, but it doesn't come cheap: The Federal Ministry of Education and Research (BMBF), and the states of Saxony-Anhalt and Saxony invested some 4 million euros in the GCEF. That's certainly not chicken feed – but then the facility is not just a project that benefits scientists – it will also provide conservationists, agricultural planners, farmers and political decision makers with valuable information.

(PHOTO: UFZ/Andre Kunzelmann)

ASK AN EXPERT – KEEPING FENCELINES CLEAN

With Weed Science Research Officer, Department of Agriculture and Food WA, Sally Peltzer

HERBICIDE resistance is quietly increasing in weeds growing along paddock borders such as fencelines, roadways and irrigation channels.

Dr Sally Peltzer said that approximately 25 per cent of glyphosate resistant populations within broadacre cropping situations across Australia come from fencelines and other non-cropping areas of the farm.

"These non-crop areas are not subject to the pressures of crop competition and are usually given lower priority than the paddocks when it comes to weed management," explained Sally.

"The over-reliance on glyphosate along borders with no control of survivors is high risk and herbicide resistance under these circumstances is inevitable.

"Also, weeds on paddock borders are typically not sprayed until later in the season when many of the plants are large and much less susceptible to herbicide," she said.

"It is also difficult to get good spray coverage on these large plants."

Once herbicide resistant weeds establish on paddock borders the seed can easily spread into the paddock with wind, water or machinery.

Sally is encouraging growers to treat weeds growing along paddock borders as a high priority job that requires good timing and a variety of management tactics, including non-herbicide options.

"New populations of herbicide resistant weeds growing along paddock borders are being identified all the time," she said.

"The problem is already widespread and demands a serious re-think of how growers manage these areas around their farms."

What is the first step if I think some of my paddock border weeds are not dying after being treated with herbicide?

Short answer: Get samples tested.

Longer answer: There are two tests available, a 'quick test' conducted on plant samples and a traditional test conducted using seed samples. Testing is needed to establish the level of resistance and to identify herbicide groups that are still effective on the sampled plants.

Around 25 per cent of the glyphosate resistant populations identified in Australian broadacre cropping situations come from fencelines and other non-cropping areas of the farm.

Are there new treatment strategies specifically for weeds growing along paddock borders?

Short answer: Yes.

Longer answer: Over the past few years field trials have helped identify some tactics that have the potential to improve weed control in non-crop areas. Spraying weeds on paddock borders in July and August is probably too late. Spraying in May when the weeds are smaller is more effective and a second treatment later in the season is commonly required to treat late germinations. The later treatment will also have a beneficial effect on managing summer weeds.

Other than glyphosate, what chemical options are available for treating weeds along paddock borders?

Short answer: A residual herbicide followed by a knockdown.

Longer answer: Weeds growing along paddock borders require targeted management tactics aimed at preventing seed set. Field trials in Western Australia have shown that an early treatment with a residual herbicide such as triazine or bromacil and a knockdown such as paraquat has a beneficial effect on seed set. ■

Sally Peltzer.

HOW TO ASK A WEEDSMART QUESTION

Ask your questions about testing for herbicide resistance, or any herbicide resistance management strategy, using Twitter @WeedSmartAU or on the WeedSmart website http://www.weedsmart.org.au/category/ask-a-weedsmart-expert/

Questions will be answered online, through our interactive blog, and may also be shared with other growers through this column.

'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.

Soil residual herbicides have come full circle

WEED smart
every weed every seed
every farm every year

RENEWED interest in using soil residual herbicides to control fallow weeds in the northern grains region is supported with research and development programs.

NSW DPI extension officer and weeds technical specialist, Tony Cook, said using soil residual chemistry following weed seed set prevention tactics has many advantages.

Tony said there is active research and commercial interest in registering more soil residual products to reduce the number of weeds germinating during the fallow.

"The main advantage is that there is a broad range of soil residual modes of action that allows more effective herbicide rotation," he said. "There is a significant level of resistance with post-emergent chemistry, making it more important to try other modes of action before these chemicals lose their potency."

There are seven commonly used mode of action groups with soil residual herbicide activity currently available. These groups are B, C, D, H, I, J and K and within these groups there are products that target different and essential weed biological processes, effectively increasing the options for herbicide rotation.

"An over-reliance on post-emergent and knock-down herbicides for fallow weed control has put these effective products under great pressure," said Tony. "A new strategy is to use glyphosate or paraquat as a knock-down soon after harvest, followed by a soil residual spray."

"This can control several weed germinations and reduce the need for glyphosate sprays during the fallow," he said.

Realistic expectations

While the opportunities certainly exist and a growing bank of trial data is supporting the use of soil residual herbicides as part of an integrated weed control program, Tony emphasises that expectations must be realistic and more experience with soil residual chemistry is required in the northern growing region.

"There can be no skimping or short cuts and these products come with some important management considerations that must be addressed for them to be effective," he said.

"Incorporation in the soil, uniform application, timely rainfall and stubble management all need to be right for these products to reliably control weeds," said Tony. "This is not a 'set and forget' option and risks such as residual chemical affecting the following crop must be taken into account."

Tony recognises that 100 per cent control with soil residual herbicides is rare. "Under certain field conditions these products can breakdown faster than expected and a flush of weeds might germinate late in the fallow, or the effectiveness may be patchy across a paddock.

"A follow-up with a post-emergent herbicide is usually required," he said. "Using a detector sprayer to apply the post-emergent product will significantly reduce costs and the amount of post-emergent applied to achieve 100 per cent control and thereby help preserve the pre-emergent chemistry."

Each product has a plant-back period on the label that must be observed and if the fallow period has been dry it may be necessary to test for residual herbicide levels before planting sensitive crops.

Tony said that organic matter, soil clay content, temperature and rainfall all impact on the breakdown of the chemical in the soil. "One way to check for residual chemical is to hand-sow indicator plants, such as conventional canola (to test for Group B residues), at different sites across the paddock and to water them in," he said. "Do this two to four weeks before the planned sowing date and monitor the indicator plants to see if they germinate normally."

For more information on managing the risk of herbicide resistance, visit www.weedsmart.org.au ■

Upper Horton grain grower, Chris Bowman (left), and NSW DPI weeds technical specialist, Tony Cook, inspect a clean crop of barley. Chris has implemented many integrated weed management principles on his farm, including grazing, crop competition, strategic tillage and effective use of soil residual and post-emergence herbicides.

Think global

"Herbicides are as important to global food production as antibiotics are to human health" – Professor Stephen Powles.

HUMANITY has faced some major challenges in the past and has always met these challenges through innovation. The extremely infectious and deadly smallpox virus plagued people for centuries and yet by 1980 we had eradicated it on a global scale. The innovation? A newly perfected vaccine, and a huge, worldwide collaborative effort.

But while smallpox is gone, herbicide resistance lives on and as AHRI Director Stephen Powles believes, it is posing a huge threat to global food security. Our population is exploding and with grains the only feasible way to feed the world, we can't afford a drop in grain production.

It will take new thinking to meet the challenge which is why Steve Powles and the AHRI team convened the Global Herbicide Resistance Challenge conference in Western Australia last year.

Ian Heap opened the conference and is the Director of the International Survey of Herbicide Resistant Weeds. This international survey tells us;

- There are 220 weed species that have evolved resistance to one or more herbicides.
- There are 404 unique cases (species x site of action) of herbicide resistant weeds globally.
- ALS inhibitors (eg. SU herbicides) account for about a third of all cases (133/404).
- There are 24 species with confirmed glyphosate resistance (and counting). Sixteen of these were found in Roundup Ready cropping systems.

Figure 1 is a very steep curve! Only a true optimist would suggest that it is flattening in any way.

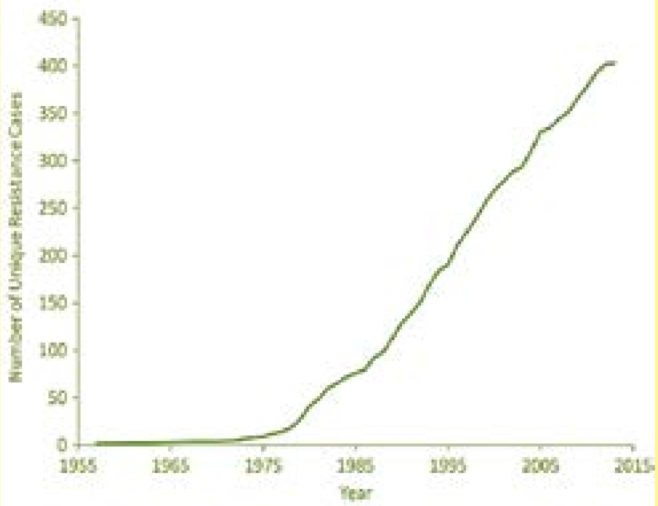
The USA is leading the charge in developing herbicide resistant weeds with Canada, Australia, China, Brazil and Western Europe not too far behind. The world map below really does show that herbicide resistance is a global challenge and is endemic in all cropping regions.

Global colour coded map of herbicide resistance.

Annual ryegrass – the world champion

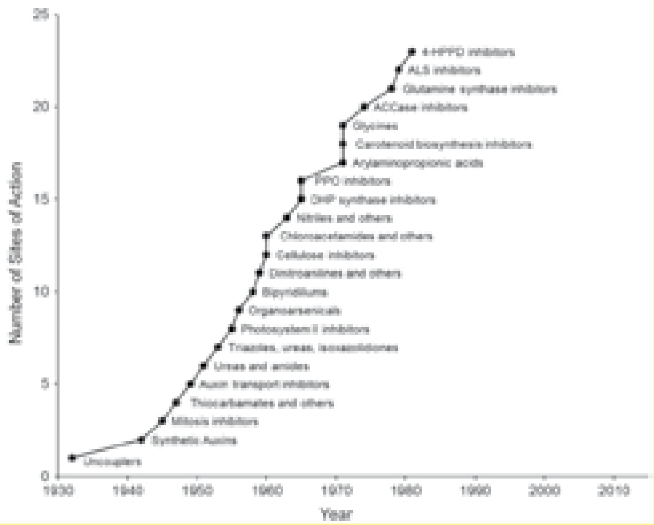
Annual ryegrass *(Lolium rigidum)* is the world's worst herbicide resistant weed, having evolved resistance to 11 herbicide sites of action, in 12 countries, over millions of hectares. Annual ryegrass has a high degree of genetic variability and rapidly evolves resistance to almost any herbicide that it is exposed to. It is particularly troublesome because it often evolves cross-resistance (both target site and non-target site) and rapidly evolves multiple resistance to a wide array of herbicides through outcrossing.

FIGURE 1: Chronological increase in the number of herbicide-resistant weeds worldwide



Reproduced from Heap IM, International Survey of Herbicide-Resistant Weeds (2013).

FIGURE 2: Chronological increase in the number of commercially available herbicide sites of action



No new herbicide sites of action in 30 years

For more than 40 years farmers have coped with herbicide resistant weeds because the industry provided them with a relatively steady stream of new herbicides with novel herbicide sites of action. This is no longer the case. Industry has not brought a novel herbicide to market in over 30 years.

Thinking globally


Professor Stephen Powles.

"Agricultural productivity and sustainability, especially for the major field grain crops (wheat, rice, maize, soybean, canola) is essential to feed our exploding global human population," Stephen Bowles says. "Only grains can be stored and globally transported at quantities that satisfy world food needs. Of the challenges to world food security, crop-infesting weeds are the biggest biotic threat. Crop weeds infest almost every crop field almost every year and they must be controlled to protect current and future harvests.

"For the past 65 years, chemical herbicides have made a major contribution to world food supply by reliably and economically controlling weeds in global crops. But the many advantages of herbicides have resulted in over-reliance on herbicide technology in field crops and many other crops and situations. Herbicide selection persistently applied to huge weed populations over vast areas without diversity has inevitably resulted in the evolution of herbicide-resistant weed populations.

"Indeed, weed herbicide resistance evolution is a stark example of rapid evolution, with major negative consequences. Now, herbicide-resistant weeds, particularly in major field crops, are a widespread problem and a significant challenge to global food security." Stephen says.

Acting locally

Grain growers worldwide must have profitable cropping as their number one priority. Our mantra at AHRI is 'More crop, less weeds – sustainably'. We very deliberately put 'more crop' first. More crop means maintaining or increasing crop area (without clearing more land) while increasing yield/profit.

More than 65 years of intensive herbicide use has created this global problem. While we believe that herbicides will continue to be a major form of weed control, it is quite clear that herbicides alone will fail.

Many grain growers are having a win in the battle against herbicide resistant weeds through using a diverse range of tools and never missing an opportunity to minimise the weed seed bank. We believe that the answer to the global herbicide resistance challenge is to use a combination of new technology along with communicating grower success stories to continually achieve more crop, less weeds – sustainably.

"It is not going to be easy, but in the interest of the global food supply, we have no other choice," Stephen warns. ■


Annual ryegrass is the world's worst herbicide-resistant weed.

Time to consider off-header seed treatment

According to Superior Seed Co Director Ian Lea, even coverage, ease of application and no dust at seeding are key features of Syngenta's cereal seed treatment, Vibrance.

WITH harvest approaching, growers are beginning to consider off-header seed treatments for farmer retained seed.

Industry practice has long moved beyond just cleaning and grading and now growers and consultants consider what seed treatments will deliver the most benefit for the following season.

According to Deniliquin-based Director of Superior Seed Co, Ian Lea, grower and industry approval of Syngenta's fungicide seed treatment Vibrance has been exceptional.

Driven by high demand, in 2013–14 Ian's business treated more than 1600 tonnes of seed at the 1.8 L per tonne rate for pythium root rot, smuts and bunts, and a significant amount of seed at 3.6 L per tonne for rhizoctonia.

"With any seed treatment we apply, complete coverage is essential to achieve the desired level of disease control or suppression," Ian said. "We've found Vibrance very easy to use with our machinery."

Vibrance is a unique combination of three Modes of Action (MoA) for the control of pythium root rot, a range of smuts and bunts and suppression of rhizoctonia in wheat, triticale, barley and oats. It also controls seed-borne net blotch in barley.

Vibrance works by moving into the soil surrounding the seed, providing a protective barrier against pathogens for both the seed and the developing root system.

"As our standard recommendation for wheat and barley, Vibrance is applied as water-based slurry and its ease of use and ability to cover the seed effectively is very exciting.

"It's easy to calibrate, doesn't produce dust at seeding and gives consistent and even seed coverage to achieve disease protection."

Vibrance can be used with Emerge insecticide seed treatment in cereals to control feeding damage caused by wheat aphids and corn aphids and the spread of barley yellow dwarf virus. ■

A key feature of Vibrance is its consistent and even coverage.

Research reveals the truth about spray drift

COLLABORATIVE research into the problem of spray drift has begun delivering practical insights into how spray nozzle and adjuvant choices can affect droplet size.

Initiated in 2006 by Vicchem, Australian pioneer of adjuvant technology, the project is a collaboration involving Dr Andrew Hewitt of Queensland University and a leading agribusiness distributor in the US.

According to Vicchem technical manager, Peter Jones, the research is helping reveal the truth about spray drift which can lead to expensive litigation and even calls to restrict or ban the use of certain chemicals.

"Our research shows a significant variation in particle size and distribution among the adjuvants commonly used to enhance crop protection," said Peter from Coolaroo, Victoria.

"We've observed that wetting agents such as BS1000* and Deluge 1000 generally produce smaller droplets while LI-700* and VC-700 increases droplet size.

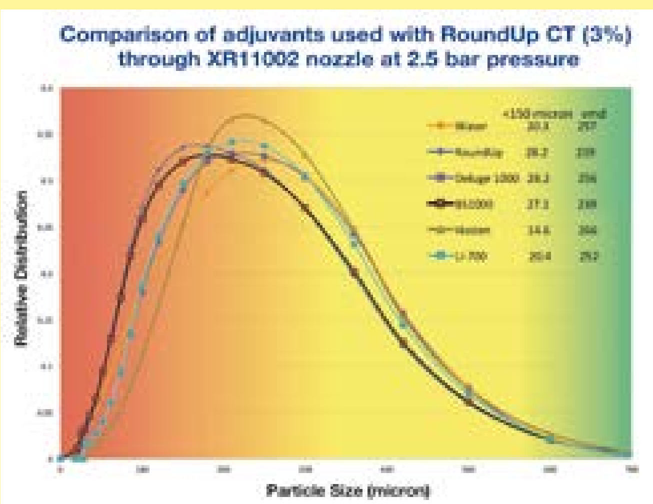
"Encouragingly, our oil-based adjuvant Hasten increases droplet size and produces one of the lowest proportions of small driftable particles (less than 150 micron)."

While the data on product performance is informative, Peter urged farmers and crop advisors not to rely solely on adjuvant choice to manage drift problems as its role in the whole drift equation was relatively small.

"Our research shows that selection of nozzle type and size has a far greater impact on droplet size which can range from very fine to very coarse depending on the combination chosen. It's a much bigger determinant of droplet size than adjuvant type.

"Of course, climatic conditions including wind speed and direction obviously have the largest bearing on spray drift and the potential for negative off-target effects."

FIGURE 1: The graph shows adjuvant choice can influence the droplet size when added to solution containing the herbicide RoundUp* CT



While wetting agents such as BS1000 and Deluge 1000 produce smaller droplets and LI-700 has the effect of increasing droplet size, oil-based Hasten increases droplet size and produces the least proportion of small driftable particles (<150 micron).

Peter said the trial was initiated in response to industry demand for greater understanding of droplet size and its role in spray drift, particularly from Vicchem's reseller partners and their farmer customers.

"This project is a credible way of testing the veracity of the many claims made by manufacturers – as well as our own claims – which has become more important with the rising influx of generic imports.

"As a market leader, we feel it's our responsibility to be at the forefront of technical knowledge with all claims backed by sound science.

"Future research will focus on the effect different adjuvants may have on beneficial insects. Aquatic toxicity is another interesting area, because while adjuvants generally appear to present few environmental concerns, that's not to say there aren't stewardship issues that could be addressed."

Peter said that while Vicchem's research aimed to be economically beneficial, it was often a lengthy process of exploring and refining in order to develop the right chemistry for a breakthrough that benefits the industry.

***Third party trademarks.** ■

Vicchem technical manager, Peter Jones, with research chemist, John Morrison, in the laboratory at Coolaroo, Victoria.

New 524 hp tractor unveiled

NORTHERN NSW producers will be the first in Australia to see the new Claas Xerion 5000, the iconic German manufacturer's first entry in the 500+ hp tractor category.

Boasting permanent all-wheel drive, all-wheel steering, continuously variable transmission, cab suspension and advanced operating systems as standard, the Xerion becomes the new flagship of the rapidly expanding Claas tractor range.

Best known as a global leader in harvesting technology, Claas has burst into the Australian tractor market over the past five years with the release of more than 40 different models across four ranges.

They include the all-new Axion 900 (320 to 400 hp), Axion 800 (210 to 270 hp) and Arion 600/500 (145 to 184 hp) series.

James Moss, Product Manager for Axion/Xerion says the Xerion 5000 has been specifically configured to meet the demand for high horsepower drawbar tractors.

"The Xerion 3800 VC multi-purpose tractor, with its unique 180 degree rotating cab, has been a drawcard at Australian field days for the past five years," he says.

"But this latest release has been tailored to make the Xerion more specific to broadacre applications."

Australian configuration

The Australian configuration is offered with a fixed cabin, 2.5 tonne front ballast, 2.5 tonne chassis-mounted ballast, rear PTO, heavy-duty drawbar, air compressor and dual 710/70 R42 tyres all-round.

"Compared to 4x4 articulated tractors, the Xerion 5000 is considerably more comfortable, more fuel efficient, and more manoeuvrable," James says.

"This is the only 500+ hp tractor with a continuously variable transmission as standard and it's the only one with transport speeds of up to 50 km/h."

James, who has spent the past five years as a service technician and technical services manager with Claas in both the UK and Australia, recently supervised a field evaluation program in northern NSW.

"We've put the Xerion through its paces in a variety of broadacre and row cropping situations and we've been extremely impressed with its performance," he says.

"In two sowing demonstrations, fuel consumption was about 20 per cent less than the farmers' existing tractors.

"The CVT means we can set the engine to run at its peak torque – about 1600 rpm – and the transmission then finds the optimum gear combination to maintain the desired ground speed from 50 metres per hour right through to 50 km/h.

"And because Claas is not committed to specific component manufacturers, it is free to consider which technology is best suited for that application."

Xerion features a full chassis frame, with the 12.5 litre six-cylinder Caterpillar C13 engine and ZF Eccom 5.0 continuously variable transmission mounted as non-load bearing modules.

"This Stage IIIA (Tier 3) engine produces full power on demand, even at low engine speeds, and has remarkable fuel efficiency," James says.

"It incorporates an adjustable hydraulic fan that automatically adjusts the fan speed according to the engine temperature – it is also reversible to allow for on the move cleaning"

"The radiator can be cleaned at any time by pushing a button in the cab."

Xerion utilises the same spacious cabin and operating systems found on Lexion combine harvesters and Jaguar forage harvesters.

"Anyone who is familiar with this cabin will tell you how quiet and comfortable it is," James says.

Xerion features the intuitive Claas electronic on-board information system (CEBIS). "This is the same technology found on Lexion and Jaguar harvesters and Axion and Arion advanced technology tractors, so operators can now move from one machine to the other without having to think about how to operate it," James says.

The Xerion 5000 made its Australian debut at the AgQuip field days in August. ■

The new Claas Xerion 5000 being put through its paces with a 36.5 m (120 foot) Janke Universal airseeder.

Skilled, short term harvest labour available now!

THE-GATE farm labour placement service is into its second season and has a number of skilled young workers available now for the busy winter crop harvest period. But be quick, as these skilled farm workers – many of them with header driving and chaser bin experience – are in high demand.

The-Gate.com.au is essentially a meeting place for young international visitors with farming backgrounds, and Australian farmers looking to fill short term labour needs.

Both workers and employers register (for free) on The-Gate.com.au website and complete a simple 5 minute online form. The skills and availability etc of the workers are then 'matched' with the needs of the employer. Catherine O'Connell from The-Gate will then make direct contact with potential 'matching' employers and workers.

A profile of the workers' skills, machinery and general on-farm experience is provided (see examples below). The English language skills of the worker is also indicated but all applicants have at least basic and functional English. In most cases, references are also provided and checked by The-Gate's Soenke Rabe in Germany.

All work arrangements including wages, hours, keep, WHS and accommodation etc are arrived at through direct email or phone contact between the employer and worker. The-Gate simply introduces the matching parties. In the event of a worker being employed, a small sliding scale placement fee is payable by the employer to The-Gate. For a work period of 4 weeks or less, the placement fee is $352 and is capped at $880 for a job lasting 16 weeks or more (see www.the-gate.com.au for more details).

Lukas Berwinkel from Germany enjoying a quick meal break with his 2013 harvest employer, Victorian Mallee farmer, Cameron Ferrier. Lukas is typical of the skilled workers filling short term labour needs via The-Gate's placement service.

Some profiles of workers available now

- Name: Joern, 21 y/o German with good English skills.
  Can start early October and available for up to 3 months.
  Excellent combine and tractor skills, also with truck experience. Harvesters driven: Claas Lexion 460 (2 harvests), New Holland CX 880. Has worked with GPS technology. References available.
- Name: Bernd, 26 y/o German with good English skills (has also worked in Canada).
  Can start early October and available for up to 6 months; Excellent tractor skills, good on a boom spray and has experience with combines and trucks. References available.

To register your interest go to www.the-gate.com.au or call 0408 717 459 ■

Portable grain analyser

PERTEN NIR whole grain analysers and falling number test gear have been a feature at large grain storage sites and grain processors for years.

Now, Perten has developed a low cost, portable on-farm whole grain NIR unit developed for Australian conditions, in partnership with Grain Growers Ltd.

The Inframatic 8800 includes many unique design features. It is highly portable, compact, lightweight and can be operated for up to two hours on its internal battery.

It can be fitted with a GPS receiver, to enable growers to identify variations in protein levels across individual paddocks. Results can be plotted on a map to plan harvest and binning strategies.

The rapid analysis (moisture and protein results in less than 40 seconds for wheat, barley and sorghum along with oil in canola) enables users to control grain drying, perform paddock and load-out spot checks, and determine optimal harvest times.

What our customers have to say

Nick Eckermann, Beelbangara, NSW: "The IM8800 allows you to make quick decisions during harvest (either to store on-farm or deliver to the local receival silo). Portability of the IM8800 is good and a very important feature."

Trevor De Landgrafft, Ravensthorpe, WA: "The speed of the unit makes it very handy. It is compact and easy to use."

Matt Lane, Milbrulong, NSW: "Anyone using Silobags (on-farm storage) needs an Inframatic 8800."

Call Perten Instruments on Ph: 02 9870 3400 or go to www.perten.com ■

Highest powered CR combine harvester ever built

NEW Holland's all-new CR10.90 combine raises harvesting to a whole new level – delivering up to 15 per cent more productivity in small grains combined with grain crackage as low as 0.2 per cent and the ultimate in operator comfort with the Harvest Suite Ultra cab. The range topping CR10.90 is the first combine to enter the class 10 segment in the world and is the most powerful CR ever produced, delivering the highest capacity in the industry and truly outstanding performance.

"The new CR10.90 is the culmination of 40 years of Twin Rotor technology," says Simon Vigour, Brand Leader for New Holland in Australia. "It offers the best of New Holland's harvesting technologies: the exclusive Twin Pitch Rotor system, Dynamic Feed Roll, SmartTrax rubber tracks with Terraglide suspension and Hi-eSCR engine technology – all working together to deliver the very best performance. All this is coupled with the Harvest Suite Ultra cab that redefines harvesting comfort. And with the capacity and performance of the CR10.90, you enter an entirely new harvesting dimension. You couldn't ask for more."

Proven technologies deliver more capacity

New Holland continues to improve and refine its proven Twin Rotor technology, which is designed for high capacity harvesting and delivers high outputs combined with grain quality without equal.

CR combines work seamlessly in variable crop conditions.

The new Dynamic Feed Roll on-the-go mechanical stone protection system further raises the CR10.90's massive capacity by feeding the rotors faster and more smoothly while removing stones with no stopping or hesitation. The serrated blades on the roll are gentle on the crop, maintaining high-quality straw. This is achieved with no additional power consumption, resulting in higher capacity.

CR combines work seamlessly in variable crop conditions with the Twin-Pitch rotors, which can raise productivity by up to 10 per cent in damp conditions. Switching between small grain and corn configurations to rice is easy. The redesigned adjustable rotor vanes require less power in high volume crops and consistently deliver high quality straw.

The SmartTrax rubber tracks with Terraglide suspension system is available on the flagship CR10.90 – and will also be available on the other models within the CR range – ensure excellent traction and low soil compaction while providing a silky smooth ride.

Increasing productivity by up to 15 per cent

The CR combines offer more horsepower than ever: from 449 hp of the CR7.90 to the massive 652 hp of the flagship CR10.90. Three models feature New Holland's Tier 4A ECOBlue SCR technology, while the flagship CR10.90 is equipped with the Diesel Engine of the Year 2014 Cursor 16 with ECOBlue Hi-eSCR technology. The engine features Common Rail technology for precise fuelling and outstandingly responsive performance, resulting in consistently high productivity in all field conditions.

The grain tank's high capacity – ranging from 11,500 litres in the CR7.90 to 14,500 litres in the CR10.90 – combined with the lightning fast unloading speed of up to 142 litres/second for the CR10.90 and the extensive autonomy mean that no second is wasted during the day – productivity soars by 15 per cent.

The extra-long 10-metre folding unloading auger on the flagship model is a match for the largest headers and tallest trailers.

Designed for ultimate harvesting comfort

The brand new Harvest Suite Ultra cab is larger and offers more glass area than previous models. Designed in consultation with customers, the new cab is larger than its predecessor, and the interior layout has been entirely redesigned to further improve ergonomics and comfort.

The ultra-wide 26.4 cm IntelliView IV colour touchscreen monitor puts all key parameters at the operator's fingertips and is fixed on rollers so that it can be moved to the most comfortable position. An optional second IntelliView display is available for operators requiring the maximum of information for mapping.

The 6.3 m^2 of glazed area, together with the floor sloping down into the front windscreen, provide excellent visibility all round and a clear view of the edge of the header.

When harvesting continues into the night, the lighting package is precision engineered to ensure perfect visibility of the entire header and the field ahead. Standard on the CR10.90 for Australia will be both HID and LED packages, with exceptional long distance working lights offering up to 500 m visibility. ■

District Reports…

September–October 2014

Western region

STATE SUMMARY

Average to below average rainfall across the Western Australian grain belt in August resulted in a downgrading of the expected total WA grain harvest, with a wide variation between the Port Zones.

In the Geraldton port zone, August rainfall was well below average and was accompanied by very warm temperatures. This caused yield potential to fall away to below average in all districts other than near the west coast. The coastal districts are still in very good condition with above average yield potential.

There is a similar position in the Kwinana zone with crops in the eastern districts now only likely to have below average yields while crops in the western parts have maintained average potential. In the south and south west districts of the Zone, yield potential looks to be similar to the record yields seen in 2013.

The entire Albany port zone was in very good condition during August with average rainfall in the Lakes districts and above average rainfall in Great Southern districts. Critically, after a lengthy dry spell, crops started to grow strongly taking advantage of plentiful soil moisture levels.

The Esperance zone was very dry and very warm during August. But late August rainfall of around 25 mm across the region recovered the situation somewhat but the yield potential is still below average. There is no deep soil moisture and further substantial rainfall events will be needed to lift yield and grain quality.

Budworm required control in districts north of Carnamah and north of Great Eastern Highway in canola and lupin crops. Sclerotinia in canola required control in west coastal districts. Some aphid control has been necessary in west coastal districts.

The very good 2013 season laid the foundation for disease issues – such as anthracnose in lupin and yellow spot in wheat – but the dry winter minimised the effects of these diseases.

By early September, the 2014 state winter crop production forecast was lowered by 1.26 million tonnes compared to the forecast a month earlier, due to the dry August. Realising the

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)	2014 rainfall to date (mm)	Summer		Autumn		Winter		Spring	
			25yr Annual Average (mm)	2013–14	25yr Annual Average (mm)	2014	25yr Annual Average (mm)	2014	25yr Annual Average (mm)	2014 to date
Emerald Qld	554	246	250	126	118	95	61	36	120	5
Toowoomba Qld	673	326	281	64	134	233	82	69	179	1
Roma Qld	590	300	248	96	135	121	73	87	137	4
Goondiwindi Qld	619	293	251	79	133	164	97	72	139	0
Narrabri NSW	642	353	228	57	125	200	128	110	162	0
Gunnedah NSW	665	394	242	66	122	205	130	140	178	2
Dubbo NSW	611	460	200	148	136	227	127	129	153	3
West Wyalong NSW	446	330	117	66	90	173	117	108	126	1
Wagga Wagga NSW	545	350	133	83	121	164	152	123	144	2
Swan Hill Vic	327	223	73	70	66	133	92	46	96	12
Bendigo Vic	524	358	110	59	105	177	171	155	138	14
Horsham Vic	392	218	77	27	71	98	135	90	110	10
Lake Bolac Vic	537	292	119	51	101	101	163	144	153	18
Murray Bridge SA	370	303	64	109	77	89	130	111	101	12
Kadina SA	345	290	55	74	77	132	123	94	90	15
Cummins SA	394	389	48	93	86	96	177	209	84	7
Esperance WA	623	387	80	42	145	121	255	242	143	11
Wagin WA	405	245	49	2	96	96	171	136	89	13
Northam WA	402	323	45	7	84	127	190	173	84	20
Mingenew WA	368	192	32	12	92	102	176	79	65	0
Moora WA	389	195	45	0	89	36	183	140	73	20
Mullewa WA	320	219	50	28	90	136	134	56	47	15

Last rainfall reading September 9, 2014.

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September GIWA forecast of just over 13.5 million tonnes of winter crop for WA, will depend on at least average spring rainfall and minimal frost events in southern districts.

Grain Industry Association of WA (GIWA)
September 4, 20144

SOUTH COAST

Season conditions on the South Coast continue to be very dry, luckily July rainfall was reasonable because August was on track to be one of the driest on record, fortunately this changed during the last few days of August with some desperately needed rain.

Most of the region is tracking on Decile 1 to 2, remarkably most crops still look quite reasonable but they have very little stored soil moisture in reserve. Spring rainfall needs to be at least average to maintain what yield potential is there.

With the extended dry conditions many growers have been able to reduce input costs by reassessing top up nitrogen and even foliar fungicides, fortunately there continues to be no major agronomic problems which has kept the 2014 season relatively easy to manage to date.

Quenten Knight,
Agronomist, Precision Agronomics Australia
August 31, 2014

Southern region

SOUTH AUSTRALIA

Weather

Rainfall for July ranged from below average in the Upper North and Murray Mallee areas to above average in the Lower Murray, Far West and Central Eyre Peninsula.

August rainfall was below to very much below average across the state with some areas on Eyre Peninsula receiving their lowest August rainfall totals on record.

Mean maximum temperatures were near average in the cropping areas of the state during July and above average during August.

Mean minimum temperatures were below to very much below average (1°C to 4°C) during August. Areas on Upper Eyre Peninsula, Upper and Mid North and the Northern Mallee had their lowest minimum mean August temperatures on record.

Growing season rainfall (April to August) was average to above average in most of the state. Although areas of eastern Kangaroo Island and the Upper South East had below average growing season rainfall to the end of August.

Crops

The cold, frosty conditions during August slowed crop growth but most crops were still more advanced than normal for that time of the year.

Widespread, severe frosts have caused significant damage to crops from Penong in the west to Pinnaroo in the east.

The crop production estimate of 7.6 million tonnes has a higher degree of uncertainty than normal due to a greater dependence on weather conditions in spring and how much yield potential frosted crops are able to recover.

The Northern Mallee appears to be the worst affected by frost with estimated losses of 30 to 40 per cent, while in other districts including Upper Eyre Peninsula, Upper and Mid North, Northern Yorke Peninsula and the Southern Mallee, losses are estimated at 5 to 10 per cent.

Early-sown crops (sown before April 20) have been the worst affected, with yield losses of 80 per cent or more.

In the Upper and Mid North and Northern Mallee where frost was very severe, wheat crops have been damaged from early stem elongation to head emergence growth stages. Early-sown oaten hay, pea and lupin crops have also been severely damaged.

Canola and later-sown pea crops have lost some flowers and pods but have continued to flower, lessening yield losses.

Barley crops have suffered some frost damage but yield losses are likely to be relatively low.

Only a small area of frosted crop has been cut for hay with some growers turning livestock onto severely damaged crops. Most frosted crops will be kept for grain harvest due to the patchy nature of the frost damage.

Some crops on shallow, heavy soils on Upper Eyre Peninsula, Upper North and the Mallee were beginning to show signs of moisture stress towards the end of August.

Canola crops affected by Beet Western Yellows virus early in the season have only partially recovered and the yield and grain quality of these crops will be poor. Fortunately the damage has been limited to only a small number of crops in most districts and the spread of the virus to other crops has been limited.

Peach green aphid numbers have been dramatically reduced by the cold weather and have not yet built up again in most districts. Aphid numbers in crops are being closely monitored.

The dry August slowed the development of foliar diseases with only low levels of stripe rust and net form of net blotch being reported. Most growers have been applying fungicide sprays on susceptible varieties.

The level of disease in pulse crops is also relatively low as a result of the dry conditions.

Diamond back moth larvae are beginning to build up in canola crops in a number of districts and these will need to be managed to avoid significant damage.

Native budworm numbers increased in the last few weeks of August and growers had begun controlling this pest in pulse crops.

There were reports of mice damage on Upper Eyre Peninsula and Yorke Peninsula with some baiting occurring in late July and early August.

Pastures

Pasture growth slowed with the cold weather and frost during August. But in most areas of the state there is still a high amount of quality pasture feed. In the South East, pasture growth has been slow and pasture availability is limited.

Insect damage and fungal diseases have slowed the growth of pastures in some districts.

Some early-sown crops and medic were cut for hay in late August.

Some frosted crops are being grazed.

PIRSA Crop and Pasture Report
September, 2014

MALLEE

After a great start to the season, yield potential in the Victorian Mallee has plummeted due to a zero rainfall month in August. Current growing season rainfall (GSR) deciles range from 2 in Birchip (southern Mallee) to 6 in Swan Hill (central Mallee) where excellent early season rainfall occurred. Limited moisture combined with several frost events have caused crops to suffer greatly. In early August, crop water use and evaporation equated to 2 mm of water used per day.

There were 10 nights in August, where night time temperatures fell below 0°C, while in July the temperature fell below 0°C eight times. It is not just the absolute minimum temperature, but also the duration of the frost events that have caused significant stem and head frost damage to crops. It is very unusual for a stem frost to occur at such an early crop stage (GS31 and 32).

Even though an El Niño is still forecast, the topic of early

District Reports…

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versus late sowing time will be one debated keenly this year, particularly if a late rain does arrive as this year later sown crops may have greater potential than those sown early. But there is still a long way to go. A number of crops are being brown manured and or cut for hay, which is early, but given the conditions the crops should cure.

We are at the beginning of the field day season and even if crops don't look fantastic, these events provide a great opportunity for growers get off the farm and to learn a few tricks of the trade from others.

De-Anne Ferrier
BCG Research & Extension Officer, Birchip
September 4, 2014

Northern region

DARLING DOWNS

Winter crop

August brought mixed amounts of rain, but at least it was some rain. Amounts varied between 20 and 60 mm, which has certainly picked up the winter crops with many paddocks now looking good. But possible damage from the frosts around at the time of writing this report will not be known for about 10 days.

This photo was taken in early spring and the Darling Downs was producing some very nice looking chickpea crops.

During September, there were only a few paddocks of chickpeas infected with ascochyta on the Darling Downs. But crops in the Central West of NSW were under heavy pressure from the disease.

Barley is breaking boot to grain fill. The early sown crops had some net blotch and a little powdery mildew, whilst the later sown crops have remained disease free so far. Wheat is moving towards head emergence, but there are plenty of crops planted later that are now putting down secondary roots.

Chickpeas range from pre flowering to early pod fill, and west of Dalby the crops look magnificent but are more mixed to the east of Dalby having suffered from the cold and dry conditions earlier. Ascochyta has been found in a few crops and treated, and on the pest front some paddocks have armyworms in low numbers, there are some mice around, heliothis have appeared in some early crops and wild pigs are still causing damage on the Eastern Downs.

Overall the yields should be fair to good, but no better than that because of the frosts and dry conditions. All the winter crop should respond to the moisture once the night time temperatures pick up.

Darling Downs chickpea growers have major problems controlling buckwheat because of a lack of effective registered herbicides.

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Summer crop

There will be an increased plant of summer crop this season as a number of winter crop paddocks were never sown, missing out on planting rain. But the mix of summer crops is changing this year. The lack of water in irrigation storages coupled with a less than robust outlook for the cotton price is causing a number of growers to move away from cotton this summer, and the area may be only 50 per cent of last year's.

West of Dalby the corn area is expected to double while to the east remaining stable. The sorghum area will see a big increase – maybe by 50 per cent – and early crops are already being planted as growers take advantage of the August rainfalls.

Sunflowers are offering some strong prices and thus gross margins, and there is an increase in the spring planted area, mostly to mono varieties, in the traditional areas. There is also some interest in spring mungbeans, again because of higher than usual prices. Millet seed is short and there is early interest there.

The trend over the past 30 plus years has been for the spring rain to be close to its long term average, but the summer rain (January to March) appears to be dropping well below the average, so there is more interest in spring planting with moisture being available

But in the summer we do anticipate a good planting of soyabeans and mungbeans, along with late corn and sorghum.

Hugh Reardon-Smith
Agronomist, Landmark Pittsworth
September 4, 2014

WESTERN DOWNS

This winter crop has proven to be difficult and vastly different to the norm. Unusual warm weather early in the crops life followed by a series of relentless frosts has upset the standard growing season.

Many crops are ahead of schedule with some wheat turning and some early barley almost ready for the header.

With little rain after planting until recently, many crops have struggled through with some hanging on better than others. The late rain will help crops fill grain, but it would have been better to see that rain earlier to set crops up with a better potential.

Frosts have knocked around chickpeas with flowers lost and some pod damage noted from a light frost last week.

Any canola was also knocked around from earlier frosts causing fair amounts of loss.

For the wheat and barley, dry weather has been the main factor in crop loss with drought tipping occurring. An eye should also be kept out for armyworm in barley with numbers occurring in the area.

Most chickpea's have had an early spray for helicoverpa setting up the potential need for a second spray, however a second influx of grubs has not been seen yet.

We now look forward to summer cropping with sorghum expected to start being planted soon, moisture permitting.

Nikolaus Fritz
Agronomy – Landmark, Miles
September 8, 2014

SOUTH BURNETT

Key issues

- Late August rain very timely.
- Dry weatrher had a significant effect on many crops.
- Significant winter crop areas not planted.
- Some frosted crops silage or hayed.
- A few crops hail damaged.

2014 has not really improved for South Burnett farmers through their winter crop.

The planted area was significantly down and the dry weather affected many crops on light soils and double cropped areas.

The rain in mid August improved crop potential with falls of around 40 to 50 mm for the month. It also allowed some land preparation to start for summer crops.

A few armyworms and heliothis are present in barley crops.

Summer crop planting options are still uncertain for many growers. Cash is very short and growers are looking to grow low cost crops this season. At this stage there will be a switch from corn to sorghum with a number of growers considering millet.

Very difficult to find any good news stories and grower optimism is at an all time low.

Ian Crosthwaite
Agronomist
BGA AgriServices, Kingaroy
September 3, 2014

District Reports…

September–October 2014

CENTRAL QUEENSLAND

Weather

Rainfall: Most of Central Queensland grain growing areas received about 20–30 mm of rain during August with only a few areas doing better including a few properties around Jambin which measured as much as 70 mm.

All districts have experienced well above average number of frost this winter but it is still too early to assess damage done to wheat and chickpea crops.

Summer crop

Sorghum: Harvest of the later planted CQ sorghum crop (planted February 2014, about 50,000 hectares) is all but complete with only a few paddocks still to be harvested. The earlier planted crop (planted January 2014, around 30,000 hectares) generally achieved moderate yields, (2.5–3.0 tonnes per hectare), and some excellent prices, (about $300 per tonne delivered port). The best yielding districts were Capella and Dysart with a few exceptional crops (over 5 tonnes per hectare) but there were also plenty of drier paddocks across CQ with lower yielding crops (below 1 tonne per hectare).

Winter crop

Wheat and chickpea: Wheat planting began in the second week of April and continued through to mid-May. Most paddocks were planted on marginal moisture (1/3–2/3 plant available water) and many had less. Rain that fell on June 14 was sufficient only in the wetter paddocks to develop secondary roots, which assisted crops to stand at harvest but was a long way short of adding yield. Rain in mid-August was too late to benefit most crops. Dry conditions and unseasonal warm weather during May-June resulted in many crops going to head early resulting in an early start for wheat harvest. I estimate about 130,000 hectares of wheat and 35,000 hectares of chickpea was planted with about 2/3 of the chickpea crop north of Emerald and 1/3 (10,000–15,000 hectares) south of Emerald and in the Dawson/Callide.

Chickpea was planted later, (early to mid-May) and has handled the dry conditions better. There were reports of stem frost damage in wheat in the Callide and chickpea pods and flowers lost as a result of frost in the Dawson and central highlands but for most farmers, drought will be the biggest limitation to yield. Average yields in wheat crops in CQ will be low (about 1.02 tonnes per hectare) with many paddocks yielding less. Chickpea harvest will start in two to three weeks.

Livestock and pastures: All pastures are grazed short. Local cattle are generally in store condition with some poorer.

Water: The Fairbairn dam is currently at 47 per cent capacity or 616,000 mL. Most on-farm water storages are empty. Unless there is unseasonal river flows before spring there will be no irrigation on farms relying on rivers for irrigation. Pre-watering for cotton planting in the Emerald irrigation area has begun.

Overland water flow is not normally expected until mid-summer so surface water will continue to be an issue for many graziers.

Maurice Conway
Department of Agriculture, Fisheries & Forestry
Emerald, Queensland
September 3, 2014

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