AUSTRALIAN GRAIN

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FRONT COVER

Thanks Hughie: Enough is enough!

David Large from Jerdacuttup, 140 km west of Esperance WA, inspecting his waterlogged Mace wheat crop. Like the rain, records have tumbled in many parts of the national grain belt with some unprecedented Growing Season Rainfall totals. A huge winter crop harvest is forecast and summer crop planting conditions are excellent.
(PHOTO: Quenten Knight)

Contents

Focus Sections

Southern Australia Focus

Covering cropping systems of Southern NSW, Victoria, South Australia, Western Australia and Tasmania

Northern Focus

Covering Northern NSW and Queensland

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Editorial... Lloyd O'Connell

IN mid-September our official commodity forecaster ABARES, was estimating a record national winter crop harvest of around 46 million tonnes – a number we've never reached before and a production level 16 per cent better than last season. This was on the back of generally wonderful growing conditions during the winter months with rain falling pretty much on cue. Of course, there's always a bit of a catch – some might say, a cruel twist – with this farming game.

Spring arrived with a continuation of the widespread rainfall but unfortunately, some damaging late September frosts also made an appearance wiping a still unknown, but significant, amount of dollars off the value of crops in some districts – particularly in Western Australia. The continually moist conditions have also been the perfect breeding ground for plant diseases.

Many growers in the southeast corner of the continent, and in parts of WA, are very cautiously (for fear of offending him) sending Hughie a message that enough just might be enough in terms of rainfall for this winter crop season.

It's anyone's guess as to how close the nation comes to ABARES' record winter grain production forecast, but there's no doubt this will be a huge year. Wheat production should be in excess of 25 mt, with barley approaching 10 mt while canola is pushing better than 3.5 mt – all results giving these crops a 'top 3 best ever' ranking.

Summer crop planting under ideal conditions

Given the magnificent soil moisture levels and across the board improvements in irrigation water allocations, the spring and summer crop planting area will also increase markedly on last year.

ABARES expects around a 20 per cent increase to 1.4 million hectares. Forecast increases in the area planted to rice and cotton in 2016–17 are expected to more than offset a price-driven fall in sorghum area.

With a continuation of favourable conditions, a total summer crop production pushing 5 mt is very much in our sights.

This all sounds fantastic – it's just a pity about the value of our grain products. While most pulses are attracting good prices and oilseeds are holding up, our wheat and coarse grains are under pressure from record global stock levels. Unfortunately, it's not just Australia producing massive crops so it's going to take a supply-side hiccup somewhere – and preferably not from us – to tilt the global grain balance sheet in favour of farmers.

Understandably there is a lot of activity at the moment beefing up on-farm grain storage capacity. Growers are hoping for that supply hiccup to happen – and somewhere else – not too far down the track. There are a lot of analysts estimating that around 50 per cent of the eastern seaboard harvest can already be stored on-farm.

The impact this has on domestic grain prices this harvest will be interesting.

Greenmount Travel destinations for 2017

After a very busy year of very out-there travel, *Greenmount Travel* has started to put together a short list of destinations for 2017. Visit www.greenmounttravel.com.au to see what's on the radar or feel free to throw your own two bob's worth in by suggesting a destination or two.

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In this issue...

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Careful consideration needed with yellow spot sprays

ALL that is yellow in crops may not be as it seems and when it comes to making a decision to spray wheat for yellow spot – correct diagnosis of the disease is critical and can help growers save unnecessary expense on fungicide applications.

NSW Department of Primary Industries (DPI) senior plant pathologist, Steven Simpfendorfer, said yellow spot *(Pyrenophora tritici-repentis)* was often misdiagnosed and blames much of the confusion on its common name.

"In the past, the use of the word 'yellow' in naming the disease has meant some growers and advisers have assumed that any yellow discolouration in a wheat crop – whether it was associated with a spot or not – must be the leaf disease yellow spot and should be sprayed with a fungicide," Steven said.

"We have seen fungicides applied to yellowing wheat crops, which are more characteristic of nitrogen deficiency, especially in waterlogged crops, or herbicide phytotoxicity, which can be caused by herbicide tank mixes and when applications coincide with frost events.

"Given the tendency for misdiagnosis, if you think you have yellow spot there are some simple checks that should be undertaken before applying any fungicide.

Simple checks

"First, check wheat stubble in the paddock for black fruiting bodies (pseudothecia), then check the current wheat crop – if lesions or spots have a small yellow margin with a tan centre, yellow spot leaf disease could be present.

"Yellow spot characteristically has spots randomly distributed across the length of leaves and does not concentrate only at the leaf tips. Within leaves on an individual tiller there will also be a characteristic distribution with more and larger lesions on the lowest leaf and fewer and smaller spots on leaves as you progress up the canopy.

"If you aren't confident in your diagnosis, get a second opinion from a plant pathologist."

New South Wales Department of Primary Industries (NSW DPI) senior plant pathologist Steven Simpfendorfer says it is important to correctly diagnose yellow spot to save unnecessary expense on fungicide applications.

It's important to identify the source of inoculum, whether it's from stubble in the wheat paddock or a neighbouring paddock, to better inform management decisions.

Stubble carrying high inoculum loads within the same paddock has a greater risk of causing repeated infection events than stubble further away as yellow spot spores have a limited spread of up to about 100 metres in wind.

Information on the identification and management of yellow spot can be found in the Grains Research and Development Corporation (GRDC) northern region factsheet available from the GRDC website *www.grdc.com.au* or *http://www.grdc.com.au/GRDC-FS-YellowSpotNorth.* There are also a number of videos on yellow spot on the GRDC's YouTube channel *www.YouTube.com/theGRDC.*

■

Yellow spot in wheat is often misdiagnosed.

ECONOMIC AND EFFECTIVE YELLOW SPOT CONTROL

Yellow spot is a stubble-borne wheat disease which affects many Australian wheat varieties and is known as yellow leaf spot in Western Australia and tan spot in other countries.

It is a necrotrophic pathogen that feeds on dead plant cells which the fungus kills by producing a toxin, giving infected lesions on leaves a thin yellow outline.

In NSW and Queensland yellow spot is commonly a problem for susceptible varieties in wheat-on-wheat rotations, at seedling growth stages and through tillering.

The GRDC Grower Solutions Groups Grain Orana Alliance (GOA) and Northern Grower Alliance (NGA) have undertaken research into the effectiveness and economics of fungicide applications for yellow spot at various stages of crop growth.

Economic benefits of fungicides

The trials found economic benefits from applying fungicides to suppress yellow spot were negligible, particularly with early fungicide applications during the seedling stages.

This is primarily because during tillering the key yield contributing top three leaves have not emerged and therefore will not be protected by a fungicide application; infection from ascospores on wheat stubble can occur over a protracted period as the fruiting bodies do not all mature at the same time; and any inoculum reduction gained through limiting the number of early leaf infections in the lower canopy is quickly swamped by the mass of ascospores released from continually maturing fruiting bodies on the stubble throughout the season, when wet weather and rain events support their development.

Steven Simpfendorfer said fungicides were generally less effective against yellow spot compared with what growers normally achieved with rust management.

"This is because all fungicides have very limited curative activity against yellow spot and never kill the yellow spot fungus within infected leaves," he said.

"Fungicides are potentially more effective used in a preventative strategy prior to rainfall events."

Protecting the top three leaves

"To achieve an economic return, fungicide management strategies need to be based around protecting the green-leaf area in the top three leaves," Steven says.

"An initial fungicide application at GS30–32, followed by a second application at full flag-leaf emergence, GS39, if the season warrants, is likely to provide the best management of yellow spot in susceptible wheat varieties."

Effective long term management of yellow spot requires careful pre-season planning. Growers are advised to select a variety with some level of resistance to yellow spot, avoid sowing wheat-on-wheat – or if sowing wheat-on-wheat be aware of the presence of yellow spot inoculum on stubble – and consider appropriate stubble management practices such as a late autumn burn.

Good agronomic management in areas like soil and crop nutrition can also be an effective means of limiting the disease's yield and economic impact.

First detection of STB leaf disease for 15 years

NSW Department of Primary Industries (NSW DPI) plant pathologist, Andrew Milgate advises growers to be on the lookout for septoria tritici blotch (STB) which hasn't been seen in NSW for 15 years – check crops, get a correct diagnosis and take actions recommended by an agronomist.

For the first time since 2001, NSW DPI has identified significant levels of the leaf disease in commercial wheat crops in NSW.

DPI plant pathologist, Andrew Milgate, said cases of STB infection were confirmed in mid to late September in Narromine, Forbes, Young and Coolamon district wheat crops.

"The severity of infection is concerning and we urge growers and agronomists to be vigilant and maintain crop inspections to determine if STB or other diseases are present," Andrew said.

"Mild, wet conditions continue to favour disease development – we advise growers obtain correct identification of any pathogen and take actions recommended by an agronomist.

"While STB has been uncommon in NSW for more than a decade, it has become a significant foliar disease in the high rainfall regions of Victoria, South Australia and Tasmania.

"Re-emergence of STB in NSW poses a threat to early sown crops in high rainfall areas – risk of widespread infection and subsequent crop loss in low to medium rainfall areas of NSW remains low."

In most cases the disease has occurred alongside yellow leaf spot (YLS) and in some situations the combined severity of infection has warranted advice to spray with fungicide to prevent further losses of leaf area.

Resistance is the big concern

Andrew said changes in virulence to variety resistance – and the development of fungicide resistance in the Australian STB population – was of particular concern.

"In the last 12 months, triazole fungicide resistance has been confirmed in additional isolates collected from Victoria, South Australia and Tasmania. Now isolates containing resistant mutations have been confirmed in NSW," he said.

"Early screening of resistance levels shows most fungicides will be effective in the paddock and to avoid further losses in efficacy growers are urged to use multiple strategies against STB.

"An integrated approach to disease control should include mixes or rotations of fungicides, crop rotation and avoid susceptible cultivars to reduce inoculum. Integrated disease management aimed at reducing the disease burden on crops will lift yields and help prevent fungicide resistance," Andrew says.

It is critical growers adopt strategies to reduce selection rates of further mutations, to maintain and extend the useful life of currently available fungicides.

One strategy which is expected to slow the selection of strains with higher resistance is to mix or alternate different azoles.

In crops where two fungicide applications are used, different actives should be used each time.

For further information contact Andrew Milgate at: andrew.milgate@dpi.nsw.gov.au

STB information and management advice is available from the Grains Research and Development Corporation. See www.grdc.com.au ■

NSW Department of Primary Industries plant pathologist, Andrew Milgate advises growers to be on the lookout for STB which hasn't been seen in NSW for 15 years – check crops, get a correct diagnosis and take actions recommended by an agronomist.

Septoria tritici blotch infections in wheat produce distinctive black fruiting bodies in necrotic (dead) lesions, which develop three to four weeks after infection.

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AHRI **insight...**

Narrow row spacing – more crop, fewer weeds

GLEN Riethmuller has had enough of this trial. He started it in Merredin, WA in 1987 and he is still at it, sowing the same row spacing treatments on the same plots every year. Anyone who has ever sown one of these trials knows how hard it is to move tines etc, so to do that 27 times is a huge task.

Dr Catherine Borger, also from DAFWA, took Glen's research and turned it into a scientific paper. There are volumes of data to report, but we'll keep it simple.

Glen Riethmuller.

AT A GLANCE...

It would be really nice if research told us that fast food, chocolate and lollies were better for us than a balanced diet. We could eat what we want without a care in the world. There are those who believe that junk food is good for you, but the science doesn't support this belief.

It would also be nice if research told us that wide row spacing increased grain yield while improving weed control. Wide row spacing is cheap and convenient. Fewer tines or discs to pull, easier stubble handling, good herbicide safety, less fuel and horsepower required, cheaper machinery – the list goes on... But unfortunately there's a large body of science telling us that narrow row spacing is better for the crop, and detrimental to the weeds.

This AHRI insight will no doubt invoke a heartfelt boo and hiss from the true believers in wide rows, and we totally see where you are coming from in terms of convenience and cost. But we invite you to put your beliefs aside for a moment, and read this monumental piece of science that was 29 years in the making by DAFWA legend, Glen Riethmuller. Any person who turns up and sows a row spacing trial every year for 29 years is a true legend in our view.

In a nutshell, narrow row spacing yielded more and had fewer ryegrass. The trial began in 1987, but ryegrass measurement only commenced in 2003 (Table 1).

TABLE 1: In a nutshell results

Row spacing	Average yield (kg/ha) 2003–13	Average ryegrass seeds/m² at harvest 2003–13
9 cm (3.5″)	1658	58
18 cm (7″)	1637	78
27 cm (11″)	1548	223
36 cm (14″)	1492	333

About the site

The trial was conducted at the DAFWA research station at Merredin, 260 km east of Perth, Western Australia. Red loam salmon gum/gimlet soil. Average annual rainfall from 2003 to 2013 was 301 mm (range 168 to 400). Sown with a high

Narrow versus wide row canola in 2009. No light reaching the ground in narrow row spacing plots. Ryegrass germinated about when this photo was taken and was not sprayed due to crop safety concerns. Very low ryegrass seed set in the 9 and 18 cm row spacing treatments (top) compared to 27 and 36 cm treatments (bottom).

TABLE 2: Yield response across all crops to row spacing

Row spacing	Average yield (kg/ha) 2003–13	% yield response per inch of row spacing 2003–13*
9 cm (3.5")	1658	0.4
18 cm (7")	1637	0
27 cm (11")	1548	1.5
36 cm (14")	1492	1.2

*When compared to the 7" treatment

box six rank combine that allows for a range of row spacing configurations with separate fertiliser tines deeper than the seed. Tines were removed from the combine as row spacing widened.

One per cent per inch

There is an old rule of thumb that wheat yield improves by one per cent for every inch that the row spacing is reduced. Hundreds of trials have been conducted to produce this rule of thumb and the rule holds true internationally.

In this trial, the yield response across all crops was 1.2 to 1.5 per cent per inch when comparing the wider row spacings to the 18 cm (7") treatment (Table 2).

Why do narrow rows yield more?

- Reduced weed competition;
- Early canopy closure;
- Increased light interception;
- Reduced evaporation; and,
- Reduced competition between crop plants within the row.

Reduced ryegrass seed set

The simple reason for reduced ryegrass seed set in narrow row spacing is light interception by the crop.

But…

There is more to it than that! The critics of this research have quite rightly pointed out that trifluralin incorporation on the 36 cm row spacing at 7 km per hour may have been compromised. They also point to the 1 L/ha trifluralin rate being too low. These are fair criticisms and would have definitely contributed to the higher weed burden in the 36 cm row spacing. A rate of 2 L/ha trifluralin was applied just to the 27 and 36 cm rows in 2007 while 1 L/ha was applied to the 9 and 18 cm treatments.

However…

The 27 cm row spacing had excellent trifluralin incorporation yet there were still much higher ryegrass numbers in the 27 cm row spacing treatment than the 18 cm treatment. Also, post-emergent grass herbicides were used in six of the 11 years reported here and for the past three years of the trial, pre-emergent herbicides that are not as reliant on incorporation were applied.

Burnt stubble versus stubble retained

This trial also compared burning stubble and retaining stubble across all row spacing treatments.

Burning stubble reduced the yield in some years, probably due to reduced moisture conservation and effects on soil structure and nutrient availability.

Ryegrass seed at harvest was reduced in the burnt plots compared to unburnt. This was probably due to a combination of burning destroying weed seeds on the soil surface and pre-emergent herbicide efficacy being improved due to reduced herbicide binding to residue.(Table 3).

TABLE 3: Burnt versus retained stubble		
	Yield (kg/ha)	Average ryegrass seeds/m² at harvest
Burnt	1530	57
Unburnt	1638	297

Narrow row spacing is achievable

In the 90s, when no-till was being adopted, most growers had little choice but to adopt wide row spacing. Stubble retention and no-till go hand-in-hand, so burning for stubble handling became frowned upon for good reason.

Harvester capacity was limited, so harvesting low was out of the question, and seeders struggled to handle stubble. Wide rows were the only option.

In 2016 we have harvesters that can harvest low (10–15 cm) and cut and spread the straw evenly. We also have seeders that can handle more stubble than their predecessors.

Many growers in regions that regularly achieve wheat yields of three to four tonnes per hectare have successfully adopted 7" (19 cm) row spacing with both tine and disc machines. It's less convenient than wide rows and costs more, but the benefits outweigh the negatives.

You don't have to achieve 7" row spacing

Seven inch row spacing may well be achievable for some, but it may be difficult in the very high rainfall areas where wheat yields are 5.0 tonnes per hectare or greater. We're not suggesting that everyone must adopt 7" – but we do believe that most growers can achieve narrower row spacing than they're currently using, and that they'll benefit from doing so.

To sum up

Crop competition with weeds will continue to become more and more important as herbicide resistance worsens. If narrow row spacing isn't your thing, you may want to consider some of the other options to improve crop competition, such as east-west sowing, competitive cultivars and high seeding rates.

East-west sowing is a good, free weed control tactic. But narrow row spacing is better than free; it makes more profit while improving weed control. Narrow row spacing is inconvenient, but the science is telling us that it is good for the crop and bad for the weeds. Give your crop heaven and your weeds hell!

P.S. There's a lot of data from this research, some of which we have included below for those of you who would like to keep on reading.

More about the site

Trial design was randomised block design with six replications in year one with treatments reapplied to the same plot from 1987 to 2013. Data from 2003 to 2013 is presented here as this is the period of time where ryegrass seed set was measured (Table 4).

The data in Table 5 shows crop yield for the various row spacing treatments from 2003 to 2013. It's good to look at this entire data set to see how repeatable the row spacing yield effect is. In very dry years (2007 and 2012) – and the field pea of 2005 – there's little row spacing effect and there's a strong row spacing yield response in all other years with the exception of 2013.

TABLE 4: Crop rotation, herbicide treatments and HWSC (harvest weed seed control) from 2003–13

Year	Crop	Knockdown	Pre-emergent	Post-emergent	HWSC
2003	Wheat	Double knock	Trifluralin 1 L/ha	Hoegrass	Chaff cart
2004	Wheat	Spray.Seed	Trifluralin 2 L/ha	Hoegrass	Chaff cart
2005	Field pea	Spray.Seed x 2	Trifluralin 1 L/ha	Select	Chaff cart
2006	Wheat	Double knock	Trifluralin 1 L/ha + Dual Gold		Chaff cart
2007	Barley	Spray.Seed	Trifluralin 1 or 2 L/ha*	Decision	
2008	Chemical fallow	Spray.Seed			
2009	Canola	Spray.Seed	Trifluralin 1 L/ha		
2010	Wheat	Spray.Seed	Trifluralin 1 L/ha	Achieve	
2011	Wheat	Glyphosate	Boxer Gold		
2012	Chickpea	Spray.Seed	Simazine	Select	
2013	Wheat	Double knock	Sakura		

Double knock = glyphosate followed by Spray.Seed; Spray.Seed = paraquat + diquat. Trifluralin 480g/L; Hoegrass = Diclofop-methyl; Dual Gold = metolachlor; Boxer Gold = prosulfocarb + metolachlor. Sakura = pyroxasulfone; Select = clethodim; Decision = diclofop-methyl + sethoxydim; the chaff cart was a Rytech system from South Australia mounted on the plot harvester.
*2 L/ha trifluralin added to the 27 and 36 cm plots in 2007. 1 L/ha applied to 9 and 18 cm row spacing plots.

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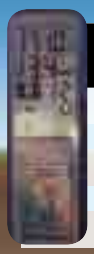

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Fuel	- 73.3 Lt/hr
Engine load	- 80%

AFTER TUNE, +TWO GEARS/ SAME SPEED	
Gear	- 14th
RPM	- 1230
Speed	- 13.5 km/hr
Fuel	- 54.6 Lt/hr
Engine load	- 65%

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TABLE 5: Crop yield (kg/ha) at various row spacings

Year	Crop	Row spacing			
		9 cm	18 cm	27 cm	36 cm
2003	Wheat	3210	3317	3099	3049
2004	Wheat	1823	1825	1760	1560
2005	Field pea	1995	2024	1761	1710
2006	Wheat	2585	2631	2358	2219
2007	Barley	366	385	394	441
2008	Chemical fallow	*	*	*	*
2009	Canola	929	887	832	766
2010	Wheat	1273	1077	988	1031
2011	Wheat	2140	2058	1969	1975
2012	Chickpea	176	148	119	141
2013	Wheat	2083	2021	2196	2035

TABLE 6: Annual ryegrass seed (per m²) at harvest

Year	Crop	Row spacing			
		9 cm	18 cm	27 cm	36 cm
2003	Wheat	324	296	702	382
2004	Wheat	318	312	757	1001
2005	Field pea	375	558	1930	1581
2006	Wheat	14	18	29	27
2007	Barley	25	54	424	789
2008	Chemical fallow	*	*	*	*
2009	Canola	140	319	3056	3468
2010	Wheat	17	24	36	173
2011	Wheat	159	162	334	552
2012	Chickpea	60	50	135	287
2013	Wheat	2	1	51	171

Table 5 crop yield was averaged across stubble burnt and stubble retained treatments.

Table 6 shows the ryegrass seed set per m² from 2003 to 2013. Ryegrass seed set for stubble retained treatment. The high ryegrass seed set in the canola in 2009 was due to late germinating ryegrass and so the canola was not sprayed post-emergent with Select (clethodim) as flower buds had commenced. There was very low seed set in the 9 and 18 cm treatments in 2009 as the canola was covering the ground extremely well when the ryegrass germinated.

There's higher ryegrass seed set in the wide row spacing treatments than the narrow row spacing treatments in every year of the trial.

The trial also compared burnt versus unburnt treatments (Table 7). The data shows that there was no difference in yield between burnt and unburnt in many years of the trial but in some years there was a significant difference. This is likely due to moisture conservation from retained stubble being very important in some years and not others – depending on how the rain fell in autumn/early winter.

Table 8 shows the effect that burning stubble had on ryegrass seed set. Burning stubble destroyed some ryegrass seed and improved pre-emergent herbicide efficacy. There has been very little ryegrass present in the burnt plots of all row spacing treatments for several years, but this has come at some yield cost, as mentioned above. ■

TABLE 7: Average crop yield (kg/ha) in the burnt and unburnt residue treatments and the row spacing treatments from 2003 to 2013

Year	Crop residue		Row spacing			
	Burnt	Unburnt	9 cm	18 cm	27 cm	36 cm
2003	2901	3436	3210	3317	3099	3049
2004	1759	1725	1823	1825	1760	1560
2005	1944	1802	1995	2024	1761	1710
2006	2468	2427	2585	2631	2358	2216
2007	335	458	366	385	394	441
2009	858	849	929	887	832	766
2010	1085	1100	1273	1077	988	1031
2011	1892	2178	2140	2058	1969	1975
2012	155	137	176	148	119	141
2013	1898	2269	2083	2021	2196	2035

TABLE 8: The effect of burning stubble on ryegrass seed set (per m²)

Year	Burnt				Unburnt			
	9 cm	18 cm	27 cm	36 cm	9 cm	18 cm	27 cm	36 cm
2003	120	117	170	141	324	296	702	382
2004	42	117	213	313	318	312	757	1001
2005	147	221	354	1101	375	558	1930	1581
2006	5	5	22	13	14	18	29	27
2007	6	23	28	105	25	54	424	789
2009	55	152	159	622	140	319	3056	3468
2010	3	1	6	17	17	24	36	173
2011	2	0	0	17	159	162	334	552
2012	3	0	4	10	60	50	135	287
2013	0	5	0	0	2	1	51	171

ASK AN EXPERT – WHY LOOK FOR SUMMER WEEDS IN SPRING?

■ With Chris Preston, Australian Glyphosate Sustainability Working Group

SOWTHISTLE, windmill grass and feathertop Rhodes grass are problematic weeds for grain growers across Australia. All three are known to evolve resistance to glyphosate – the mainstay herbicide in no-till farming.

These three weeds have several key biological traits in common that make them difficult to control, particularly once the winter crops have been harvested and these weeds have uninhibited access to whatever soil moisture and nutrients are available over summer.

Dr Chris Preston, Chair of the Glyphosate Sustainability Working Group says these three weeds have some natural tolerance of glyphosate, particularly once they have some size, and some populations have been identified that are resistant to robust rates, even when applied to small, actively growing plants.

Dr Chris Preston says sowthistle, feathertop Rhodes grass and windmill grass are of concern in all Australian grain growing regions, not just the northern region. (Photo: Jenny Barker)

"All three species respond to warming temperatures in spring and can germinate late in-crop where they are difficult to control with herbicides," says Chris. "Windmill grass is a short-lived perennial that can regrow from the crown, giving it a distinct advantage when soil moisture is limited."

"Another trait that these species share is the short period of seed dormancy. This means that seed will germinate almost immediately after rainfall events in spring once the soil has started to warm and, once established, these plants are also very tolerant of heat and moisture stress.

"Sowthistle can also germinate in autumn but these populations are easier to control as part of the seeding operation," he says.

Why is sowthistle more of a problem in some years than others?

Short answer: Sowthistle seed does not persist in the soil for very long. More rainfall over spring and summer leads to larger populations.

Longer answer: Burying seed can extend the life of the seed so cultivation is generally not recommended. Sowthistle incursions often begin in non-crop areas where there is little competition. Sowthistle resistance to Group B herbicides is widespread, resistance to Group M (glyphosate) has been confirmed in the northern region and resistance to Group I

herbicides has been confirmed in the southern region. This means that one or more of the common summer fallow herbicides do not work on many populations of sowthistle.

If these summer weeds are so hard to control with herbicides, what options do growers have?

Short answer: Herbicides can still play a part but applications need to be well-timed and survivors removed.

Large sowthistle plants produce huge quantities of air-borne seed but the seed does not persist for long, giving growers the opportunity to intensively manage incursions and non-crop areas to keep weed numbers low.

Longer answer: The key to control lies in preventing emergence to run down the seed bank. These weeds are not great candidates for harvest weed seed collection even though they are often present at harvest, because the seed is light and easily spread on the wind. They generally don't perform well in competitive situations so they often become prolific in non-cropped areas like roadsides and fencelines. Avoid spraying these areas with glyphosate alone whenever possible and use non-herbicide options like slashing, pasture and hay making to prevent seed set.

Are feathertop Rhodes and windmill grass really a problem outside the northern region?

Short answer: Feathertop Rhodes and windmill grass are closely related C4 species, which means they grow rapidly in warm, sunny conditions, so they are prevalent in the northern region. But they are found on roadsides all over Australia – representing a considerable risk in all regions.

Longer answer: These two grasses produce seed that does not persist in the soil for very long, in fact all the viable seed that is shed, germinates the following spring and summer. Like sowthistle, these grasses prefer to have no competition. Feathertop Rhodes incursions often begin in a patch around a mature plant and experience in the northern region suggests that intensive patch management is effective and worthwhile.

The most effective control is a double knock strategy of glyphosate plus a Group A herbicide, followed by paraquat. As Group A herbicides are prone to resistance, use of Group A herbicide must be followed with a robust second knock. ■

HOW TO ASK A WEEDSMART QUESTION

Ask your questions about managing herbicide resistant crop plants that establish in non-crop areas on the WeedSmart Innovations Facebook page *https://www.facebook.com/pages/WeedSmart-Innovations/354441941389122*, Twitter @WeedSmartAU or the WeedSmart website *http://www.weedsmart.org.au/category/ask-a-weedsmart-expert/*

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

Weather stations for better weed control

UNCERTAINTY over future weather conditions is one of the major frustrations for farmers when planning important tasks such as applying herbicide and other crop protection sprays. Having more information about the weather conditions close to a location, and any changes that are on their way, could help growers ensure that their spraying operation is both safe and effective.

Delta Agribusiness Principal and Group Manager Advisory, Chris Duff says that key environmental factors impact on the efficacy of herbicide applications and as a result play a part in potential evolution of herbicide resistance if weeds are exposed to sub-lethal doses of herbicide.

"Growers have complete control over tractor speed, boom height and nozzle selection and can work within the constraints of a variety of weather conditions," he says. "Weather conditions just prior to, during and in the few days after a herbicide application can all impact on the effectiveness of the operation.

"This level of detail has not been available to growers and so they have had to make important decisions based on limited information. Until recently, the 14 million hectares of cropping land in regional NSW – where Delta Agribusiness operates – was serviced by only 18 Bureau of Meteorology automatic weather stations, many of which are located at airports, and often farms

Delta Agribusiness Executive Director Chris Duff says the DAWWN network of weather and soil moisture stations will change the way farmers manage spray events and better ensure herbicide is applied at full label rates to the target weeds, minimising the risk of spray drift and associated sub-lethal doses of herbicide on the target weeds. Chris (left) is pictured with John Pattison (Delta Ag operations manager) and Mark Bryant (Greenethorpe grower).

are 60 to 90 km away from the nearest BOM station," Chris explains.

In what is thought to be Australia's largest private weather station network, Discovery Ag (a Delta-owned company) has installed an additional 62 automatic weather stations to create a network that brings every farm within the Delta footprint of NSW to within just 25 km of an automatic weather station.

Real time weather information

"What this means is that a grower can access weather information relevant to their decision making in real time," says Chris. "Rainfall, wind speed and direction, solar radiation, soil and air temperature, humidity and barometric pressure are critical to safe herbicide application and they can vary considerably over a relatively short distance. Having access to data that are no more than 10 minutes old gives growers a great deal more confidence that the conditions will be suitable for the duration of the spray operation."

The best wind condition for spraying is a consistent breeze of at least four to five km per hour (and below 15–20 km per hour) in a predictable direction during daylight hours. These conditions provide sufficient turbulence to allow effective deposition of the spray droplets on the target. Under marginal wind conditions growers still have the option to alter their choice of nozzle or adjust the boom height, according to the product label directions.

After wind speed, delta-T is the next critical factor to consider.

Delta-T is calculated using temperature and humidity data and provides a measure of the evaporative potential of the air. The delta-T value at the time of spraying should be above 2 and less than 8, and the target weeds should not be stressed.

Below delta-T 2, even course droplets can 'survive' in the air and there is a higher risk of spray drift. When values are over 8, spray droplets tend to decrease in size as they move through the air, again increasing the risk of spray drift. Spraying above a delta-T of 8 can also result in poor weed control due to plant stress and droplet survival. Choosing nozzles that provide the coarsest droplet size suitable to the product can enable safe spraying under conditions where the delta-T is up to 10 or 12.

One of the 62 additional automatic weather stations installed to create a network that brings every farm within the Delta footprint in NSW to within just 25 km of an automatic weather station.

Effectively managing herbicide spray events is so important that it is part of the *WeedSmart* 10 Point Plan, which outlines an array of tactics that growers can use to minimise the risk of herbicide resistance in weeds.

Soil moisture probes

"The next major phase of the Discovery Ag Weather & Water Network (or DAWWN) project is to increase the number of soil moisture probes across the region to assist growers with sowing date decisions and decisions related to the use of pre-emergent herbicides," says Chris. "Given the variability of rainfall we are currently also looking to expand the number of stand-alone rain gauges in the network."

"Growers are gaining better access to environmental information and are able to make more value judgements about the timing of key weed and crop management operations."

"If growers and spray contractors know that a herbicide was applied in optimal conditions they are able to rule spray failure out if there are weeds that survive the operation," he says. "In such circumstances it would be fairly clear that herbicide resistance could be an emerging problem for the grower and resistance testing would be advisable."

For more information about managing spray events and herbicide resistance, visit the Weedsmart website: www.weedsmart.org.au ■

Optimising harvester settings

OPTIMISING the set up and operation of a harvester is vitally important in maximising the success of most Harvest Weed Seed Control (HWSC) systems used to collect or destroy weed seeds.

And ensuring that harvesters are not travelling too fast will help prevent grain losses worth as much as $20 per hectare.

These were messages delivered by Charles Sturt University (CSU) researcher John Broster to the recent Grains Research and Development Corporation (GRDC)-sponsored Australasian Weeds Conference in Perth.

He presented findings from a GRDC-funded study aimed at determining the proportion of annual ryegrass weed seeds collected by a harvester – that then exit in the grain, straw and chaff fractions - under commercial wheat harvesting conditions.

The research was conducted in south-eastern Australian wheat crops by the Graham Centre for Agricultural Innovation – an alliance between CSU and the NSW Department of Primary Industries.

Minimise weed seeds exiting the harvester

An important factor in many HWSC systems is the proportion of weed seeds exiting the harvester in the chaff fraction, with chaff carts, chaff tramlining, chaff lining, the Harrington Seed Destructor (HSD) and the Integrated Harrington Seed Destructor (iHSD) targeting this fraction only.

"Cab settings of the harvester used in the 2015 trials were adjusted to maximise the efficiency of an attached iHSD, although no physical changes were made to concaves or grates," John said.

Simply adjusting the settings helped to ensure that grain and weed seeds were moved out of the concave and onto the sieves and resulted in a low percentage (3.4 per cent) of annual ryegrass being lost in the 'straw fraction'.

"This was a much better outcome compared with results from 2014 trials, where the settings of five harvesters were not adjusted and were simply what farmers were already using," John said.

"In the 2014 trials, an average of 49.2 per cent of annual ryegrass was lost in the straw fraction."

John said the most effective harvester set-up for HWSC might vary between different weed species, as trial results were different for annual ryegrass weed seeds and wild oats.

The effect of harvest speed was also investigated, with speeds of 4, 6 and 8 km per hour tested in 2015.

"When harvester settings optimised the efficiency of the attached iHSD – as was the case in 2015 – harvest speed did not influence the amount of annual ryegrass seed lost in the straw fraction," John said.

"But increasing the harvester speed did result in increased loss of grain (5 per cent of the total amount harvested) through the straw, especially when the harvester was operating at full capacity.

"The average yield of the crop was 2.45 tonnes per hectare and at 8 km per hour the harvester was at full capacity.

"If wheat is worth $200 per tonne the additional wheat loss at 8 km per hour would be valued at $20 per hectare," John explains.

'Opening up' hardware

Australian Herbicide Resistance Initiative communications leader Peter Newman said improving the set up of a harvester included changing settings in the cab and 'opening up' hardware in the harvester to help clear grain from the rotor.

Peter said a video demonstrating how to 'open up' a harvester, featuring WA grower and HSD inventor Ray Harrington, was available at www.ahri.uwa.edu.au/harvester-setup

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John Broster's HWSC research paper – Harvest weed seed control: the influence of harvester set up and speed on efficacy in south-eastern Australian wheat crops – is available at www.caws.org.au/awc/2016/awc201610381.pdf

Information on HWSC is also available at www.weedsmart.org.au ■

On the scrapheap – nearly!

By Ian M. Johnston – PART 1

Buried somewhere down in Back Paddock, there are the remnants of a 1935 rusted-out Fordson tractor. I recall it was beyond salvation. Indeed, there was not even a necessity for me to put it to sleep with the aid of my seldom used point 303. It was that crook, it had expired of its own accord.

A common denominator I share with the ancient Fordson, is that I too am a 1935 vintage. Yes, 1935 was a vintage year for both tractors and tractor folk. Both proved to be kind of special. (I am renowned for my conservatism and modesty).

But where I differ from the unfortunate Fordson is that, when unexpectedly I got really crook (good old Ozy terminology) a few weeks ago, I was repairable thanks to some modern miraculous medical management performed by the brilliant Doctors Sesh and Banks. They saved my life. But it was a close call! Even now my cardiologist (Dr Sesh) is amazed by the fact I am still around. How good is that?

I confess to having thought of the old Fordson as I lay in a medicated fog. I also contemplated for a moment a world without Ian M. Johnston's waffle about old tractors. In fact, come to think of it – such an unimaginable spectre probably prodded me into my recovery mode.

Okay, so all that is in the past tense. The future for me is bright and the good doctors reckon I shall be around boring people to distraction about Scotland and tractors, for many years yet.

But I admit to some recent exercising of the little grey cells while contemplating parts of my past life. I have been recalling some particularly harrowing experiences Margery and I encountered during our travels around the globe, while engaged in researching material for my tractor books and articles. These included visits to no less than 36 countries and 27 states of the USA.

I shall now (imprudently probably) throw discretion to the wind and reveal a few of these stressful experiences.

The 1935 Fordson.

Bulgaria 1988

We had been ordered by an obnoxious Communist security cretin that, as we would be motoring through a restricted zone on the Black Sea coast, we would be expected to overnight at a specific hotel. It was essential we arrive before nightfall and report to the resident security officer.

So we did as ordered, except I took exception to the belligerent attitude of the female officer at the hotel. Now normally I am a fairly polite sort of a cove, particularly towards the fairer sex. But having spent three weeks behind the Iron Curtain in search of East European tractors, which involved driving through Bosnia, Herzegovina, Slovenia, Romania, Hungary and now Bulgaria, and putting up with the rudeness of obtuse Communist officialdom, I committed the ultimate sin – I did my block!

So having told her what I thought of Communists and Communism, I stomped out of the hotel, jumped into the driving seat of the rental Zastawa, slammed the door and shocked Margery by flooring the loud pedal. "We shall find another hotel" I told her. Through the rear vision mirror I noticed the woman had rushed out of the hotel and was obviously making a note of the car registration number.

It was now dark and the road hugged the shore of the Black Sea. And then it happened. A fast overhauling car, bristling with antennas and flashing lights, pulled us over. Out jumped a couple of black uniformed grim faced unpleasant looking individuals, who proceeded to aim Kalashnikov machine guns at my head. Wow! They were followed at a more leisurely pace by a senior officer, who unfolded himself from the back seat. He accused me of disobeying instructions, so logically I must be a NATO spy. (Was it my James Bond good looks)?

Margery and I were placed under house arrest overnight, in yet another designated hotel, until late in the morning we were informed (reluctantly I thought) that it had been determined I was not a spy after all and therefore free to continue on our way!

Moral – don't argue with officialdom in a foreign country!

Montana USA 2004

Following completion of our tour of rural museums in Alberta and Saskatchewan, we entered Montana, from the rugged mountain terrain of Canada. Within an hour the scenery had softened and we found ourselves driving through undulating swaying grasslands. Our destination was a bison preservation national park, embracing thousands of acres of this lush prairie country.

We passed through one of the entrances and drove for around half an hour without sighting a bison. Eventually we pulled off the winding road, giving Margery the opportunity to get out the thermos and butter a couple of rolls for our picnic lunch.

While she was so engaged, I clambered up onto a rocky shelf adjacent to the car for the purpose of shooting off some film from my movie camera. Upon reflection I must have remained on the ledge for possibly 10 minutes or so while doing my Cecil B. DeMille thing, before rejoining Margery in the car.

As I chomped on a ham roll, I happened to glance at the

A rather unpleasant character. A cranky rattlesnake.

shelf upon which I had been standing and nearly passed out! In a crevice, inches from where my feet had been planted, was a large rattlesnake coiled in the ready to strike attitude. I have no idea whether it had been doing any rattling or not. A stiff breeze would have likely masked the sound.

Lunch was forgotten as I urged the car back onto the road.

Montana USA 2004 – again

I had just about stopped shaking, following the rattlesnake episode, when upon rounding a bend we were confronted by the spectacle of a huge old bison bull lying crosswise on the bitumen, completely blocking the narrow single track road.

For those who may not have experienced a North American wild bison, let me tell you they are seriously huge beasts! A bull's head is about the size of a Japanese car. (Okay – a slight exaggeration maybe).

Anyway I nudged the car to within about 10 metres of the massive beast, which was as close as my nerves would permit. It glanced at the vehicle with an expression of utter disdain, before returning to its obviously preferred state of 'couldn't care less'. I gingerly sounded the horn. It didn't even blink!

Suddenly, from behind a rise emerged not one but two young prancing bulls. They appeared to be in a playful mood and put on a show of a mock fight, repeatedly charging each other. Obviously becoming bored with that, they turned their attention to our car.

Now our Hertz rental car just happened to be a Mercury Cougar, which is a low (very low) profile high performance car. So being trapped in the car, with two gargantuan Bison heads, one on either side of the vehicle peering in through the windows, was not a fun experience! From our low viewpoint the beasts each appeared to be the size of the Sydney Opera House! (And all this only 20 minutes since the rattlesnake appearance). It occurred to me that Mr Hertz would not have been amused.

At that moment the Old Bull decided it was time to show these young upstarts who was boss. He scrambled to his feet and snorted his fury. The young bulls rendered only a pathetic return snort, before deciding that diplomacy was the best course of action and trotted off into the horizon.

This massive old bison bull is a fellow to be treated with a great deal of respect!

This was our opportunity. The old bull had moved off the roadway. The Mercury Cougar proved it was indeed a performance car as I gunned it off in the direction of the exit.

Just within the exit gate, we noticed a sign warning visitors not to leave their cars, owing to the danger presented by a huge increase of the rattlesnake population! Another sign advised against approaching bison as they could be dangerous!

The next day, we heard on the local news that a tour bus had been savaged by a rogue bison!

I guess we were just lucky, but we definitely should pay more attention to signboards!

Northern Ireland 1990

Having spent a full day at The Ulster Transport Museum, we overnighted in a hotel at the seaside resort of Bangor. This was right in the middle of 'The Troubles', when the IRA terrorists were scaring the daylights out of everyone, with their enthusiasm for a range of toys, such as bombs and guns.

Our rental Rover proved to be a mistake. We had brought it across to Dublin on the ferry, so of course it had English number plates. Accordingly, it presented a great temptation for the IRA guys. A security chap pointedly recommended we inspect the underside of the Rover each morning prior to activating the starter motor!

Following consumption of the mandatory Ulster health breakfast – fried eggs, fried bacon, fried sausages, fried black pudding, fried bread and rolls plastered with good old healthy butter and spoonfuls of marmalade – I left Margery to attend to the packing, while I went in search of a chemist shop to buy a packet of something for an aching stomach (not surprising really).

The main street was only a short drive from our hotel. I found not only a chemist shop, but one which had a parking spot right outside the door. The shop was fairly busy, so I waited my turn to be served.

After quite an interval, the nice lady behind the counter smiled and apologised for the delay in serving me, but assured me I was next in line. It occured to me to ask if it was okay for my car to be parked outside. She responded that it was quite okay, as it was half hour parking and of course there would be someone sitting in the car. A strange remark I thought. But when I replied in the negative she, plus all the other customers in the shop, looked utterly stunned!

What followed was like a rugby scrum. I was physically manhandled out through the door onto the footpath and bundled into the car. When I had recovered my breath, a stout wifey lectured me through the side window, as she might a simpleton.

In her strong Ulster accent she shouted "You, being obviously from across the water, haven't been told about the restrictions, so you haven't". She went on to explain that on account of the number of booby trap explosives being placed in unattended parked cars, it was now illegal to leave a car in a shopping zone without an occupant remaining inside. Presumably that occupied car would not be rigged to blow up.

I learned later, if an empty parked car was reported to The Ulster Constabulary, they routinely would clear the area and with a robot simply blow up the offending vehicle, on the assumption it was rigged with an explosive device aimed to kill innocent shoppers.

Two days later, before the police could get to it, an IRA booby trapped car, packed with explosives, was detonated in an adjacent Bangor street, completely destroying a number of buildings!

Conclusion

Who would have thought that writing about classic tractors could be such a hazardous occupation? In future maybe I should take out additional insurance and always wear a tin hat! Or maybe it is approaching the time when I should hang up my pencil, er I mean keyboard. Only joking!

Ian's self confessed harrowing travel experiences will be continued in the next edition of the magazine. ■

IAN'S MYSTERY TRACTOR QUIZ

Question: Can you identify this tractor?

Clue: It is not American, not many were sold into Australia.

Degree of difficulty: It is so oddball that a good tractor person should recognise it.

Answer: See page 48.

STRENGTH where it counts

Some twenty five years ago, C&C Machining and Engineering (named Tasweld at the time) were approached by Jamie Grant to extend the axles of his John Deere tractor to three metre centres for Controlled Traffic Farming (CTF). Since then, a lot has changed. The number of farmers practicing CTF has increased and so has the variation in machine types.

"We knew that our conventional 'cotton reel' spacers were weakening the front axle assembly and messing with the steering. We had to offer our customers something else..."

"We knew that our conventional 'cotton reel' spacers were weakening the front axle assembly and messing with the steering. We were worried about the new independent front suspension systems being offered by Fendt and John Deere. We had to offer our customers something else. After an extensive R&D process we are happy to give farmers the option to use front weights and heavy implements on wide spacing without fear of damage".

The bolt-in kits take a few hours to assemble and are fully reversible if the customer wants to sell the tractor or kit separately. C&C now offer wheel spacing solutions for nearly every machine out there.

"It's a constant R&D process. These days everything is computer designed and tested and then CNC machined. We have just designed a kit for a Claas header so we are excited to see how that goes."

More of C&C's work can be found at www.ctfextensions.com

C&C machining and engineering

Research showing early sowing pays off

By GRDC northern region panellist Neil Fettell

PAIRING long fallowing with the early sowing of wheat is proving to be a successful combination when it comes to maximising crop yield potential.

Research supported by the Grains Research and Development Corporation (GRDC) and conducted by CSIRO, Central West Farming Systems and Ag Grow Agronomy, is highlighting the yield value that can be derived from sowing early into long fallow country with slow developing cultivars.

Long fallowing and early sowing are complementary practices, as the fallow reduces weeds and diseases which can be difficult to control in early sown crops while early sowing with slow developing cultivars allows the crop to better use soil water stored during the fallow.

Stored soil water has the added benefit of helping establish early sown crops when there is minimal autumn rainfall.

It's no secret that one of the major drivers of wheat yield and quality is flowering time. When it comes to selecting a cultivar and sowing time combination, the goal is to match plant development with seasonal pattern and most importantly, have flowering occur within the optimal period for yield.

The optimal flowering period varies significantly depending on a farm's location and climate but in general, in south-central New South Wales the optimal flowering period varies from late August in the west to early October in the east.

GRDC northern panellist Dr Neil Fettell says research is showing that yield increases can be derived from sowing early into long fallow country with slow developing cultivars.

Early flowering – long grain fill

In simple terms, the reason it is critical to match variety and sowing date is so that flowering occurs early enough to allow a long grain filling period before the high evaporative demands and soil water deficit of early summer occur but additionally, so the flowering period is late enough to avoid damage by frosts in early spring.

Understanding how each variety responds to the environment will help growers target varieties to their best sowing time.

Research is showing that in the presence of stored soil water following long fallow, winter and slow developing spring cultivars sown early yield more than faster cultivars sown later.

This is because the longer growing season available to early sown crops allows them to grow deeper roots and extract more water, reduce evaporation and produce more biomass.

But if there is no stored soil water for growth around flowering and grain filling, early sown crops can hay-off and will yield the same or in some cases less than faster developing cultivars sown later. This risk can be reduced by appropriate seeding rates and delaying nitrogen fertiliser application.

Growers using long fallows should keep either a winter or slow spring cultivar in order to maximise yield in seasons with a sowing opportunity in April. They also need to keep either a mid-fast or fast cultivar to use on non-fallow paddocks, and in seasons where there is no establishment opportunity until May.

Winter, slow and mid-developing cultivars should not be sown dry, even on long fallows. If these cultivars are not established at their optimal time they will flower too late and suffer yield loss due to drought and heat stress.

As with so many areas of farming, careful planning and an awareness of the latest research data can offer the best bet on maximising crop yield and profit potential.

For more information download a copy of the GRDC Update paper `Long season wheat varieties, what are the opportunities?' from the research and development section of the GRDC website www.grdc.com.au or click on https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2016/07/Longer-season-wheat-varieties-what-are-the-opportunities ■

NORTHERN FOCUS
COVERING NORTHERN NSW AND QUEENSLAND

Mungbean and powdery mildew: One spray is good, but two better

AT A GLANCE...

- Applying tebuconazole to mungbean infected with powdery mildew can substantially boost yield and gross margins.
- One spray when the fungus is first detected will help boost yield, but the best balance between application cost and returns is struck when a second spray is applied 14 days after the first if infection occurs early.
- The value of treating powdery mildew varies depending on the region, timing of infection and season. Incidence and severity will be determined by weather conditions – cooler humid conditions favour the disease.

WHEN it comes to protecting mungbeans from powdery mildew, one well-timed fungicide spray is valuable but two can be even better.

That's the conclusion of a research project across several Queensland research facilities, which looked at the most cost-effective option for limiting the damage *Podosphaera fusca (P. fusca)*, can wreak on a crop.

If powdery mildew infects the crop early and two sprays of tebuconazole are applied 14 days apart after the first sign of infection, the study found that net returns on a mungbean crop increased by more than $400 per hectare over an unsprayed crop.

Sue Thompson from the Centre for Crop Health at USQ has been involved in a GRDC-supported research trial which monitored different powdery mildew treatments at three research facilities over two years.

The investigation was led by Sue Thompson from the Centre for Crop Health at the University of Southern Queensland, who with Queensland Department of Agriculture and Fisheries colleagues, monitored different powdery mildew treatments at three research facilities over two years.

"Effective management of mungbean powdery mildew relies on the use of varieties with the highest possible levels of tolerance and on the strategic application of fungicides," Sue said.

"The variety Jade-AU has the highest level of tolerance of the green shiny varieties to *P. fusca* (moderately susceptible – MS), with all other Australian varieties apart from Green Diamond being susceptible (S) or highly susceptible (HS).

"As it's unlikely that significant gains in breeding for resistance to the powdery mildew pathogen will be made in the near future, the targeted use of fungicides is vital to minimising the disease's impact."

It's important to note that fungicides containing tebuconazole are currently under APVMA permit (Nos 13979 – which expires June 2017 and is only valid in Queensland and New South Wales) for the control of mungbean powdery mildew.

In the 2016 trials at the Hermitage Research Facility, the fungus was detected very early at 24 days after crop emergence. Sixty-three days after emergence, the infestation on untreated plants rated at '8' on a severity rating ranging from 0–9.

Severe powdery mildew in mungbeans. (Photo: Sue Thompson, USQ)

In Kingaroy, the fungus progressed to a mean severity rating of 8.3. In drier Emerald, the mean severity rating only reached 4.5 after the plants matured in unseasonably hot conditions.

A fungicide applied when the fungus first appeared checked powdery mildew development at all sites but with no further sprays, infection generally ramped up as the plants filled pods to reach similar levels to control plots where no spray was applied.

Multiple applications most effective

The most effective treatments all involved two or three sprays, even when the fungicide treatments were applied according to different criteria.

At Hermitage in 2016, where infection started very early and moved rapidly up the canopy, virtually the same yield increase came from applying the first spray when the fungus had spread one-third of the way up the plant, or at the first sign of infection, with another treatment 14 days after the first. Infection reached one third of the way up the canopy prior to flowering in this trial.

In 2015, when powdery mildew came into the trials later and with less intensity, holding off the fungicide application until one third of the canopy was infected resulted in a lower percentage yield increase than the treatments applied at first sign.

"This reinforces the importance of monitoring mungbean crops for the first sign of the disease and applying the first spray at that time. It appears that even if the first sign is at the flowering or early pod fill crop stage, some yield increases will result," Sue said.

"There was a trend of yield increase at all sites by the application of Folicur 430SC although at Kingaroy and Emerald the increases were not statistically different."

At Hermitage, the researchers found that the cost-versus-benefits of the two-spray approach were always unequivocally in favour of treating powdery mildew.

Assuming seed costs of $1000 per tonne, and costs of $20 per hectare per spray, the two-spray methods delivered returns between $412–$439 better than those from unsprayed plots in a year when powdery mildew infected early.

Seasonal conditions will vary results, but the researchers concluded that in general, the returns from applying tebuconazole far outweigh the costs, particularly in more humid areas and when crops are maturing into cooler conditions.

And they determined that while a single spray when the fungus first appears is useful in boosting yield, a second spray 14 days later produces the optimum balance between cost and return.

For more information on the fungicide research, download a copy of Sue's GRDC Updates paper Fungicide management of mungbean powdery mildew from the research and development section of the GRDC website www.grdc.com.au or click on https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2016/06/Fungicide-management-of-mungbean-powdery-mildew ■

Decoding the peanut

By Jan Suszkiw, Agricultural Research Service – USDA

AT A GLANCE…

- ARS scientists helped decode the modern peanut's genome.
- This work will help find genes for resistance to pests like root knot nematodes.
- Finding those genes will speed development of improved peanut varieties.

OVER the past couple of years, an archaeological dig – of the genetic kind – has been in the works to uncover the complex beginnings of the beloved peanut, *Arachis hypogaea.*

Major headway was made in 2014, when an international team of scientists from the Agricultural Research Service (ARS), University of Georgia, and other organizations announced the completion of a first-draft sequence of the peanut's book of life – or 'genome'.

The team accomplished the feat using cutting-edge tools to decode the order of the DNA bases that make up the genomes of the modern peanut's wild ancestors, which merged long ago to form the cultivated species grown today as a source of high-quality cooking oil and nutritious food.

A research paper published in the February 2016 issue of *Nature Genetics* describes the results of the team's draft genome-sequencing efforts. The advance should speed efforts to breed new peanut varieties that have desirable traits like higher yield; longer shelf life; and greater resilience to pests, diseases, and drought.

Similar size as human genome

According to Steven Cannon, one of four ARS participants on the Peanut Genome Project, the effort uncovers most of the genes and regulatory elements necessary for making a peanut plant. That's no small task, considering that the modern-day peanut's genome totals about 2.7 billion base pairs – a size approaching that of the human genome (3 billion base pairs).

The *Nature Genetics* paper clarifies humankind's domestication of these ancestral peanuts, says Steven, a plant geneticist at the ARS Corn Insects and Crop Genetics Research Unit in Ames, Iowa. "It is a bit of living genetic archaeology in the sense that the genome sequences tell us about how, where, and when the ancestor species came together to become the peanut that is grown by farmers now."

Scientists believe the merger happened 9000 to 10,000 years ago – quite possibly from wild peanut plants cross-pollinating in the hardscrabble plots of prehistoric farmers in what is today southeastern Bolivia.

One application of the latest sequencing effort will be the use of 'molecular markers' – specific genomic regions that can

ARS and international scientists found that the modern peanut is made of genomes from these two wild ancestors – *Arachis ipaensis* (left) and *Arachis duranensis* (right) – which merged 10,000 years ago. (Photo: Merritt Melancon/University of Georgia)

flag the presence of nearby genes of interest, such as those for resistance to pests like the root-knot nematode. Using technology to detect the markers, for example, peanut breeders can check and select for the resistance trait in seedlings instead of growing the plants to maturity, infecting them with nematodes, and waiting for symptoms to appear.

Ultimately, such marker-assisted selection should help speed commercialisation of sturdy new varieties with nematode resistance that will cut the need for chemical controls.

Scientists from nine countries (including Australia) participated in this phase of the Peanut Genome Project. Contributions by the ARS members Steven Cannon, Brian Scheffler, and Baozhu Guo, as well as Noelle Barkley (formerly with ARS), included providing bioinformatics support, peanut germplasm resources, and data to help describe and analyze genomic points of interest.

"Decoding the Peanut" was published in the September 2016 issue of the USDA's AgResearch Magazine. ■

Better dryland cotton yields with phosphorus

■ By Bede O'Mara, Subtropical Farming Systems Agronomist, Incitec Pivot Fertilisers

DRYLAND cotton growers may be missing out on yield if they plant without phosphorus fertiliser. Applying some fertiliser phosphorus increased dryland cotton yields by as much as 20 per cent in last year's trial at 'Colonsay' on the Darling Downs.

It took just 10 kg per hectare of phosphorus to increase yields by between 1.5 and 7.24 bales per hectare compared with the nil phosphorus treatment.

The results were surprising because the amount of phosphorus in the soil's reserves was already above the level thought to be optimum for dryland cotton. Phosphorus fertilisers would not usually have been recommended.

Bede O'Mara, Incitec Pivot Fertilisers.

Question the previous rules for P

This has prompted us to question the previous rules for phosphorus in dryland cotton.

All of the phosphorus rates tested (5, 10 and 20 kg per hectare) yielded significantly higher than where nil phosphorus was applied.

These treatments also had the benefit of greater phosphorus reserves in the soil, thanks to years of previous applications in trials at the site where the same rates of fertilisers are repeated in various crops including summer and winter cereals, pulses and cotton.

Standard 0–10 cm Colwell P soil tests taken in July 2014 measured 8.9 mg/kg of phosphorus in the nil treatment and 27.5 mg/kg in the five kg per hectare of phosphorus treatment (with a history of 15 kg per hectare of phosphorus pre 1999). There was 28 mg/kg in the 10 kg per hectare of phosphorus treatment and more than 60 mg/kg Colwell P in the 20 kg per hectare of phosphorus treatment.

The cumulative improvement of soil phosphorus nutrition over 30 years may have had a major impact on the results.

Coarse-rooted cotton plants generally do not proliferate around phosphorus bands like fine-rooted cereals, so the higher soil phosphorus gained from repeated applications in the rotation, along with the starter phosphorus applied pre-plant, drove the results.

Because the season was particularly wet, crop root exploration was better than average and the plants had more time to explore the enriched phosphorus environment closer to the soil surface and use it to their advantage.

Banding phosphorus fertiliser followed through to yield results because it gave the plant roots the boost they needed to get into the shallow subsoil zone where they could then exploit phosphorus reserves from previous applications.

This dryland cotton trial showed good yield responses to phosphorus last season.

This had a direct effect on yield.

The best results came from applying 20 kg per hectare of phosphorus with 120 kg per hectare of nitrogen under zero till, where 8.05 bales per hectare were harvested.

Further, the addition of phosphorus at all nitrogen rates improved yields and the performance of nitrogen significantly. We saw that phosphorus was valuable for improving nitrogen fertiliser use efficiency (NFUE) of the crop.

Where 120 kg per hectare of nitrogen was applied alone, it produced 11 kg lint per kg of nitrogen applied. This increased to 15.1 kg lint per kg nitrogen applied when 20 kg per hectare of phosphorus was applied as well.

Cotton growers are used to seeing the results from nitrogen in their crops and they know applying urea or BIG N is going to give them a good 'bang for their buck'. But these results show it's even better when phosphorus is also applied.

Based on these results, I'd be recommending further soil testing prior to sowing dryland cotton using Colwell P and BSES analysis, at both the 0–10 cm and the 10–30 cm depths.

While the previous calibration data suggests the critical level for phosphorus in dryland cotton at the 0–10 cm depth is around 15 mg/kg Colwell P, it could actually be as much as 25 mg/kg.

This was also found in the results of recent plot trials at the same site, conducted by Dr Brendan Griffiths from the University of New England. He saw responses to banding phosphorus fertiliser in dryland cotton until soil levels reached 25 mg/kg Colwell P.

Previous Incitec Pivot Fertilisers guidelines on the value of a small amount of phosphorus fertiliser (also known as a 'pop up' or starter) in colder or wetter planting conditions or following long fallows would seem to hold true – and this is what the 2016–17 season is looking like.

These findings will prompt a review of the critical soil phosphorus levels and interpretation guidelines to ensure dryland cotton growers continue to receive the best advice and fertiliser recommendations.

But if soil test results this season are showing less than 25 mg/kg, consider applying at least starter phosphorus to assist with crop growth and yields, as well as replacing the removal of nutrients by the crop and building soil reserves.

Don't forget that at a minimum, long term fertiliser programs should aim to replace the nutrients removed in a rotation. For example, this eight bale per hectare cotton yield would have removed around 20 kg per hectare of phosphorus from the system which needs to be replaced at some stage in the rotation.

That's similar to the phosphorus removal that would occur with a 5.5 to 6.5 tonne per hectare dryland sorghum crop, so why wouldn't you replace it with fertiliser?

We are recommending that growers use a quality granular product such as Granulock Z or MAP at rates of between 30 and 50 kg per hectare for ease of application at planting and compatibility with other crops they may be planting in their rotations.

Growers need to be mindful of seed safety when applying fertilisers in the same furrow as seed, and given the various planting configurations for dryland cotton, it is best they consult with their agronomist.

Incitec Pivot Fertilisers is continuing to focus on phosphorus in dryland cotton and other rotational crops in its research programs with the aim of refining recommendations for growers.

In the meantime, don't ignore phosphorus in the dryland cotton crop within your rotation – it can make all the difference in a favourable season.

Further information: please contact Bede O'Mara, 0417 896 377 or bede.omara@incitecpivot.com.au

Incitec Pivot Fertilisers appreciates the long-term support of FK Gardner & Sons and GD Farming at 'Colonsay'.

NUTRITION RESEARCH IN DRYLAND COTTON

Location: 'Colonsay' Darling Downs, Queensland
Managed by: Kalyx Australia for Incitec Pivot Fertilisers

Timing and conditions

The dryland cotton planted in 2014 was preceded by wheat, harvested in 2013. Fallow was managed as per district practice.

Soil testing was conducted in early July 2014. Fertilisers were pre-sown in a band offset five cm to the side of the intended plant line on July 22, 2014. Urea was used for nitrogen, triple superphosphate for phosphorus and Gran-Am for sulphur.

The crop was planted on November 30, 2014 and 81 mm of rain fell between planting and emergence.

A growing season rainfall (GSR) of 430 mm was recorded, including 124 mm of late rain following defoliation on 20 April which delayed harvest until June 9–10, 2015.

Snapshot of results

- Applying nitrogen improved cumulative yields throughout the rotation
- High levels of residual nitrogen improved yields
- Applying phosphorus with nitrogen improved the efficiency of nitrogen use
- All rates of phosphorus improved yields compared with none
- Higher soil phosphorus levels improved yields
- There were no significant responses to sulphur
- The highest yielding treatment was 120 kg per hectare of nitrogen with 20 kg per hectare of phosphorus.

'Colonsay' 2014–15 dryland cotton yield (bales/ha)

N rate (kg/ha)	P rate (kg/ha) 0	15/5	10	20	mean
0	5.57	7.05	6.58	7.26	**6.61**
40	5.97	7.51	7.31	7.29	**7.02**
80	5.62	7.32	7.46	7.92	**7.08**
120	5.74	7.54	7.59	8.05	**7.23**
mean	**5.72**	**7.35**	**7.24**	**7.63**	**6.99**

LSD (p=<0.05) 0.78 (N x P); LSD (p=<0.05) 0.39 (N or P rate)
Source: Incitec Pivot Fertilisers, dryland cotton trial at 'Colonsay' in Queensland, 2014-15.

Tapping sorghum's genetic potential

By Dennis O'Brien, Agricultural Research Service – USDA

SORGHUM offers something for just about everyone. For health-conscious consumers, it's a good source of fibre and antioxidants and is gluten free. For growers, it's productive under heat and drought and can thrive in soils where most other cereal grains can't. And for historians, Benjamin Franklin is credited with successfully introducing sorghum to the United States in 1757.

Decades of breeding has produced sorghum suitable for a swath of 14 US states extending from Texas to South Dakota. Sorghum is growing on 8.8 million US acres this year, which represents a 24 per cent increase from last year.

Tropical plant for temperate regions

But diseases and pests continue to evolve and threaten sorghum's future. Because sorghum originated in the tropics, there are challenges to breeding new varieties for temperate regions. Many tropical sorghums flower when day lengths are short. By the time the days are short enough for flowering in temperate regions, it's often too cold for producing a sorghum crop with sufficient grain.

Agricultural Research Service (ARS) plant geneticist Robert Klein, with the Crop Germplasm Research Unit in College Station, Texas, and his colleagues have developed new genetic resources for sorghum breeders – newly converted tropical sorghum lines that will thrive in temperate climates and have the genetic potential for high grain yields. The work is important because with climate change and water shortages, sorghum is becoming a critical option for staving off hunger overseas and an attractive alternative to crops that require more water.

Like other producers, sorghum growers are always interested in higher yielding crops.

"Sorghum growers face constant challenges, and we want to make sure sorghum stays economically viable in areas where it's become an important cash crop, as well as in areas where it's a vital source of food," Robert says.

Breeding trials

For breeding trials, Robert and his colleagues selected sorghum lines from the ARS Plant Genetic Resources Conservation Unit in Griffin, Georgia, that were known for producing high grain yields in countries such as Sudan and Ethiopia. Because they were originally from sorghum's centre of origin in Africa, the lines selected would not flourish in temperate regions. But they had the potential to produce high grain yields while offering resistance to some of nature's most daunting threats.

The researchers used molecular and traditional cross-breeding techniques. Essentially, they "converted" tall, late-flowering tropical sorghum plants into lines that will mature faster and come equipped with genes for combatting future generations of pests and diseases.

Along with helping to ensure sorghum's future, the work demonstrates the value of the ARS collection in Griffin, where sorghum lines from around the world are kept viable. "This work wouldn't have been possible without the USDA-ARS collection and the efforts of those who maintain it," Robert said.

The research was partially funded by the Sorghum Checkoff program, which is supported by growers. The results were published in the Journal of Plant Registrations in January 2016.

Sorghum growing at a breeding nursery. (Photo by Robert Klein)

Spring crop pest management requires integrated approach

GRAIN growers are intensifying their monitoring of crops as spring conditions promote insect pest population growth and activity, and potential crop damage.

Insect management experts say effective control of pests – this year and in the future – will require an integrated approach involving a mix of chemical, biological and cultural controls.

They say thorough routine monitoring is now required, especially in areas where the newly-introduced Russian wheat aphid (RWA) has established, as temperatures increase and crops reach critical growth stages.

Entomologists who co-ordinate the Grains Research and Development Corporation-supported PestFacts news services report that RWA populations appear to have stabilised in most parts of Victoria and southern New South Wales, while in South Australia reports indicate a rise in populations in some areas, as would be expected with gradually warming temperatures. The number of winged adults in SA has also increased, indicating that some levels of dispersal are likely to have commenced.

To support growers in their efforts to control RWA and other insect pests, the GRDC has produced a video which outlines the principles of Integrated Pest Management (IPM) and provides useful advice on dealing with RWA.

The video features cesar entomologist Dr Paul Umina outlining the GRDC's RWA FITE strategy, based on the four steps of:

- Find;
- Identify;
- Threshold Approach; and,
- Enact.

Paul says while individual circumstances will dictate each grower's response, the FITE strategy remains the cornerstone plan of action.

"The first step of the FITE strategy is about how to find and locate RWA within cereal paddocks," Paul says. "The second step is positive identification of RWA through consultation with an industry specialist.

"The next step is to adopt a threshold approach. Based on overseas literature there are two indicative thresholds suggested for consideration by growers in Australia. Up until the tillering stage, the suggested economic threshold of when chemical sprays should be applied, is when 20 per cent or more plants are infested with aphids. As we step into the high risk period in spring, from tillering onwards that threshold is reduced to 10 per cent or more tillers infested with RWA."

Paul says given that the aforementioned thresholds are indicative only, based on overseas information, growers and advisers should make a decision based on their individual situation and consider other factors including crop yield potential, actual number of aphids per individual tiller, timing of infestation and cost of the control measure to be applied.

"The fourth step is around enacting an appropriate management strategy for each individual situation. Currently there are two chemicals listed for RWA control under emergency use permit 82792 issued by the Australian Pesticides and Veterinary Medicines Authority.

"Those two products are chlorpyrifos and pirimicarb. If chemical control is warranted, consider using pirimicarb which is softer on many beneficial species."

Growers are reminded of the longer (six week) withholding period for grazing and harvest when using pirimicarb and should always read the product label before use.

Bee Aware

Paul encourages growers to "Bee Aware" and consider the impact of insecticides on foraging bees.

The positive contribution of beneficial insects to IPM strategies has been underlined in recent weeks, with high populations of parasitoid wasps associated with RWA populations, along with several predatory insects such as brown lacewings, hoverflies and ladybird larvae.

With rising temperatures, cesar consultant and graduate of the GRDC and Agriculture Victoria's Agronomist Development Program, Julia Severi, says populations of beneficial insects are likely to increase and assist in controlling RWA populations.

Julia explains in the GRDC video that encouraging beneficial insects is an important element of IPM, which not only aims to prevent pests from reaching economically damaging levels, but to provide a long-term solution to crop pest incursions.

"IPM is not about abandoning chemical use all together. Rather, it aims to reduce our reliance on pesticides as the sole means of pest control on farms," Julia says.

"We know that when we rely on pesticides too much, we often get problems with resistance and eventual control failures down the track."

Julia says the four steps to adopting IPM principles begin with routine monitoring of both pests and beneficial species, followed by positive identification of pest or beneficial species.

"If spraying is warranted, choose selective over broad spectrum insecticides where possible, and the final step involves incorporation of cultural control methods such as crop rotation, time of sowing, grazing, tillage and cultivation, to make the environment less favourable to pests."

The management of RWA and other insect pests video can be viewed at. https://www.youtube.com/watch?v=iH6nnU-JKlo

Further information: Paul Umina, cesar. Ph: 03 9349 4723

More information on IPM is available via the GRDC-supported IPM Guidelines for Grains website at www.ipmguidelinesforgrains.com.au. GRDC Project Code: DAQ00201 ■

Consultant Julia Severi, of cesar, says IPM not only aims to prevent pests from reaching economically damaging levels, but to provide a long term solution to crop pest incursions. (PHOTO: cesar)

New northern GRDC panel chair

THE Grains Research and Development Corporation (GRDC) has announced the appointment of New South Wales grain grower and agricultural consultant John Minogue to the role of northern panel chair.

John operates a mixed broadacre farming business and an agricultural consultancy - Agricultural and General Consulting – at Barmedman in south-west NSW and is a former GRDC southern panel member.

He replaces outgoing panel chair James Clark, a widely-respected and long serving GRDC northern panellist who has overseen the development and implementation of a progressive Northern Region Strategy in recent years to ensure that levy investment is well-targeted, nets a tangible return for growers and reflects growers' research needs and priorities.

GRDC chairman Richard Clark said delivery of the Northern Region Strategy would continue to be a core priority for GRDC and the northern panel under John's chairmanship.

"John brings vast experience to the northern panel chair role as a fifth generation grain grower, agricultural consultant, a former GRDC southern panel member and more recently as a northern panellist," Richard said.

"Importantly, John is a strong leader with the ability to galvanise an effective team. This will enable the northern panel to continue providing a strong voice for Queensland and NSW growers to ensure that their research needs and priorities are communicated back to the research community and GRDC."

An enduring strength of the GRDC, the panel system provides a practical conduit between growers, the research community and GRDC and plays an important advisory and strategic role in GRDC investments across the research, development and extension (RD&E) spectrum.

"An effective panel is fundamental to progressing the Northern Region Strategy which aims to improve the productivity and profitability of northern grain operations, build research capacity and address succession planning within our research community as well as increase GRDC's presence within the key production areas of NSW and Queensland," Richard said.

"Outgoing chair James Clark has played a pivotal role in the development of the Northern Region Strategy, having served as a panellist since 2005 and panel chair since 2008 and I'd like to thank him for his invaluable contribution to both GRDC and the wider northern grains industry."

Diverse region requires panellists from varied backgrounds

The GRDC's northern region which stretches from the Victorian/NSW border to central Queensland, represents the most diverse production region in Australia, characterised by relatively high seasonal rainfall and production variability, high inherent soil fertility and the production of a broad range of winter and summer crops.

Given the region's diversity, northern panellists are strategically located across NSW and Queensland and bring a broad range of farming, agronomic and research expertise to the table.

The current northern panel incorporates John Minogue; NSW grower Tony Hamilton, Forbes; NSW agronomy consultant Andrew McFadyen, Coolah; Queensland grower Arthur Gearon, Chinchilla; former southern panel member and NSW grower Neil Fettell, Condobolin; NSW Department of Primary Industries agronomist, Loretta Serafin, Tamworth; NSW based consultant Jules Dixon; NSW agronomist Penny Heuston, Warren; Queensland agronomist and grower Jack Williamson, Goondiwindi; and GRDC executive manager research programs, Brondwen MacLean, Canberra. ■

Incoming Grains Research and Development Corporation (GRDC) northern panel chair, John Minogue.

New era for northern chickpeas

THE reliability of chickpea production has entered a new era with the recent release of a new variety that promises to deliver superior disease resistance and standability.

The release of the new desi variety, PBA Seamer, was announced by New South Wales Minister for Primary Industries, Lands and Water, Niall Blair and Grains Research and Development Corporation (GRDC) northern panel chair (immediate past) James Clark at the AgQuip Field Days at Gunnedah in August.

James said PBA Seamer (CICA 0912) offered superior disease resistance to existing varieties PBA HatTrick and PBA Boundary, with the potential to deliver valuable yield benefits in high-pressure disease years.

"PBA Seamer has a number of agronomic benefits that will help keep dollars in growers' pockets through yield improvements and reductions in fungicide costs," James said.

"This is particularly relevant in years like this one where large areas of the north are experiencing a wetter than average season which vastly increases the risk of yield loss from diseases such as ascochyta blight and botrytis grey mould."

The release is the result of targeted long term investment in chickpea breeding by the GRDC and research partners NSW Department of Primary Industries and Pulse Breeding Australia.

In addition to improved Ascochyta blight resistance to PBA HatTrick and PBA Boundary, PBA Seamer offers moderate resistance to Phytophthora root rot, equivalent to PBA HatTrick.

It is a semi-erect plant type with superior lodging resistance and a larger seed size than PBA HatTrick and PBA Boundary and is preferred by end users due to a greater dahl milling yield.

It's broadly adapted to suit the northern production regions from central NSW to Central Queensland. ■

SOUTHERN AUSTRALIA FOCUS

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

Planning ahead will help achieve barley grass control

GROWERS concerned about barley grass should check crops before harvest and 'rank' paddocks according to levels of the weed to help guide management and seeding strategies for the next cropping season.

This was the advice from University of Adelaide research officer Ben Fleet when he addressed a WA WeedSmart Week forum in Perth where industry experts and growers shared insights and research into tackling weeds.

Ben has conducted Grains Research and Development Corporation (GRDC) supported research into barley grass in South Australia, where it has become a major weed in lower rainfall areas including the northern Eyre Peninsula, causing high control costs and yield losses.

Barley grass is regarded as an 'emerging weed' in WA cropping systems.

Ben said it was a good time to inspect paddocks for barley grass following final post-emergent herbicide applications and before harvest.

"Ideally, where barley grass is found to be prevalent, two consecutive seasons of high control is recommended to help deplete seedbank numbers," he said.

'Dormancy' is a big issue

Ben said many South Australian barley grass populations had developed high levels of 'dormancy' due to selection pressure from reliance on pre-sowing weed management practices such as knockdown herbicide use, and germination was being triggered later in the season by wet, cold conditions.

Dormancy is when viable seed does not germinate under ideal germination conditions.

Ben said there could be limited control measures available to manage barley grass populations emerging in cereals.

"But time of sowing can be manipulated to help manage dormant barley grass," he said.

"When there are very early breaking rains, growers can sow their 'dirtiest' paddocks early to allow the crop to get established before the barley grass germinates, resulting in a higher competitive advantage for the crop against dormant weeds.

University of Adelaide research officer Ben Fleet says two consecutive seasons of high control is recommended to help deplete seedbank numbers where barley grass is prevalent.

Many barley grass populations are developing 'dormancy' which means increased weed pressure later in the season.

"Alternatively, if there is a late start to the cropping season, growers can delay sowing these weediest paddocks so they have the best chance of achieving an effective control with a knockdown herbicide.

"Crop competition can also be improved by using narrow row spacings and increased seeding rates."

Ben said growers could help preserve the effectiveness of post-emergent Group A and B herbicides by using multiple weed control tactics.

Barley grass is the focus of WA-specific research as part of the project 'Seedbank biology of emerging weeds' – national GRDC-funded research conducted in WA by the Department of Agriculture and Food (DAFWA) and overseen by Gurjeet Gill, of the University of Adelaide.

DAFWA researcher Abul Hashem said this WA research was showing that barley grass was emerging later than it had in the past and that it was now tending to emerge in-crop and one to two weeks later than brome grass.

"This suggests that barley grass populations may be developing dormancy in WA and that application of effective in-crop herbicides and adjusted seeding strategies may also be necessary in this state to control late emergence of this weed," he said.

Liming also reduces grass density

Abul said recently completed GRDC-funded research by DAFWA, in collaboration with the Australian Herbicide Resistance Initiative, had shown that applying two to three tonnes per hectare of lime sand to WA acid soil significantly reduced barley grass density in three to four years.

Other emerging weeds of WA being investigated in the 'Seedbank biology of emerging weeds' project include Afghan melon, brome grass, button grass, caltrop, doublegee, roly-poly, sowthistle, windmill grass and wireweed.

Abul and his team are collecting seed of the weeds and studying seed dormancy, seed dispersal, seed bank persistence, seed production potential, and competitiveness with crops.

More information about barley grass management is available by searching 'barley grass' on the DAFWA website www.agric.wa.gov.au

WA WeedSmart Week was held from August 8 to 12. It also included a program on crop disease research by the Centre for Crop and Disease Management (CCDM) and a road trip visiting WA growers.

WeedSmart is an industry-led initiative to enhance on-farm practices and promote the long-term sustainability of herbicide use in Australian agriculture. GRDC is its main sponsor. Other sponsors include Bayer CropScience, Monsanto, Nufarm, Sinochem and Syngenta. ■

Slashing yield losses from waterlogging

TASMANIAN farmer and 2014 Nuffield Scholar, Greg Gibson, says there's money to be made in better understanding the true cost of waterlogging and subsequent yield losses in farming.

He says waterlogging is a significant issue in his region in northern Tasmania, where he manages his family's 730 hectare intensive farming operation.

Greg runs a cropping program consisting of alkaloid poppies, onions, processing peas, potatoes and an array of seed crops, as well as a lamb trading operation fattening 10,000 head.

Past yield losses of between 50–100 per cent on his property due to inadequate draining, prompted him to investigate the causes of waterlogging, and the variety of monitoring tools available worldwide.

His 2014 Nuffield Scholarship, supported by the Sidney Myer Fund, allowed him to travel to the US, Canada, the UK and the Netherlands to research global best practice in combatting waterlogging, and build on existing systems on his own farm.

Systematic approach to reduce waterlogging

"My goal was to find out if there is a systematic approach to reduce waterlogging, and in turn yield losses, in the countries I visited," he said.

"This would potentially allow me to bring non-performing ground into production through better water management and

Greg Gibson (right) with UK-based drainage contractor, Les Cotton, during Greg's Nuffield travels in 2014.

soil health, including Variable Rate Irrigation (VRI), soil moisture monitoring and drainage."

Greg said high rainfall zones like Tasmania and Victoria typically experience lost production due to waterlogging, and believes it's a significant issue for many other farmers too.

"The importance of understanding how much waterlogging really costs agriculture in Australia cannot be over-emphasised. We cannot continue to expend valuable resources on unproductive ground," he said.

"Randall Reeder, an Ohio State University Extension agricultural engineer, said that for every $1 spent on drainage technology, producers get $3 to $4 back in corn and soybean profits.

"That's a pretty big call, and past losses in my own system lead me to believe that he's right.."

Manageable causes of waterlogging

Accepting that rainfall and soil type were the two non-negotiable factors of his operation, Greg identified over-irrigation, poor drainage and compaction as the manageable causes of waterlogging on his farm.

"I am looking at developing a management plan – potentially including VRI – to reduce over-watering, Controlled Traffic Farming (CTF) to limit compaction, and surface/subsurface drainage to alleviate problem areas," Greg said.

"There's some exciting new technology available in this field, particularly in irrigation, that I am currently investigating for use on my own farm."

Greg is experimenting with strip-tillage and plans to trial as many crops as possible, working in conjunction with cover crops to improve soil health. His aim is to work towards a full CTF strip-till system in the crops that allow wider row spacings.

"Moving forward, I will be collecting as much relevant data as I can, and sharing knowledge with other farmers in the industry," he said.

"The agricultural community is renowned for being industrious and innovative. This, combined with new technologies and programs like Nuffield, means we've got solutions at our fingertips."

For more information contact Greg on Mob: 0419 528 165, E: gibsonag@bigpond.com

Nuffield Australia provides opportunities to Australian primary producers and managers to travel the globe investigating a research topic important to them and Australian agriculture. Scholars are provided with a $30,000 bursary to embark on a 16-week program consisting of both group and individual travel over a two-year period. ■

Over-irrigation, poor drainage and compaction are key causes of waterlogging.

Extended fallows put to the test

THE use of longer-term tactical spray fallows, which 'spell' paddocks into the winter growing season, are becoming increasingly popular with grain growers particularly in lower rainfall areas. These extended fallows can reduce risks associated with seasonal variability, herbicide resistant weeds and growing non-profitable crops in poor years.

According to Grant Thompson, of Crop Circle Consulting based in Gerladton WA, yield advantages can be as high as 0.5–1 tonnes per hectare for wheat and 0.5 tonnes per hectare for canola. Herbicide savings can be about $15–$50 per hectare.

"By strategically knocking down weeds in fallow paddocks during the summer months or at seeding time – and keeping these paddocks clean from weeds until the next year's sowing period – vital soil moisture for the next 18 months is conserved," he said.

"This next crop should be healthier, have a lower weed burden, produce more grain yield and be more likely to generate a higher two-year gross margin than growing two low-yielding cereal crops.

"But a clean spray fallow can be costly to set up in a low rainfall environment, especially if there are multiple winter and summer weed germinations, and there is also concern about reliance on glyphosate in this phase," Grant says.

Fallow trials

To boost grower confidence in the system, the GRDC – through its Kwinana East and Geraldton Regional Cropping Solutions Networks – is supporting fallow trials providing local data about:

- The effectiveness of summer and winter weed control from a wide range of herbicides;
- Crop tolerances to residual herbicides in the treated soil; and,
- Grain yields and quality from growing crops to full potential on stored winter and summer rainfall.

The trials were established in 2015 at Wyalkatchem, Mingenew and Mullewa and are being conducted by Grant and Quade AgriServices Landmark agronomist Bernie Quade.

More than 20 knock-down and residual herbicide options are being assessed, along with new crop technologies that include: 2-gene Clearfield wheat (CL); imidazolinone (IMI) tolerant barley; a new short-season Clearfield canola (CL) and a dual-tolerant Triazine tolerant/RoundupReady (RT) canola.

Tactical spray fallow trials at Mingenew. (Photo Grant Thompson)

Mullewa site – 2015 results summary

Grant says at this site, a range of IMI herbicide treatments showed potential suitability for fallow or pre-emergent use under the CL wheat system – with little or no yield penalty.

The highest yield of 3.55 tonnes per hectare and highest economic return for this variety was achieved with an IMI herbicide applied prior to sowing in April. This was almost 1.0 tonne per hectare higher than the average yield in untreated control plots. As expected, the highest rates of atrazine and terbuthylazine seriously affected the CL wheat yields.

Grant says the same three top performing IMI herbicide treatments in CL wheat plots provided the highest yields in the short-season CL canola plots, ranging from 0.98 to 0.85 tonnes per hectare. This was above the 0.65 tonnes per hectare average yield in the untreated control plots.

The dual-tolerant RT canola performed best in the atrazine treatments and yields were lowest in the IMI herbicide and terbuthylazine treatments at this site – with the crop affected by maturity length and inherent yield and fitness penalty associated with TT attributes.

Soil moisture testing at the Mullewa site in April 2016 showed the 5–10 cm layer was noticeably wetter in the fallow plots from 2015, compared to the wheat-on-wheat plots and were more conducive to a seeding opportunity.

By June 2016, Grant says the IMI tolerant barley at this trial site had emerged strongly compared to the other cereal varieties, especially on fallow plots from 2015.

Mingenew – 2015 results summary

Crops at the Mingenew RCSN trial site were planted into good moisture in 2015. But a rapid onset of warm and dry weather, little follow-up rainfall and an infestation of Green Peach Aphid affected oilseed plots and harvest results were not collected.

Wheat plots survived and the highest yielding and highest economic return treatments tended to be where the middle (and lower) rates of several IMI herbicides were used.

High rates of atrazine and terbuthylazine caused significant yield loss at this site.

Grant says in May 2016, the CL wheat plots that were planted back-to-back on CL wheat were showing fewer herbicide effects than those planted on fallowed plots from 2015.

Non-tolerant wheat and barley were showing less vigour and biomass in early winter 2016 on plots where higher rates of the IMI herbicides were applied in 2015.

At this stage, Grant says the CL wheat and barley were showing much less response to the varying rates of IMI treatments applied in 2015.

He says the CL canola at this site appeared to have very good tolerance to all rates of some IMIs and all rates of the two triazine treatments.

"The RT canola was adversely affected by all IMI treatments, but was tolerating the triazine residues well at June 2016."

Wyalkatchem site – 2015 results summary

The highest yields at the Wyalkatchem site were achieved with the highest rates of two IMI herbicides and there were few significant yield differences between plots where any of the IMI products/rates were used. Treatment differences could have been reduced by the very dry season at this site. Atrazine treatments were very damaging to the CL wheat, as was terbuthylazine. ■

Spring crop pest management requires integrated approach

GRAIN growers are intensifying their monitoring of crops as spring conditions promote insect pest population growth and activity, and potential crop damage.

Insect management experts say effective control of pests – this year and in the future – will require an integrated approach involving a mix of chemical, biological and cultural controls.

They say thorough routine monitoring is now required, especially in areas where the newly-introduced Russian wheat aphid (RWA) has established, as temperatures increase and crops reach critical growth stages.

Entomologists who co-ordinate the Grains Research and Development Corporation-supported PestFacts news services report that RWA populations appear to have stabilised in most parts of Victoria and southern New South Wales, while in South Australia reports indicate a rise in populations in some areas, as would be expected with gradually warming temperatures. The number of winged adults in SA has also increased, indicating that some levels of dispersal are likely to have commenced.

To support growers in their efforts to control RWA and other insect pests, the GRDC has produced a video which outlines the principles of Integrated Pest Management (IPM) and provides useful advice on dealing with RWA.

The video features cesar entomologist Dr Paul Umina outlining the GRDC's RWA FITE strategy, based on the four steps of:

- Find;
- Identify;
- Threshold Approach; and,
- Enact.

Paul says while individual circumstances will dictate each grower's response, the FITE strategy remains the cornerstone plan of action.

"The first step of the FITE strategy is about how to find and locate RWA within cereal paddocks," Paul says. "The second step is positive identification of RWA through consultation with an industry specialist.

"The next step is to adopt a threshold approach. Based on overseas literature there are two indicative thresholds suggested for consideration by growers in Australia. Up until the tillering stage, the suggested economic threshold of when chemical sprays should be applied, is when 20 per cent or more plants are infested with aphids. As we step into the high risk period in spring, from tillering onwards that threshold is reduced to 10 per cent or more tillers infested with RWA."

Paul says given that the aforementioned thresholds are indicative only, based on overseas information, growers and advisers should make a decision based on their individual situation and consider other factors including crop yield potential, actual number of aphids per individual tiller, timing of infestation and cost of the control measure to be applied.

"The fourth step is around enacting an appropriate management strategy for each individual situation. Currently there are two chemicals listed for RWA control under emergency use permit 82792 issued by the Australian Pesticides and Veterinary Medicines Authority.

"Those two products are chlorpyrifos and pirimicarb. If chemical control is warranted, consider using pirimicarb which is softer on many beneficial species."

Growers are reminded of the longer (six week) withholding period for grazing and harvest when using pirimicarb and should always read the product label before use.

Consultant Julia Severi, of cesar, says IPM not only aims to prevent pests from reaching economically damaging levels, but to provide a long term solution to crop pest incursions. (PHOTO: cesar)

Bee Aware

Paul encourages growers to "Bee Aware" and consider the impact of insecticides on foraging bees.

The positive contribution of beneficial insects to IPM strategies has been underlined in recent weeks, with high populations of parasitoid wasps associated with RWA populations, along with several predatory insects such as brown lacewings, hoverflies and ladybird larvae.

With rising temperatures, cesar consultant and graduate of the GRDC and Agriculture Victoria's Agronomist Development Program, Julia Severi, says populations of beneficial insects are likely to increase and assist in controlling RWA populations.

Julia explains in the GRDC video that encouraging beneficial insects is an important element of IPM, which not only aims to prevent pests from reaching economically damaging levels, but to provide a long-term solution to crop pest incursions.

"IPM is not about abandoning chemical use all together. Rather, it aims to reduce our reliance on pesticides as the sole means of pest control on farms," Julia says.

"We know that when we rely on pesticides too much, we often get problems with resistance and eventual control failures down the track."

Julia says the four steps to adopting IPM principles begin with routine monitoring of both pests and beneficial species, followed by positive identification of pest or beneficial species.

"If spraying is warranted, choose selective over broad spectrum insecticides where possible, and the final step involves incorporation of cultural control methods such as crop rotation, time of sowing, grazing, tillage and cultivation, to make the environment less favourable to pests."

The management of RWA and other insect pests video can be viewed at. https://www.youtube.com/watch?v=iH6nnU-JKlo

Further information: Paul Umina, cesar. Ph: 03 9349 4723

More information on IPM is available via the GRDC-supported IPM Guidelines for Grains website at www.ipmguidelinesforgrains.com.au. GRDC Project Code: DAQ00201 ■

A new Clearfield wheat variety with excellent yield potential

INTERGRAIN'S Dan Mullan bred the company's newest wheat – Chief CL Plus – and named it. While breeders sometimes do get 'naming rights', it doesn't always come their way.

As Dan explains it, he pushed InterGrain CEO Tress Walmsley for the name of the Clearfield APW wheat, trialled as IGW6089, because he was confident it would be "the leader in its field".

InterGrain WA Territory Manager, Kynan Jackson, recently launched Chief CL Plus at Gary Butcher's Nugadong farm on Great Northern Highway, half way between Dalwallinu and Wubin, as part of Liebe Group's 2016 spring field day.

According to Kynan, InterGrain has trialled Chief CL Plus within its program and National Variety Trials for several years and excitedly watched its performance due to its exceptional yield potential.

Current yield data indicates Chief CL Plus is on average 12 per cent higher yielding than Justica CL Plus and, on average, one to two per cent higher yielding than Mace across WA.

"We've also recently received APW classification in WA for Chief CL Plus, which is very exciting news for growers who now have this new Clearfield Plus wheat available and it's so well rated," he said.

Chief CL Plus is a mid-maturing line which can be sown slightly earlier than Mace and it has excellent yellow spot resistance, coupled with a very effective disease resistance package.

Dan believes that with Chief CL Plus rated MR – the highest available yellow spot resistance rating currently given to varieties – the new InterGrain wheat is 'the yellow spot chief'

"Historically, Clearfield Plus lines have been very poor for yellow spot and while growers have cleaned up weeds, they haven't had access to good yellow spot resistant varieties, with the exception of InterGrain's Impress CL Plus. Having Chief CL Plus solves both problems as it leads the market in this resistance in terms of recent releases," he said.

"Clearfield wheats have, in the past, been inferior yielding to conventional wheats, therefore limiting their uptake."

A yield benchmark changer

"But Chief CL Plus signals a yield benchmark changer, while offering growers an excellent varietal option in its own right and the bonus luxury of Intervix tolerance.

"Chief CL Plus is exciting because it's performed and yielded so consistently well across WA's ag-zones," Dan said.

The advantage of a mid-maturing wheat with Clearfield Plus tolerance is that it can be sown early or even dry sown, with the added subsequent convenience of cleaning up weeds, including problem grasses such as brome, later in the program.

A Clearfield Plus wheat also means growers don't have to worry about residue issues from previous imidazolinone tolerant barley or canola that may still be in the system.

Chief CL Plus also has very good grain size (similar to Wyalkatchem) and this is highly advantageous if dry spring conditions prevail.

It is also slightly longer maturing than Mace and its ideal sowing window is early to late May.

In summary, the key features of Chief CL Plus are:

- Highest yielding Clearfield Plus wheat in WA;
- On average 12 per cent higher yielding than Justica CL Plus;
- Mid-season maturity and APW classification;
- Excellent disease resistance package, superior yellow spot resistance;
- Registered for label rate applications of Intervix herbicide; and,
- Available for planting in 2017.

For more information, contact Kynan Jackson at InterGrain, Mob 0427 855 059 or Email kjackson@intergrain.com ■

InterGrain's Dr Dan Mullan, who bred and named Chief CL Plus, the company's newest wheat, is confident it will be the leader in its field.

Launching Chief CL Plus at Liebe Group's 2016 spring field day, InterGrain WA Territory Manager, Kynan Jackson, said trials showed its exceptional yield potential.

New barley varieties are a great fit in this mixed farming operation

HIGH yields, easier harvest and a positive outlook from maltsters for Flinders barley are just some of the benefits that make this new variety an ideal replacement for Bass, according to Andrew Slade of Mount Barker, WA.

After trialling and bulking-up Flinders last season, Andrew went on to plant 350 hectares on his farm this autumn.

He's pleased with the decision and it's growing very well to date, despite a particularly wet growing season. It seems to handle the conditions well and last year yielded 5.5 tonnes per hectare and achieved malt specifications despite a tough finish.

Andrew explained that for his situation, Bass had not been consistently achieving malt grade due to colour issues. It also suffered head loss at harvest time.

"Flinders offers much better rust resistance and was really easy to harvest. Very noticeable last season was its shorter straw and reduced head loss compared to Bass," he said.

Andrew believes Flinders will also be better able to cope with pressure from barley leaf rust and powdery mildew.

An important observation was that unusual levels of powdery mildew were observed in 2015 in Oxford barley, which was previously rated as resistant. Samples collected from infected Oxford barley plants were tested at Curtin University's Centre for Crop Disease Management (CCDM) and they confirmed there is a powdery mildew pathogen population with virulence for the MlSt resistance gene.

Oxford and other varieties which possess the MlSt gene, therefore should now be treated as moderately susceptible to powdery mildew, particularly in the lower Great Southern.

Rosalind provided another barley upgrade

In the lead up to 2016, Rosalind had exhibited an approximate five per cent yield improvement compared to Hindmarsh across WA Agzones.

The yield advantage in itself proved inviting, with Andrew planting 200 hectares of Rosalind this season. He bulked this feed variety up last season where it yielded a very pleasing 5.7 tonnes per hectare.

Feed barley complements Andrew's sheep and cattle production where he feeds out grain and sells excess production.

"Rosalind has shown impressive vigour, which really helps suppress weed growth," he said.

"We plant our rows east to west to help manage weeds and Rosalind's shading of weeds is outstanding, it just grows so fast.

"Rosalind's mid-season maturity also works well in our seeding program. We can start with Flinders, being a mid-long season, and then move into Rosalind, helping us to spread our flowering window risk.

"We need feed grain for livestock, which is where the Rosalind fits in, while we are growing Flinders for its malt premiums," he said. ■

Mount Barker farmer, Andrew Slade with two new barley varieties he has grown commercially this season. On the left is Flinders and on the right is Rosalind.

Vegetable oils remove heavy metals from water

By Sandra Avant, Agricultural Research Service – USDA

AT A GLANCE...

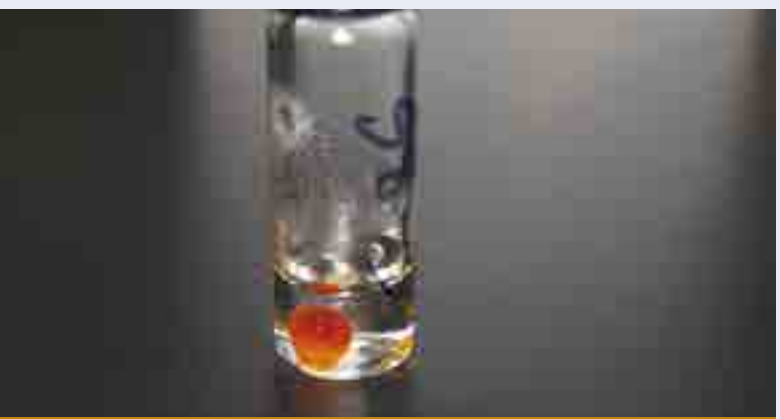
- A new ARS-patented process modifies vegetable oils.
- The modified vegetable oils extract metals from water.
- Corn oil extracted more metals than canola oil.

DANGEROUS lead levels in drinking water in cities across the globe are of major concern. Water contaminated with lead, mercury, or other heavy metals poses serious problems for not only our health but also for our environment.

At the Agricultural Research Service's (ARS) National Center for Agricultural Utilization Research (NCAUR) in Peoria, Illinois, scientists are investigating safe ways to remove heavy metals from various substances. Recently, they developed and patented a new method that uses vegetable oils to remove metals from liquids, solids and gases.

Rex Murray, research leader at NCAUR's Bio-Oils Research Unit, and his colleagues have created a chemical process to modify vegetable oils into "functionalised" vegetable oils that effectively separate heavy metal ions from water.

The team included chemist Kenneth Doll, physical scientist Grigor Bantchev, chemical engineer Robert Dunn, and physical science technician Kim Ascherl.



In the vial, the oil droplet's red colour shows that it absorbed metals from the water/metal solution. (Photo: Kim Ascherl)

Excellent environmental attributes

Vegetable oils have excellent environmental attributes, Rex says. They are biodegradable, nontoxic, and derived from renewable resources. NCAUR scientists have a history of developing different nonfood uses for vegetable oils, including as inks, diesel fuel, and lubricants.

In earlier research, Grigor Bantchev produced sulfide-modified vegetable oil lubricants from canola and corn oil, which led to heavy-metal extraction research.

"We found that our bio-oils – functionalised vegetable oils – that were used as lubricants are also good for absorbing heavy metals. The process is simple," Rex says.

"When you mix the functionalised oil with water contaminated with toxic heavy metals, certain atoms in the oil bind to the heavy metals, pulling them out of the water.

"The clean water can then be easily separated from the heavy-metal-containing oil, and the oil can then be safely removed from the environment.

"We analysed the amount of metal removed by different functionalised oils," Rex says. "Corn oil worked better than canola oil. We believe a different fatty-acid content in corn oil leads to its better metal-binding capabilities."

This research shows that modified vegetable oils hold promise as a safe method to help clean up heavy-metal waste in the future, Rex adds. Other studies are under way to determine the effectiveness and ability of vegetable oils to extract other metals from solutions.

For more information contact Rex at: Rex.murray@ars.usda.gov ■

The grain protein lottery and prospects for this year's crop

By Peter McMeekin, Nidera Australia Originations Manager

AS at the end of September, protein spreads for new crop wheat remain well supported and the market continues to be cautious regarding the profile of the crop heading into harvest.

This support is being driven by the elevated potential for continued, La Niña-like, wet conditions on the east coast as harvest approaches and the recent frost events in Western Australia.


Peter McMeekin.

Week-on-week (up to September 29) we have seen the east coast H2 premium over APW increase by $2 per tonne to be around $28. Over the same period the ASW discount to APW on both the east coast and in South Australia has been steady at $15 and $13 respectively.

This is all happening as harvest commences in Central Queensland – the harvest 'gut slot' across Australia is probably only a month away and we are looking at a potential record crop.

As we stand at the beginning of October, the protein profile of this year's wheat crop is anybody's guess.

I have seen plenty of widely varying estimates on the proportion of the wheat crop going APW or better – suggesting it would be easier to hit the bullseye on a dart board down at the local at 2 am than get close to the final outcome.

Good rewards for quality this year

But growers seems to be the most optimistic and I hope they are right as there will be relatively good rewards this year for quality wheat.

As we know the eastern Australia has seen plenty of rain throughout the growing season and the land is now saturated leading to flood events across many areas of southeastern Australia.

This should lead to a dilution of protein and a higher proportion in the ASW/AGP bins, but there is still plenty of urea going onto accessible country in an attempt to maintain protein and bank the rewards. This is a very game strategy in a year such as this, but "one will never ever know if one never has a go!"

In Western Australia frost events on September 17 and again on the 23rd generated an enormous amount of Twitter traffic. Unfortunately with frost, the production impact is not immediately evident and is not truly known until headers go into the paddock. That said there will undoubtedly be areas cut for hay in WA and a quality and production impact on those affected crops that go through to harvest.

The most unfortunate consequence of the rain and frost is that Australia will be producing more of what the world already has – plenty of feed wheat.

In Russia, the situation is similar as their record harvest winds up with a significant portion of the later crops affected by sprouting.

The Canadian harvest has been progressing slowly and continues to be hampered by rain, which is certainly having an effect on the quality profile.

Export values

On the export front, east coast values remain rich compared to levels where business is currently being done into Asia out of the Black Sea and Russia.

APW values in South Australia and Western Australia are close to working into export channels, but only to destinations with inelastic Australian demand at the moment.

In the US, winter wheat plantings have started and are running at an average pace versus the past five years. But the market is generally expecting a 5 to 7 per cent decrease in planted acres in the US – but there are no significant pull back in acres elsewhere across the globe.

So it is hard to expect global supply of wheat to be noticeably down (based on planted area alone) next season. A sizeable weather disruption somewhere and sometime in the next six to 12 months would be needed to reduce (very comfortable) supply levels.

For more information see: www.nidera.com.au or call the Grower Hotline on 1300 NIDERA ■

Taking stock of the world wheat crop

By Stephanie Bryant-Erdmann, US Wheat Associates Market Analyst

WHILE world wheat production volume and supply are once again remarkably high, buyers around the globe are concerned about how much of the new crop will meet quality and milling requirements. The USDA's September forecast of total world wheat production stands at 745 million tonnes (mt). That is up one per cent from 2015–16. At the same time, the USDA expects global wheat consumption to be 4 per cent higher at 737 mt, compared to 709 mt in 2015–16.

The following is a look at production and quality expectations for major exporting regions and countries.

United States

With generally very favourable growing conditions, projected US wheat supplies for 2016/17 are raised with the prospects of a larger crop of around 64.5 mt – 13 per cent bigger than last season despite a 6 per cent drop in harvested wheat area to 17.8 million hectares.

Average US wheat yield for this season is estimated at 3.6 tonnes per hectare. In 2015/16, the average US wheat yield was three tonnes.

Black Sea

On September 19, Russia's Ministry of Agriculture reported that wheat harvest there was 90 per cent complete. To date, the reported average yield is 2.90 tonnes per hectare compared to 2.65 tonnes on the same date in 2015. Russian consultancy SovEcon pegged 2016–17 Russian wheat production at 70.8 mt, down 500,000 tonnes from its previous estimate, but still up 16 per cent from 2015–16 levels.

Stratégie Grains (SG) has reported that Ukrainian farmers harvested 24.2 mt of wheat this year, down 5 per cent from 2015–16 despite a record yield of 3.9 tonnes per hectare.

Kazakhstan wheat harvest is advancing despite scattered showers. SG pegged 2016–17 Kazakh wheat production at 17.9 mt, which would be up 31 per cent from 2015–16.

USDA expects Black Sea exports to total 53.5 mt, up 6 per cent from 2015–16, if realised.

SGS Russia – an independent crop inspection service – classified 31 per cent of the Russian wheat crop as feed wheat compared to 26 per cent in 2015–16. The milling quality wheat supply (with protein of 11.0 per cent to 12.3 per cent on a 12

per cent moisture basis) remains large because of the overall larger crop size. SGS reports that some areas have more Fusarium damage than in 2015 and some areas have high levels of sprout damage and very low falling numbers – there are also areas with a larger share of high test weight values than seen last year. SGS reports the average protein of Ukraine's 2016 wheat crop as 10.5 per cent compared with 9.9 per cent in 2015.

The crop has lower average moisture and a much higher average falling number compared with 2015.

Canada

In its September 20 report, StatsCan projected a 4 per cent increase in spring wheat production at 20.6 mt due to an estimated 13 per cent improvement in yields year over year. This more than offset a 9 per cent decline in spring wheat planted area. Canadian durum production is estimated at 7.30 mt, up 36 per cent year over year due to a 4 per cent increase in planted area and a 30 per cent year over year increase in yields.

According to crop reports from the province of Alberta, rainfall is slowing spring wheat harvest and damaging quality. As of September 16, only 31 per cent of the crop there had been harvested compared to 60 per cent at this time last year. Producers in Saskatchewan are also fighting wet conditions with quality issues.

As of September 15, Saskatchewan spring wheat and durum harvests were 29 and 30 per cent complete, respectively, compared to 23 and 26 per cent complete the week prior.

Preliminary durum grade data from the Saskatchewan weekly crop report shows 51 per cent of the crop graded as #4 or #5 Canadian Western Amber Durum (CWAD).

On average, Saskatchewan produces 85 per cent of the Canadian durum crop.

European Union

Stratégie Grains (SG) forecasts total European Union (EU) wheat production at 146 mt, down 9 per cent year over year. Durum production is expected to increase to 9.10 mt, up from 8.10 mt in 2015–16, but soft (non-durum) wheat production will fall 10 per cent to 136 mt.

Persistent rain hurt yields in top wheat producing countries France, Germany, United Kingdom and Poland. The rain also damaged wheat quality in France, Poland and parts of Germany, resulting in milling output percentages below their five-year averages.

Current SG estimates peg EU milling quality wheat output at 59 per cent of total 2016–17 production, putting total EU soft wheat milling quality production at 81.1 mt. That is 14 per cent below the five-year average and 25 per cent lower than 2015–16.

SG expects EU total wheat exports to fall to 26.6 mt, down 21 per cent year over year, if realised.

Argentina

Bolsa de Cereales Buenos Aires (Buenos Aires Grain Exchange) recently estimated farmers in Argentina planted 4.30 million hectares of wheat for 2016–17, up 19 per cent from 2015–16 in response to President Macri's elimination of the wheat export tariff and currency devaluation. As of September 1, Bolsa rated 63 per cent of Argentine wheat in very good to excellent condition compared to the prior year when excessive rain damaged the crop. IGC pegged Argentine wheat production at 14.2 mt, up 20 per cent from 2015–16 if realised.

But the expected higher production will not offset an estimated 78 per cent decrease in carry-in stocks, which fell to 1.0 mt. Total Argentine wheat supply is predicted to fall 4 per cent year over year to 15.2 mt. Despite the smaller supply, IGC expects Argentina to export 8.50 mt, on par with 2015–16 levels.

Australia

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) forecasts 2016–17 wheat production at 28.1 mt, up 16 per cent from 2015–16 due to very favourable weather conditions. If realised, production volume would be the second largest ever, behind the 2011–12 wheat harvest of 29.6 mt. Australian farmers increased planted wheat area for 2016–17 to 12.9 million hectares, up one per cent from 2015–16.

USDA expects Australian exports to increase to 19.5 mt, up 22 per cent from 2015–16 and 3 per cent above the five-year average.

ABARES also reported that China's wheat crop may also have quality problems and said, "the margins between milling and feed wheat prices are expected to be larger than usual" for the 2016–17 crop. ■

'Return to ordinary times' warns grains expert

AUSTRALIAN grain growers should brace for a 'return to ordinary times' for the foreseeable future, as competition from the Black Sea region and Europe intensifies and the market remains heavily oversupplied, according to a leading commentator on the grains and oilseeds industry.

Hailing from St Louis in the US corn belt, Stephen Nicholson, vice president of Rabobank's Food and Agribusiness Research and Advisory division has recently met with growers in Western Australia's wheatbelt and the grain-rich Riverina and central-west regions of New South Wales.

Stephen said while his message was "not what farmers wanted to hear", it highlighted the "adjustment to a new reality", with the market set to remain pressured in the short to more medium-term by burgeoning stocks of wheat, corn and soybeans.

"The past 10 years or so have essentially been an aberrant of the norm and gave many producers around the world a skewed view of margins," he said, "and we are now back to the era of high volumes and tighter producer margins."

Pressure in Australia not as great

But in Australia, the pressure on producer margins is not as great with the market back around 2012 levels, underpinned somewhat by the lower Australian dollar and reluctant sellers given the lower prices. Australia's increased focus on the South-East Asian market is also offering many opportunities, he said.

With global wheat stocks currently at record highs, Stephen said corn stocks were also weighing heavily on the balance sheet, with feed grain stocks expected to build up for the second consecutive season.

This is seeing farmers in the US – but also broadly speaking in other parts of the world – increasingly focus on "understanding their costs of production," he said, with technological advances also key to optimising yields in a lower-profit environment.

Stephen said, with much of the downward pressure on the global grains complex stemming from high stocks and Kansas wheat futures now at a 10-year low, this had been amplified by higher exportable surpluses out of the Black Sea region and Europe, particularly France.

Stephen Nicholson sees challenging times ahead but also opportunities for Australian grain growers.

Changed marketplace

"The global marketplace is undergoing significant change as grain trade is no longer dominated by the US, Canada and Australia," he said. "Instead we are seeing the Black Sea region and Europe increase their dominance in world markets, to become significant suppliers of wheat into our traditional export markets such as the Middle East – which has been a particularly big market for Australia.

"The geographical advantage that the Black Sea region and Europe holds into the Middle East has been further aided by their relative exchange rates, with the Russian ruble and Ukrainian hryvnia depreciating significantly over recent months, while the euro has also taken a slide."

In light of this, Stephen said, Australia's increased focus as a supplier of grain into South-East Asia offered many opportunities.

"Not only is demand from both South-East Asia's food and feed sectors continuing to increase, but Australia is geographically well positioned to supply the market, whereas the US and Canada have a larger distance to travel across the Pacific," he said.

"Australia, as well as the US and Canada, also have the advantage of being renowned as dependable suppliers into the Asian market, with their trade not disrupted by significant currency volatility, like we have seen in Europe, or trade barriers, such as embargoes out of Russia."

Canola to benefit

Stephen said Asia's rising incomes and westernisation of diets would particularly bode well for Australia's canola industry, as consumers increasingly prefer canola oil (over palm oil) due to its lower saturated fat content when cooking chicken and pork dishes.

During Stephen's two-week visit to Australia, he has seen first-hand the potential of this season's bumper crop. He said the US and Black Sea region were also on the cusp of a big wheat harvest this year.

"The only major grain-producing region facing a production setback at this point is western Europe, with heavy rains inflicting considerable damage to the French crop. But with the market so oversupplied, this supply shock is not enough to drive a considerable shift in market fundamentals," he said.

Stephen said the rain damage had impacted France's protein levels, which could leave a shortage in the market for high-quality wheat.

"This suggests Australian wheat with good milling and protein qualities could attract some premiums this season," he said.

Stephen, who holds a Master of Science in Agricultural Economics from Iowa State University, has more than 30 years' experience in cash grain markets, hedging, commodity/ingredient procurement, commodity risk management and commodity analysis. ■

Back to basics with soil carbon and soil organic matter

A Future Directions International interview with Dr Peter Keating

AT A GLANCE…

- There are many forms of soil carbon and they all have very different physical, chemical and biological properties. Differences include how much energy they contain and how easily this energy can be accessed and used by living organisms.
- Virtually all soil carbon originates from plant growth, and the amount we can potentially store is a function of how much plant material we can produce. This in turn, is determined by factors like rainfall, temperature, sunlight and mineral nutrition.
- If farming land is productive, it should stay farming land. Farming is an important part of Australia's culture and economy. This is not to say that reforestation is to be avoided.
- Whether a plant nutrient comes from a chemical factory or manure, it can be used properly to promote better, more efficient food production, or it can be used carelessly and promote environmental harm and degradation.
- FDI has again taken the opportunity to interview Dr Keating on the topic of soil carbon; its types, importance, measurement and why Australian agriculture needs to be mindful of its conservation and promotion.

Future Directions International: There is a good deal of debate in the scientific and farming communities about the role of carbon in both improving the capacity of soil to increase food production and also to ameliorate the extremes of climate change. How does carbon do this?

Peter Keating: That is a very complicated question. To answer it completely would take a doctoral dissertation or two. But I will try to put the issues in a nutshell.

There are many different forms of carbon in the soil, and they all have very different physical, chemical and biological properties. The differences are mostly to do with how much energy is contained in the carbon, and how easily this energy can be accessed and used by living organisms.

At one end of the spectrum of soil carbon is charcoal, which is produced by the incomplete combustion of woody materials by fire. Wood contains lots of energy, which is why it burns. Burning removes almost all of that energy, so charcoal has only physical structure to contribute to soil properties. What that particular structure is (big lumps, porous granules or powder) is determined mainly by the type of wood and the heat of the fire. Because there is virtually no energy for living things to consume, it does not break down chemically or biologically, so is very stable in soil.

At the other end of the spectrum are the carbon compounds which plant roots emit into the soil. These are mostly organic acids which contain a lot of energy and provide easily accessible food for almost all living organisms. It is very quickly consumed by soil bacteria and fungi so it has a very short life in the soil. It also fuels the growth of microorganisms in the ecosystem which transforms the carbon into different forms.

MAINTAINING SOIL HEALTH

Dr Peter Keating, Managing Director of the Australian company, Bioscience, believes that understanding and maintaining the health of soils can provide the agricultural and horticultural industries with a foundation for sustainable practices and increased productivity.

Peter and his staff believe their approach is unique and holistic, taking into consideration the structural, chemical and biological properties of soil to build an integrated, soil fertility picture.

The Bioscience laboratories in Forrestdale, WA, are equipped to undertake the full range of analyses. They have invested in leading edge technologies to focus research on the link between soil microbiology, soil carbon and plant productivity, while retaining traditional methods of soil nutritional profiling, structural testing and microbiology analysis.

In the middle of the spectrum, there are the soil components formed by dead and decaying plant matter, including leaves, stems and trunks on the soil surface, and roots at depth. These all contain energy that provides food for a broad range of organisms, from invertebrates like white ants and slaters to microbes like bacteria and fungi. Generally, the finer materials like petals, leaves and small roots break down quite quickly (weeks to months), whereas tougher things like big roots and trunks can take many years to decay. Further, the finer materials break down leaving only a small amount of residue, whereas the tougher parts with more woody fractions leave quite a lot of residue.

An important feature of this process of decay is that it produces a lot of living biomass, that is organic matter derived from living, or recently living organisms, in the form of earthworms, other invertebrates, bacteria and fungi.

Scientists now realise that about half of all the biomass on the earth is this microbial biomass.

Finally, within the spectrum of soil carbon, is non-living, or mineral carbon. In the simplest form, this includes carbon dioxide or minerals like limestone. Even though it is not alive, it is subject to chemical reactions; for example, limestone dissolves when it contacts acids, so farmers add limestone to remove acidity from soil.

How accessible the energy is in the various forms of carbon is critical in sustaining living soil organisms such as earthworms.

So how does this change the capacity of soil to produce food? Each of the carbon groups I have described can do so to a

different extent and in very different ways.

In general, scientific research shows that soil charcoal, by itself, provides very minor, if any, benefits to plant production.

The carbon released into the soil by plant roots does not directly increase plant production, but the microbes they attract have a profound influence on plant establishment and productivity, but how this works is an attribute of the middle spectrum of soil carbon.

Soil health, or the capacity to reliably produce food, is very much dependent on that middle portion of soil carbon, the one composed of various plant litter elements, breaking down and giving up their energy under the action of soil life. There are many reasons why this is so:

- The plant matter, and the microbes feeding off it, contain a large part of the total soil nutrients.
- As the process of decay occurs, and microbes are consumed by others, these nutrients are converted to mineral substances and become available for plant growth in a slow release.
- The living and dead matter is spongy with a high surface area, so increases the water holding capacity of soil.
- The tough organic residues also have a high ion exchange capacity. This assists in the prevention of nutrients leaching from the soil at times of high rainfall.
- With greater diversity of bacteria and fungi growing on the organic matter comes a more competitive environment, thus making it harder for pathogens to get a foothold, resulting in disease suppression.

Soil organic matter and the soil microbiological community is such a huge carbon sink, in fact one of the largest on the planet. It is my personal belief that if we can learn to maximise soil carbon storage we can get both a massive gain in agricultural productivity, and also sequester a huge amount of atmospheric CO^2. Surely abatement of climate change and feeding the world should be research priorities.

FDI: There is also much debate over how much carbon can be added to the soil each year with some suggestions that over 10 tonnes of carbon per hectare per year is sustainable in some areas while other areas are actually losing carbon. What is your take on this issue?

PK: Because virtually all soil carbon originates from plant growth, the amount we can potentially store is a function of how much plant biomass we can produce, or what is termed Net Primary Productivity (NPP). This is, in turn, determined by factors like rainfall, temperature, sunlight and mineral nutrition.

But how much of the carbon fixed by NPP turns into stable soil carbon very much depends on the type of soil, on farming practices and how we manage soil.

Only a fairly small fraction of the CO^2 captured by plants in photosynthesis will end up as stable soil carbon. A much larger fraction will end up as temporary, labile (readily changeable) soil carbon which is driving the biology and health of soil. The most stable, and long lived part of this middle spectrum of carbon is referred to as humus. It is almost an end point or permanent product of microbial, organic transformation. Plants which contain a significant quantity of wood produce more humus.

Plants which are fleshy (like lettuce) contain very little woody material, so leave very little long term humus residue.

There are some important farming practices which have a significant impact on how soil carbon accumulates and how it breaks down. Burning stubble is one practice which should be avoided, as it robs soil of the energy which drives soil biology.

Cultivation is another practice which should be minimised. This is because turning soil over introduces more air, and the availability of oxygen means a broader range of soil microbes are able to metabolise the carbon more rapidly. The way nitrogen fertiliser is applied can also accelerate the breakdown of soil carbon, as the availability of nitrogen often limits the rate that microbes can grow and thereby burn up soil carbon.

So taking all these factors into consideration, increasing soil carbon by 10 tonnes per hectare per year is not unrealistic in some soil types if that year has good seasonal rainfall, the hectare has minimal tillage and a judicious application of nitrogen.

Clearing bushland is the biggest cause of soil carbon loss.

In other words, the right amount, is applied at the right time and in the right way.

Higher rainfall zones with a clayey soil and lots of sunshine can accumulate more than 10 tonnes of soil carbon per year, but the 10 tonnes is quite unrealistic at the fringes of the wheat belt where farmers might be producing a crop on a sandy soil from as little as 150 mm of seasonal rainfall.

The amount of clay in soil has an important impact on soil carbon, because carbon residues become protected from further microbial breakdown when they become bound to clay particles.

Clearing bushland is the most significant cause of soil carbon loss. This is because clearing means native trees and shrubs – which live a long time and often have deep woody structures – are lost. A large part of the natural bushland is woody. It is uncultivated and is nitrogen poor. It produces slowly cycled and long lived humic substances in the soil. Converting bushland into farmland for cropping will inevitably cause a gradual reduction in soil carbon.

But more prudent farming methods in established crop lands can restore soil carbon, perhaps even back to what it was when it was bush. Soil carbon equates to soil fertility. Therefore, it is in the farmer's interest to halt and reverse carbon loss in agricultural soils.

FDI: There is considerable discussion about retaining or returning land to forests or natural habitat in order to reduce the amount of CO^2 in the atmosphere. Farmers, of course, would say that they need to farm such land in order to sustain a living. Is there a compromise whereby carbon rich sinks can be retained while enabling such land to produce food?

PK: If farming land is productive, it should stay farming land. Farming is an important part of Australia's culture and economy. This is not to say that reforestation is to be avoided. Virtually all farms have patches which are subject to waterlogging or erosion or are otherwise unproductive. These areas should be returned to native trees and shrubs.

But I think it is a nonsense to believe that we can't have productive farms producing food for the world, keeping rural communities alive and prosperous, while at the same time increasing soil carbon on those farms.

The compromise can be struck where farmers learn of, develop and adopt practices which preserve and enhance soil carbon. It is in their commercial interest to do so, as their fields will become more productive and more sustainable.

FDI: Much has been said about measuring the amount of carbon in the soils. In particular, the use of satellite technology is seen by some as a means of being able to accumulate large amounts of information quickly. How advanced are we in being able to acquire carbon measurements and what role, if any, do you see satellites playing?

PK: Measuring soil carbon accurately is not an easy thing to do and the best approach depends on how you want to use the data you collect. For example, if you want to gather data for a carbon accounting purpose, you take a very different approach to what you would do if you are interested in soil health and productivity.

- For soil carbon accounting purposes – if you want to trade in carbon credits – you should only measure stable soil carbon elements which have a very long life.
- If you are interested in soil health, you should measure carbon in the different fractions in mid spring, when growth both above and below ground is at a maximum.

Separating and accurately measuring each type of soil carbon can be devilishly difficult.

My view is soil health is more important to farming than carbon credits. For example, a farmer could bury lots of carbon in the form of charcoal in his soil. They would get carbon credits but will not get much soil health benefits. Alternatively, they could focus on increasing the shorter half-life forms of carbon and get a significant health and productivity benefit, but struggle to get that recognised as a carbon credit.

I don't believe that with current technology satellites will be much use. All they can measure is electromagnetic radiation. They can measure natural radiation from the earth surface, but soil carbon is beneath the earth's surface.

Aircraft fly much closer to the earth's surface, and so can get radiation from a greater depth of soil. This can be useful for mapping the mineralogy of soils, for example how much sand or how much clay is present on the surface and a bit deeper down. This technology is being used now by farmers to get detailed soil maps, but these maps don't tell much about organic content. They can give information on how much carbon could potentially be sequestered, for clay can hold more carbon than sand.

Electromagnetic radiation in the infra-red (heat) wavelength is being developed as a potentially useful way to measure soil carbon, but penetration is hopeless. Equipment is being developed which uses near infra-red sensors on a tyne which is pulled through the soil. This seems to be a promising technology, because it has the prospect of taking a lot of discrete measurements at different depths throughout a particular paddock.

FDI: The role of industrial agriculture increasingly is being questioned, particularly in relation to the use of chemical fertilisers. What role, if any, do you see industrial agriculture playing in the future?

PK: Agriculture is an industry. In fact, it is the first and oldest industry. It enabled civilisation to develop as we know it. In a world where the population increases, yet the number of people producing food declines, without efficient agriculture humanity is in serious peril.

All living things are made of the same stuff, the same 11 major elements and the same six trace elements. These are essential nutrient elements for life. Fortunately, plants don't have a philosophy which says some nutrients are artificial chemicals and bad, whereas others are natural and good.

The natural environment upon which our quality of life and agriculture depend, also uses the same essential elements. If those elements get out of balance due to the ill-considered or inappropriate use by industries like agriculture, manufacturing, mining or indeed any other industry, then environmental damage and pollution can arise.

Whether a plant nutrient comes from a chemical factory or manure, it can be used properly to promote better, more efficient food production.

My position is that whether a plant nutrient comes from a chemical factory or manure, it can be used properly to promote better, more efficient food production, or it can be used carelessly and promote environmental harm and degradation.

About the Interviewee: Dr Peter Keating has over 35 years of practical experience as a commercial scientist in a vast spread of biological, chemical and engineering applications, as well as maintaining a career as research scientist and inventor. He has extensive knowledge soil science and plant nutrition, and of Australia's flora, fauna, waterbodies, aquifers and geology.

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Lack of copper in ancient soil regulates nitrification

RESEARCHERS from The University of Western Australia and Newcastle University (UK) have discovered copper levels in the soil affect the delicate balance of microbes responsible for soil nitrification, which affects how well crops grow.

Soil nitrification has critical implications for the environment. Lack of nitrogen in the soil can limit plant growth but too much nitrogen can cause algal blooms and greenhouse gas emissions.

The research differs from previous studies that suggested nitrogen fertilisers played a large role in affecting the microbes (archea and bacteria) which are responsible for soil nitrification.

Australia is home to some of the most ancient soils in the world.

Soil nitrification has been an important process in global nitrogen cycle since the earth was first oxygenated.

One of the biggest farming costs globally is the use of nitrogen fertilisers to aid crop productivity and this latest discovery has important implications in developing further understanding of soil nitrification for the agricultural industry.

Professor Tony O'Donnell, Dean of UWA's Faculty of Science, said the soils in Australia were some of the oldest in the world, compared to soils in the northern hemisphere where most global research has been done to date.

Bacterial nitrification dominates

"In testing ancient Western Australian soils, we found a relationship between the soils' age and the levels of archea and bacteria microbes," Tony said.

"When we looked into this further we found that in ancient Western Australian soils, the lack of copper limited the archea microbial population which in turn limited their soils nitrification – instead bacterial nitrification dominates."

Professor Daniel Murphy, UWA Chair of Soil Biology, said the only way to effectively manage nitrogen in farming systems was to understand the microorganisms responsible and what affected their growth.

"These findings are an important step forward in developing targeted solutions to manage nitrification in soil," he said.

"Use of nitrogen fertilisers is only 50–60 per cent effective so understanding the nitrification process in soils is very important."

The study has been published in the journal *Scientific Reports*
http://www.news.uwa.edu.au/201608118927/research/lack-copper-ancient-soil-regulates-nitrification ■

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The impact on Australian agriculture as Britain exits the EU

By Mick Keogh, Australian Farm Institute

ON Thursday, June 23, 2016, the citizens of the United Kingdom (UK) voted in a referendum which asked whether the UK should continue as a member of the European Union (EU), or leave. The resulting vote was 52 per cent to 48 per cent in favour of the UK leaving the EU.

Mick Keogh.

The EU is an economic and political partnership involving 28 European countries. It began after World War II to foster economic cooperation, with the idea that countries which trade together are more likely to avoid going to war with each other. It has since grown to become a 'single market' allowing goods and people to move around, basically as if the member states were one country.

For the UK to leave the EU it has to invoke an Article 50 of the Lisbon Treaty (the founding document of the EU) which gives the two-sides two years to agree the terms of the split. This means that there will not be a clear idea of what kind of deal the UK will seek from the EU, on trade and immigration, until at least mid-2017.

It is likely that subsequent negotiations will extend well beyond that time, and it could be up to five years before the separation comes into effect.

While the potential terms of a UK exit from the EU remain quite unclear, it is reasonable to assume that there will be three major implications of this decision which have potential flow-on effects for Australian agriculture. These are:

- Agricultural trade between EU nations and the UK will no longer be free of any tariffs or restrictions;
- The movement of people (especially workers) between the UK and the EU will face increased restrictions; and,
- The large subsidy that UK farmers currently receive from the EU each year will cease, but may be at least partly replaced with subsidies from the UK Government.

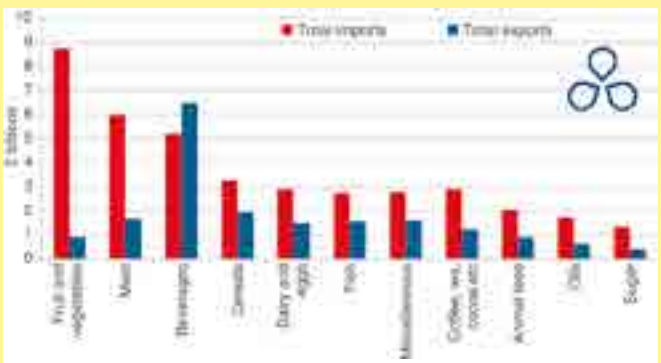
The remainder of this article examines the farm trade and subsidy issues and what the implications may be for Australian agriculture.

Implications for agricultural trade

The UK has long been a net importer of agricultural products (see Figures 1 and 2). The value of agricultural imports by the UK increased dramatically in the immediate aftermath of World War

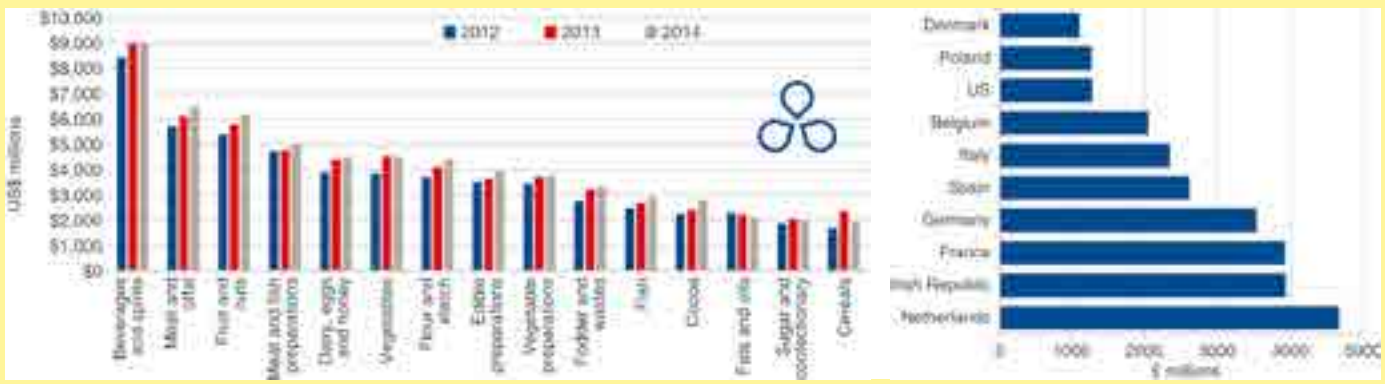
FIGURE 1: Trends in UK agricultural trade

FIGURE 2: UK trade in different food groups



Source: DEFRA (2015).

FIGURE 3: Value and source of UK agricultural imports



II as international trade resumed and the UK economy underwent recovery.

UK agricultural imports again grew rapidly from 1973 as the UK's entry to the EU encouraged imports from other EU nations. A third spike in UK agricultural imports occurred in the aftermath of the major foot-and-mouth disease outbreaks in the early 2000s, when large numbers of UK livestock were destroyed and strict regulations were imposed on the UK livestock industries.

Major UK agricultural and food imports include wine and spirits, meat, fruit and vegetables, and a wide range of semi-processed and processed foods.

UK agricultural imports are dominated by products sourced from EU nations – hardly surprising given the proximity of the UK to mainland Europe, and the free trading environment that exists between the UK and EU nations (Figure 3).

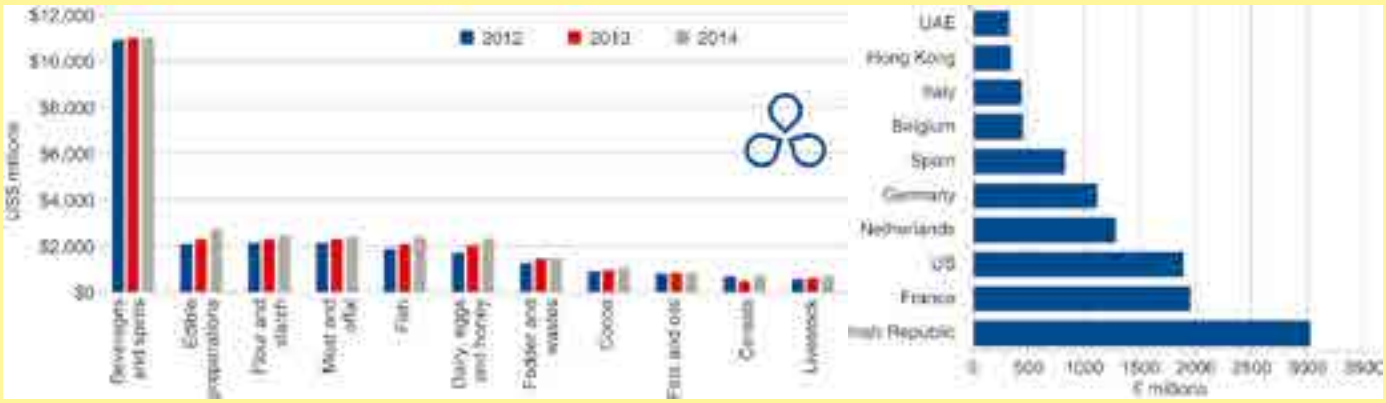
The UK is a significant exporter of a number of agricultural and food products – specifically whisky, lamb and dairy products. More than two-thirds of UK agriculture and food exports are destined for EU nations (Figure 4).

Australian trade with the UK

The UK was one of Australia's major markets for agricultural exports during the 19th century and the first half of the 20th century. At the end of World War II, the UK imported one-third of all Australian agricultural exports, including 80 per cent of all beef exports and 90 per cent of all butter exports. During the 1960s, the US, Japan and Korea grew in importance as export markets, followed more recently by the emergence of the Middle East and Asia as major markets.

The UK joined the European Union in 1973 which resulted in

FIGURE 4: Value and destination of UK agricultural exports



tariffs and quotas being applied to Australian agricultural exports destined for the UK, and by the mid-1980s, the UK was taking less than 2 per cent of Australian rural exports.

At that time, the major markets for Australian agricultural exports were Japan (21 per cent), the Middle East (15 per cent), North America (12 per cent), the EU (11 per cent), Eastern Europe (9 per cent), South East Asia (9 per cent), and China (5 per cent).

By 2015, Australia's agricultural exports were predominantly destined for North Asia (including Japan, Korea and China) which collectively accounted for more than 40 per cent of total exports of which 20 per cent was China alone, followed by South-East Asia (20 per cent), the Americas (14 per cent), the Middle East (7 per cent), and Europe including the UK (5 per cent).

Australian agricultural and food exports to the UK in 2015 accounted for around 1.5 per cent of Australia's total agriculture and food exports. Principal among these was wine, lamb and beef.

Of note, over recent years, has been the significant decline in the value of Australian wine exports to the UK, as other 'new world' suppliers such as New Zealand, Argentina and the US have become more prominent in export wine markets. In contrast, Australian beef exports to the UK have been growing as a result of both higher beef prices and some increases in quota access under EU agricultural trade arrangements.

Australia also imports agricultural and food products from the UK – predominantly alcoholic beverages (whisky) and a variety of processed foods.

Australian agricultural and food imports from the UK have been increasing over recent years in line with the general growth in the value of food imports to Australia, especially over the period of relatively high Australian dollar exchange rates as a consequence of the mining boom (Figure 5).

Australian trade with the EU

Australia also has significant two-way agricultural trade with the EU as is evident from Figure 6. Principal Australian exports to the EU include canola (as a consequence of demand driven by the EU biofuels mandate), wine, fruit and nuts, wool, and beef. Total Australian food and agriculture exports to the EU (excluding the UK) were valued at approximately A$2.3 billion in 2015 and have been relatively static over recent years.

Australia's agriculture and food imports from the EU were valued at approximately A$3.8 billion in 2015, and consisted predominantly of wine and processed foods, as well as canned vegetables (tomatoes from Italy), and pigmeat sourced from Denmark and the Netherlands.

Australia has an agriculture and food trade deficit with the EU, part of the explanation for which is the restrictions that are applied by the EU to agriculture and food imports from Australia.

Figure 7 displays the tariffs that are applied to imports of agricultural products by Australia and the EU respectively. Applied tariffs are those that are estimated to be currently applied, whilst bound tariffs are the maximum tariffs each trading partner is legally able to apply under World Trade Organisation (WTO) agreements on a most favoured nation (MFN) basis. Figure 7 highlights the significant disparity between the tariffs faced by Australian agricultural imports into the EU, and EU agricultural imports into Australia.

FIGURE 5: Australia's agriculture and food trade with the UK (major products)

FIGURE 6: Australia's agriculture and food trade with the EU (major products)

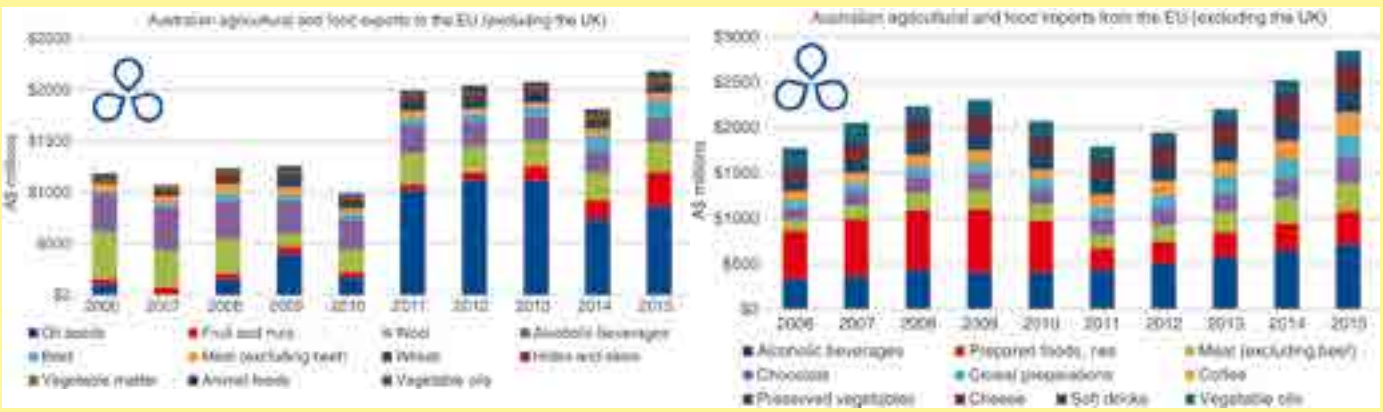
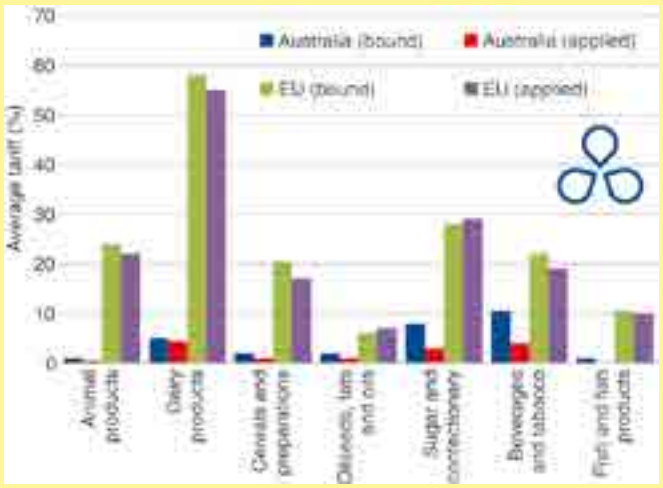


FIGURE 7: Bound and applied tariffs on trade in agriculture and food products



Over all agricultural products, Australian import tariffs average 1.2 per cent, while EU tariffs average in excess of 12 per cent.

Australia's red meat exports also face quota restrictions in the EU market.

Against this agricultural trade background, the potential implications of Brexit for both the UK and Australia remain somewhat unclear. On a very simple analysis, the UK would no longer be a member of the EU, and agricultural exports from the UK to the EU (predominantly whisky and lamb) would therefore presumably face the same tariff rates that Australian agricultural imports to the EU face.

This could result in a reduction in the value of UK agricultural exports to the EU, and a diversion of these exports to other markets.

The UK, meanwhile, would have greater autonomy in being able to set tariff rates on agricultural imports, and could conceivably increase tariffs on agricultural imports from the EU to a level equivalent to current EU agricultural tariffs. This would effectively increase the price of EU agricultural exports to the UK, with the potential result being a loss of market share by EU agricultural exporters, and a possible increase in UK agricultural production (due to increasing agricultural commodity prices), or at least an increase in UK agricultural imports from non-EU sources such as Australia.

The exchange rate of the British Pound has depreciated against most major currencies including the Euro in the wake of the Brexit decision. This has the effect of making imports to the UK more expensive, and exports from the UK more competitive in international markets. This will likely stimulate increased farm production in the UK and a reduction in net agricultural imports.

Limited opportunities

From an Australian and New Zealand perspective (ignoring exchange rate fluctuations), the potential opportunities that are likely to emerge as a consequence of the Brexit decision are fairly limited. There may be increased opportunities for Australian exports of beef and wine to the UK (depending on how much of the current EU beef import quota is transferred to the UK), but this will depend largely on decisions that the UK makes about the tariff regime that will be adopted post-EU membership.

Bulk Australian agricultural commodities such as grains are generally not competitive in European markets due to the impact of freight costs, although Australia does export a small volume of specialised wheat to the EU.

Higher value products – including red meat, wine and some horticultural products – can be competitively exported from Australia to the EU or the UK, but Brexit is more likely to result in a shift in market destinations (for example more Australian beef to the UK and less to the EU) rather than an overall increase in demand.

An unknown in relation to the potential impact on Australian agriculture of Brexit is future decisions by governments about agricultural trade. Australia has already initiated preliminary discussions with the EU about an Australia-EU free trade agreement, and it seems likely that if such an agreement eventuates, there will be some downward movement in the level of agricultural tariffs imposed on agricultural imports by the EU.

From an Australian agricultural perspective, it would also be advantageous to initiate trade negotiations with the UK, although that nation represents a much smaller market than the EU.

UK farm subsidies after Brexit

One of the more challenging issues facing UK farmers, as a likely consequence of Brexit, is that they will no longer receive the generous EU agricultural subsidies that are associated with EU membership.

Under the current EU Common Agriculture Policy (CAP) the average farmer in England and Wales receives direct subsidies of £235 and £179 per hectare (A$412 and A$314 per hectare) each year. There are also payments available under agri-environmental and other schemes, with the total EU payments to UK farmers exceeding £2.8 billion (A$4.9 billion) in 2015. It is estimated that these payments are equivalent to 55 per cent of the total income from farming generated in the UK (NFU 2015) each year.

What arrangements might be put in place to substitute for all or part of these payments by the UK Government in the post-EU era are very unclear. In 2014, the UK's net contribution to the EU

was £9.8 billion, which is around 1.5 per cent of total UK public expenditure and equivalent to almost 0.7 per cent of its GDP.

In theory, when the UK leaves the EU, these payments will no longer need to be made and therefore some of this funding could be utilised to replace existing EU CAP payments to UK farmers with equivalent farm subsidies paid for by UK taxpayers.

But in the event that the UK subsequently negotiates some form of trading agreement with the EU post-Brexit, then if the pattern established by Norway and Switzerland is applied, the UK will be required to make some contribution to the EU budget in return for specific market access arrangements. Some estimates put the potential future required contribution to the EU budget by the UK at 60 per cent of current levels.

If this is the case, then the savings available to the UK Government as a consequence of Brexit may actually be less than the total current value of UK CAP payments.

Critic of the CAP

The UK Government has long been a critic of the CAP, arguing that it should be transformed into some form of risk management or insurance system, rather than the current system of direct payments. If this view prevails, then it is likely that UK farm subsidy levels will be reduced in the future.

This obviously has implications for UK agriculture, given that it is widely acknowledged that UK agriculture is not internationally competitive, and would decline significantly in the event that subsidies were removed.

This would mean additional opportunities for competitive agricultural exporters such as Australia, although the nature of UK agricultural imports (predominantly fruit and vegetables, pork and poultry meats, and wine) means that Australian would only gain small additional benefits from a reduction in UK farm subsidies.

To sum up

The proposed exit of the UK from the EU brings many associated uncertainties, especially in relation to the timing of the breakup, and the future UK–EU arrangements that may be put in place in advance of the split occurring. Nevertheless, it seems likely that the UK's dependence on agricultural imports from the EU will be reduced due to likely trade barriers, and this will open up opportunities for other nations to export agricultural products to the UK.

But the UK currently accounts for only about 1.5 per cent of Australian agricultural exports, and it seems unlikely that even in the post-Brexit era, this will increase to any great degree.

There are some wider implications of Brexit and similar protectionist and isolationist sentiments evident in the current political landscape of the US and Europe. These suggest that the trend over the past decade of reducing international barriers for agricultural trade may have reached its limits, and that further progress in reducing global agricultural trade barriers will be difficult to achieve.

For example, both main contenders in the current US Presidential contest have expressed outright opposition to the proposed Trans-Pacific Partnership (TPP) agreement, indicating that the likelihood of this agreement being implemented is now remote.

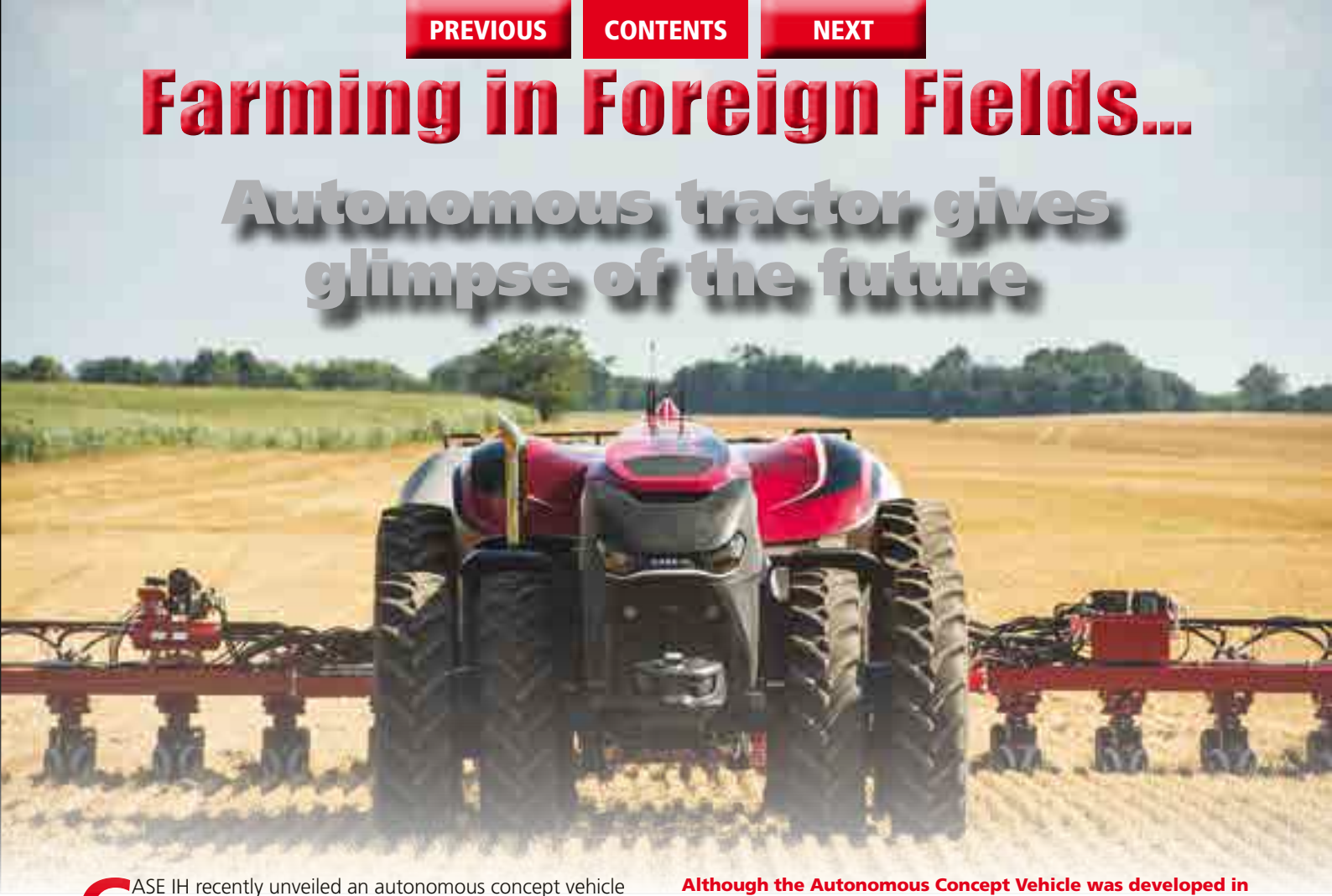
For farmers in Australia and New Zealand – who have long advocated for the removal of agricultural trade barriers – it may be time to take stock of the undoubted progress that has been made in recent years, and to focus on ensuring that the benefits of recently negotiated trade agreements are not eroded by the adoption of non-tariff trade restrictions.

It will also be important to ensure that the protectionist and isolationist sentiments evident in these global developments do not go unchallenged.

This paper was originally presented to the GRDC Farm Business Updates for Advisors, July 2016. ■

Farming in Foreign Fields...

Autonomous tractor gives glimpse of the future



CASE IH recently unveiled an autonomous concept vehicle at the Farm Progress Show in Boone, Iowa. The concept vehicle is a cabless Case IH row crop tractor that can operate autonomously with a wide range of field implements.

"In many parts of the world, finding skilled labour during peak use seasons is a constant challenge for our customers," said Case IH Brand President Andreas Andreas. "While we offer auto-steering and telematics on our equipment today for remote management of farm machinery and employees, this autonomous tractor concept demonstrates how our customers and their employees could remotely monitor and control machines directly.

"This technology will offer our customers greater operational efficiencies for tasks such as tillage, planting, spraying and harvesting."

Andreas explained that the concept was created to validate the technology and to collect customer feedback regarding their interest and need for future autonomous products for their operations.

"It is very exciting for us to explore the possibilities that this technology can provide to our customers. We look forward to getting their input regarding this concept and how it can help them achieve new production efficiencies," said Andreas.

Remote operation

Case IH and CNH Industrial's Innovation Group based the cabless autonomous concept on an existing Case IH Magnum tractor with reimagined styling. The vehicle was built for a fully interactive interface to allow for remote monitoring of pre-programmed operations.

The onboard system automatically accounts for implement widths and plots the most efficient paths depending on the terrain, obstructions and other machines in use in the same field.

Although the Autonomous Concept Vehicle was developed in the form of a cabless tractor, combines or other equipment would operate on the same technology.

The remote operator can supervise and adjust pathways via a desktop computer or portable tablet interface.

Through the use of radar, lidar (light imaging, detection, and ranging) and onboard video cameras, the vehicle can sense stationary or moving obstacles in its path and will stop on its own until the operator – notified by audio and visual alerts – assigns a new path. The vehicle will also stop immediately if GPS signal or position data is lost, or if the manual stop button is pushed.

Machine tasks can also be modified in real time with via remote interface or automatic weather warnings.

Supervise multiple machines

AFS Global Product Marketing Manager, Rob Zemenchik explained that autonomous tractor operation brings together the latest in guidance, telemetry, data sharing, and agronomic management to offer farm managers more control, monitoring capabilities and cost savings.

"A farm manager can supervise the activities of multiple machines via a mobile tablet interface while he tends to other tasks or even operates another vehicle," said Rob. "Multiple autonomous tractors can work as one fleet or simultaneously in multiple sub-fleets assigned to separate fields, each assigned with pre-programed maps and prescriptions.

"So you could have one tractor pulling a chisel plow followed closely by another one operating a planter. The opportunities for efficiency are substantial."

Although the autonomous vehicle is presently considered only as a concept tractor, Rob said the technology could function just

Some of the main benefits of ACV technology are in the more efficient use of farm labour.

as well in a standard cabbed tractor where it could use real-time weather and satellite data to optimally apply crop inputs such as nitrogen, herbicides or fungicides.

When weather comes into play

"These enhancements really become interesting for our customers when weather comes into play," said Rob. "Because if it starts to rain in one field, the tractor will automatically stop what it's doing and head over to another field that is dry to work on that provided it can access that field via private roads."

Prior to the concept's unveiling, company executives presented a video demonstration of the tractor tilling and planting on land in the southeastern US earlier this (northern hemisphere) summer.

CNH Industrial collaborated with its long-standing technology provider Autonomous Solutions Incorporated – ASI – a Utah-based company that is the industry leader in off-road autonomous solutions.

To watch a video detailing the concept tractor's capabilities, visit the Case IH channel on YouTube. For more information about Case IH equipment, contact your local Case IH dealer or visit www.caseih.com.au ■

THE DAY THE FARM CHANGED

At the recent GrowAg Summit held in Albury, Pete McCann, Case IH's Marketing Manager for Australia and New Zealand, commented on the US Farm Progress Show unveiling of the Autonomous Concept Vehicle.

"There are a lot of different opportunities and the ACV really does open a very big door into 'what's next, what can we do?' Well, we can do pretty much anything – we just need to build on the technology.

"The whole idea of bringing that tractor out of the 'development shed' was to show people what Case IH is working on. As with Australia's first tracked tractors – which we brought out in 1996 – we're leading development of this technology."

The main benefits of ACV

The main benefits of autonomous technology are being able to use labour in value-added, rather than low-skill, tasks; for the possibility to work 24 hours with no variation in productivity; and options to overcome skilled labour shortages during critical times such as planting.

According to a 2012 Senate inquiry into higher education and skills training to support future demand of agriculture and agribusiness in Australia, acute labour shortages cost Australian farmers more than $150 million a year in lost productivity, as they struggle to find specialist workers and technicians.

"This sort of technology can help to overcome these shortages, and allow workers to focus less on manual labour and more on the science of farming, helping to attract people into the industry," says Pete.

Brett Whelan, Associate Professor in Precision Agriculture at The University of Sydney, concurs. "Automated vehicles

Pete McCann says ACV technology will 'open a very big door'.

running broad-scale farming operations open up new linkages between agricultural science and engineering. Combining an understanding of agricultural systems and high-tech engineering provides exciting new career pathways for the next generations to help feed and clothe the world."

Pete says software developments featured in the ACV could enhance current Case IH models.

"Information and information control, rather than the actual hardware, are the biggest advances that I see in regards to where we're up to with agricultural technology, and I think we'll continue seeing this technology be incorporated into machines. Some of the components of the ACV such as information control, could eventually be applied to standard tractors. These are very exciting times for farmers."

Target 100 campaign launch

SINOCHEM have announced the launch of their technical information platform – 'Target 100'. Target 100 delivers a simple yet important message to agents, advisors and end users of herbicides; Do everything in your power to target 100 per cent weed control every time.

Darren Thomas, Marketing Manager with Sinochem said, "Historically growers may have believed 95 per cent weed control was good enough. Every plant that survives an application may cause bigger issues in the future if it is allowed to set seed. The Target 100 campaign, starting now, will train our customers to get the best results they can."

Darren Thomas.

Recent research by Dr Peter Boutsalis from Plant Science Consulting has highlighted the impact that a small number of survivors can have on herbicide resistant populations on farm. Gene flow between survivors, facilitated by pollen movement, can raise the level of herbicide resistance and combine separate resistance mechanisms from the parent plants into their progeny.

Darren added, "Sinochem is committed to providing stewardship on their herbicide range, with a particular focus on maintaining the longevity of glyphosate. It is imperative that every application of glyphosate is managed to reduce the risk of surviving plants setting seed."

Factors that reduce the efficacy of glyphosate are rate, application, environmental stress and timing. When one or more of these critical factors are not addressed plants can survive. From a glyphosate resistance consideration this has two significant implications:

- Survivors with weak resistance mechanisms can potentially cross pollinate with other survivors culminating in progeny with higher levels of glyphosate resistance; and,
- Sub-lethal dosing of susceptible plants is a pre-cursor to the development of resistance, particularly in cross-pollinating species such as annual ryegrass.

Glyphosate and surfactants

One often overlooked driver of glyphosate performance is the surfactant system in glyphosate formulations. It's well documented that glyphosate alone is very poor at penetrating leaf surfaces. As a result glyphosate formulations are manufactured with surfactants.

Surfactant quality and quantity in glyphosate formulations vary widely and any shortcomings cannot generally be made up for by adding extra surfactants to the spray tank. Darren concluded: "A key message of Target 100 is that agents, advisors and growers should use the highest quality product they can to target 100 per cent control. Sinochem can provide these high quality formulations so users can have confidence that weed control will be maximised." ■

New early sowing wheat variety

THE release of **Sunmax**, developed by Australian Grain Technology (AGT), is especially relevant as it adds significantly to the choice of wheat varieties available for early sowing.

Ongoing research continues to highlight the potential big yield gains and more profitable production available from early versus mid or late sowing. But to minimise risk – especially from late winter-spring frosting – early sowing requires slower maturing varieties.

Slower maturing varieties such as Sunmax generally head around the same time as many of the quicker-maturing varieties sown later in their respective sowing windows.

Advantages of early sowing with appropriate varieties usually include plants with deeper and more developed root systems, higher potential yield and greater ability to cope with wet winter conditions if well-established before semi waterlogging occurs.

Senior AGT wheat breeder Meiqin Lu reports that Sunmax is a long season spring variety slower in maturity than Sunbri and Sunzell and slightly quicker than Sunbrook and has Australian Prime Hard (APH) classification for the northern Zone.

Other important attributes include an excellent level of stripe rust resistance based on both major and multiple minor APR genes. Stem rust resistance is also good although leaf rust resistance will need careful monitoring as its rating is lower.

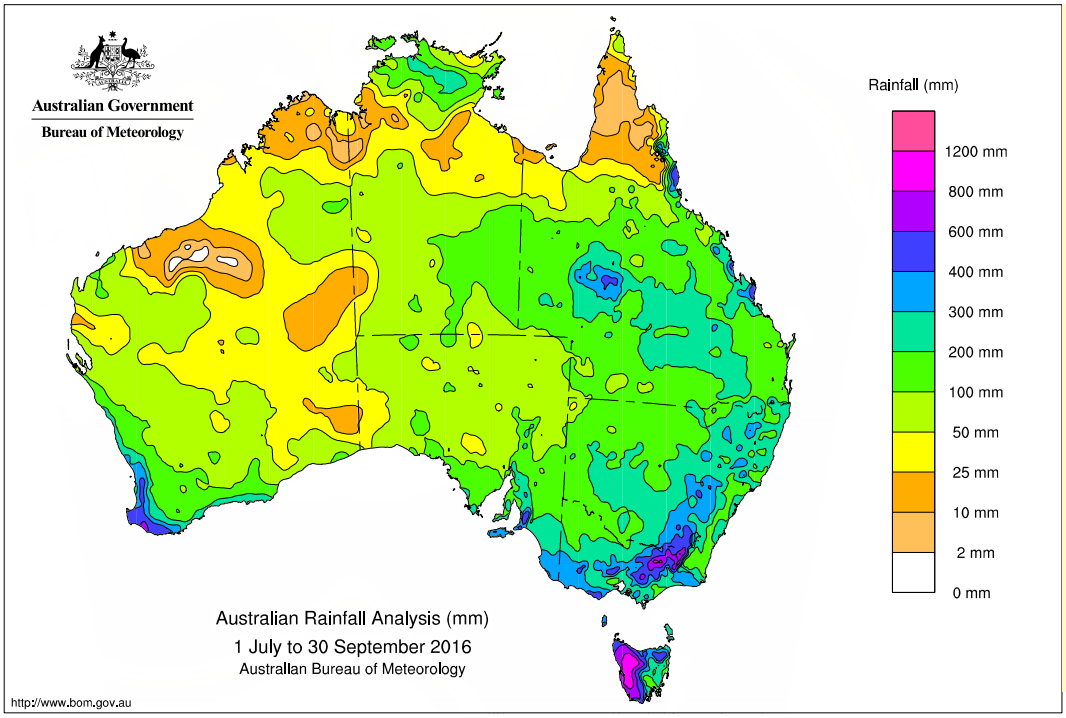
It also has good tolerance and resistance to crown rot and root lesion nematodes *(P. thornei)* and seed will be available for sowing in 2017.

Coolah will also be available for sowing in 2017. This new variety has the pedigree of EGA Gregory and is similar to EGA Gregory in most traits, but in NVT trials has shown a two to nine per cent yield advantage depending on the zone.

Compared to EGA Gregory and LPB Flanker, Coolah is slightly shorter in stature and has improved straw strength, with greater standability resulting in improved harvesting speeds and fewer harvesting losses.

Coolah, like EGA Gregory is suited to end of April into May plantings. ■

Senior AGT wheat breeder, Meiqin Lu.



RAINFALL REPORT…

Like the rain, records have tumbled across the national grainbelt with exceptional rainfall totals for the three month, July–September period.

Soil moisture levels range from excellent to too much of a good thing with waterlogging causing problems in the southeast of the continent as well as parts of WA (see the darker shaded regions). September frosts have also damaged some crops.

But growing conditions – and yield prospects – are generally excellent as the Australian winter crop heads towards harvest and the summer crop goes in.

District Reports…

September–October 2016

Western region

STATE WIDE SUMMARY

While the Western Australian grain crop for 2016 remains on track for a large harvest, frosts through September have thwarted what was expected to be a record harvest and in particular, has taken the gloss off the season for growers in eastern districts and the Lakes region.

September saw the coldest average minimum temperatures on record across most of the grainbelt. Frost events occurred regularly from August in many districts and caused localised losses in early sown barley and wheat crops. Two very cold frosts on September 17/18 and 23/24 in the Lakes region have caused large losses of grain in barley and wheat with lesser effect on canola and lupins.

Cereal yield potential has declined by around 25 per cent in this region as a result.

The frosts have resulted in a 1 million tonne reduction in the GIWA statewide crop forecast made at the start of September, to around 16.9 mt as we enter October.

Low evaporation and heat shock offsets frosts

While the frosts have had a big negative impact, the cool weather will also have a positive impact on crops. Evaporation has been low enabling grain yield potential to be fulfilled by the remaining levels of soil moisture. Heat shock can severely limit grain yield and quality and this is unlikely to have an impact this year based on the current predicted weather patterns through to harvest.

The outlook for grain quality is mixed. The very high yield potential in most regions will result in average grain protein levels for wheat and barley. For barley, grain staining in early maturing crops is a concern, but protein levels and grain size for malting grades will be good.

Generally oat yields have not been affected by frost and quality of the oats harvested is expected to be very good.

Canola oil quality will be high with oil content expected to average around 48 per cent and higher.

Grain Industry Association of WA (GIWA)
October 4, 2016

NORTH

The season has generally been very good in our district with most areas having adequate rain to grow good crops. Very cool September conditions have helped crops fill grain very well even with low September rainfall totals. The wet July conditions also have some western crops looking a little washed out on sand soils.

Crops on stronger soils have coped well but yields will be lower than expected in some western sand soil areas.

The east and north-eastern fringe still have some dry pockets with rainfall tallies year to date in the low 200 mm range. These areas have OK crops but they may struggle to finish well.

The cool conditions have kept insects quiet in some crops but

we have seen high numbers in others. Cereal aphids were sprayed in some areas but very few aphids have been sprayed in canola. Diamond Back Moth are at very low numbers this year due to the cool conditions and frequent rainfall events. Some lupin crops have had to be sprayed for aphids which is unusual for our region.

Frost has damaged crops in some areas that are generally more prone to frost damage. Some damage has been seen already and growers will have to wait until harvest to see the full extent of the damage.

Above average yield prospects

Wheat crops are from haying-off stage to late grain fill and generally look very good. Quality should be very good with low protein, frost damage and some grain fungal infections the only likely downsides. Yields should generally be above average.

Barley crops look very good across the landscape and the area sown to barley looks to be up. Barley should yield well this year and low prices look to be the main downside.

Canola crops are very good and insects have stayed out of most of them. This is a rare outcome in our area. Yields should be well above average and the cool finish will mean very high grain oil levels. Sclerotinia has been at low levels in most western crops but should not cause major yield losses this year.

Lupins are loving the cool finish and have stayed green much longer than usual which should mean high yields. Most crops have podded very well but some early sown western crops will have sclerotinia damage. Lodging may also be a problem in some of the early sown western crops.

District Reports...

September–October 2016

Generally the season has been kind in our area but frost will be a big problem on some farms. Even with this frost damage, the region looks set to take off an above average crop.

The main downside is the grain prices being well below where they were at the start of the season. Hopefully harvest progresses smoothly and I think it will be an early start for some.

Good luck at your place.

Peter Norris
Agronomy For Profit and Synergy Consulting, Geraldton
September 30, 2016

SOUTH COAST

Seasonal conditions on the South Coast have continued to be wet over the past two months. Winter crops started to dry out during July, but August was incredibly wet. Some growers received in excess of 180 mm for the month. Those farms within about 40 km of the coast are the worst effected by waterlogging and will probably return a less than average yield.

But the Mallee regions are looking very good with above

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)	2016 rainfall to date (mm)	Summer		Autumn		Winter		Spring	
			25yr Annual Average (mm)	2015–16	25yr Annual Average (mm)	2016	25yr Annual Average (mm)	2016	25yr Annual Average (mm)	2016 to date
Emerald Qld	539	641	252	419	100	22	60	262	122	45
Toowoomba Qld	663	583	277	264	127	96	82	205	174	120
Roma Qld	572	484	252	252	117	30	74	132	127	129
Goondiwindi Qld	612	526	254	348	120	52	99	142	136	119
Narrabri NSW	630	610	227	176	118	79	124	266	161	130
Gunnedah NSW	650	418	232	144	112	53	126	172	179	122
Dubbo NSW	603	701	199	186	122	97	128	307	153	172
West Wyalong NSW	443	654	119	95	78	108	119	287	126	189
Wagga Wagga NSW	541	651	130	109	110	155	154	216	145	209
Swan Hill Vic	318	321	73	48	62	82	88	94	95	104
Bendigo Vic	509	582	108	51	102	131	162	230	136	183
Horsham Vic	379	386	77	63	70	87	128	138	106	110
Lake Bolac Vic	519	534	114	100	99	132	157	189	148	149
Murray Bridge SA	369	358	67	40	80	74	124	136	99	115
Kadina SA	339	400	57	38	78	137	116	150	89	77
Cummins SA	391	471	50	83	90	136	171	197	82	65
Esperance WA	614	597	78	112	142	187	248	233	144	108
Wagin WA	395	386	43	88	94	163	168	133	89	41
Northam WA	399	472	38	83	85	184	191	171	84	43
Mingenew WA	354	349	27	22	91	106	175	208	61	15
Moora WA	382	428	41	40	86	113	185	242	70	36
Mullewa WA	326	267	46	34	96	67	135	162	49	13

Last rainfall reading October 4, 2016.

District Reports...

September–October 2016

Farm manager David Large from Jerdacuttup, 140 km west of Esperance, inspecting waterlogged Mace wheat after heavy rainfall during August.

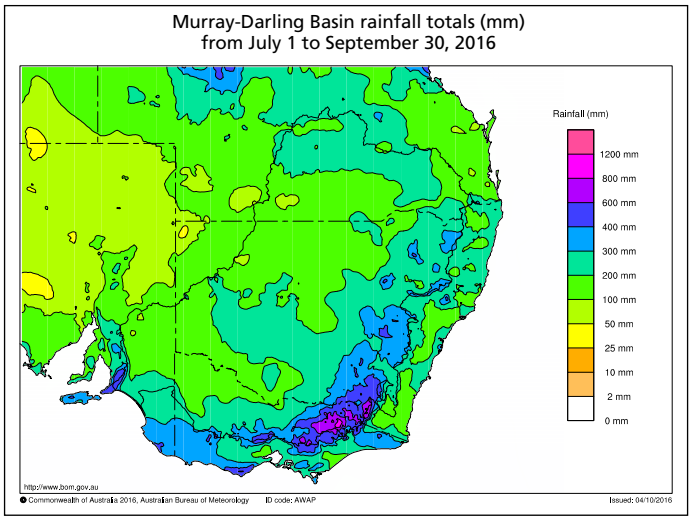
David Large counting pods in a very nice crop of Gunyidi lupins.

average rainfall to date and no major waterlogging. These areas are on track for above average production.

Swathing and desiccation of early April sown canola has just begun and we should see harvest begin in early October. Many growers are now busy getting equipment ready for harvest and doing maintenance on water-damaged farm roads so grain can be carted off the farm once harvest begins.

Quenten Knight,
Agronomist, Precision Agronomics Australia
September 26, 2016

Southern region



SOUTH AUSTRALIA

Weather

July rainfall was average to very much above average in most of the agricultural districts, with an area in the Adelaide Hills receiving its highest rainfall on record. The northern part of the Upper North (Quorn and Carrieton) received below average rainfall.

August rainfall varied from below average to average across most of the cereal zone with small areas of very much below average on Kangaroo Island, Lower Eyre Peninsula and the north west of the Upper South East and a small area of very much above average in the Southern Murray Mallee.

Mean maximum temperatures were average for July and above average for August across the agricultural districts.

Mean minimum temperatures for July ranged from average to very much above average. Minimum temperatures in August ranged from very much below average in the northern part of the Upper North to above average in the Mid and Lower South East.

Strong and damaging winds in excess of 80 km per hour were recorded on August 9 and 18 ahead of cold fronts that brought heavy rain across southern areas of the state.

Editor's Note: Severe weather conditions were experienced throughout much of the cropping regions of SA in late September. These events occurred after the submission of this report. The impact of these high winds and heavy rains on the state's winter crops will be detailed in the next issue.

Winter crop condition

Prior to the extreme weather conditions in late September, rainfall and growing conditions were ideal in most areas across the state with above average yields predicted in all districts. In most districts, crops have high levels of biomass and require good spring rainfall to achieve their yield potential.

Growers responded to a low grain price outlook by capping

production costs through reduced application of some inputs, particularly in the low rainfall districts. Less inputs may cost growers some potential grain production and possibly exacerbate quality issues such as lower grain protein.

Some crops on Lower Eyre Peninsula, Yorke Peninsula, Lower North, Kangaroo Island and the South East have been damaged by waterlogging. Crops unaffected by waterlogging in these areas have well above average yield potential.

There has been some minor moisture stress in several lower-rainfall districts but in most cases this has had only minimal impact on yield.

High rates of nitrogen fertiliser have been applied to cereal and canola crops in most districts to maximise the chance of crops achieving their potential.

Trace element deficiencies have become more apparent with the cold wet conditions, requiring foliar applications of trace elements in a number of districts.

Some early-sown cereal crops are at grain fill with, later-sown crops at tillering and the majority are at flag to early head emergence.

Pulse crops range from early flowering to mid-podding with average to above average yield potential.

Canola crops are at full to late flowering with high yield potential in most districts.

Pests and diseases

The level of blackleg is generally higher than normal, particularly in higher rainfall areas where canola is grown more intensively.

Early preventative fungicide applications, both in-furrow and applied at early stem elongation, have been effective in reducing diseases in cereal crops, despite the wet conditions.

There are low levels of leaf rust in cereals in a number of districts with most farmers applying at least one fungicide spray to protect new growth against further infection.

The levels of the disease ascochyta blight have increased in chickpea crops. Farmers are closely monitoring their crops as per SARDI advice and applying fungicide as required, but the impact of the disease on the chickpea crop is uncertain.

Ascochyta disease is present on the foliage of lentil crops, with severity depending on the lentil variety. Grey mould is also present at low levels in some very thick sown crops. The high number and frequency of lentil crops grown on Yorke Peninsula has contributed to the higher disease incidence.

Showery weather during September will place lentils on Yorke Peninsula at high risk of losing yield due to the foliar diseases grey mould and sclerotinia, and grain quality could be affected by ascochyta.

Cow pea aphid numbers have increased in vetch and bean crops with most being sprayed once and sometimes twice to reduce damage.

Russian wheat aphid is present at low levels across the eastern part of the state. In some districts damage is being restricted to isolated patches in crops. But in other districts numbers are beginning to build up and whole crops have required spraying.

Early-sown crops appear to have higher levels of Russian wheat aphid, with aphids often difficult to find in later-sown crops (those sown from late May onwards). Aphid numbers appear to be higher around grassy areas in crops and along fence lines.

Pastures

Pasture growth was slow in many districts due to the cold wet conditions in July and early August but the warmer weather and longer days in late August stimulated rapid growth.

District Reports...

September–October 2016

There are now adequate to high levels of pasture feed in all districts of the state.

High levels of biomass in pasture paddocks, particularly on Eyre Peninsula and the Mallee have provided farmers the opportunity to cut surplus feed for hay.

In most districts, crops and pastures sown for hay have high levels of biomass with above average yield potential.

Livestock are in good to excellent condition in all districts.

Rural Solutions SA for PIRSA
September, 2016

VICTORIAN MALLEE

The Victorian Mallee is having a prosperous year with much of the region sitting on Decile 7 to 10 for the growing season (April 1 to September 27). Fortunately for all Mallee growers, the 70 to 150 mm of rainfall that's fallen in September so far has meant it is a Decile 10 for the month alone.

As a result, the crops are looking exceptionally good and it can be said they're some of the best the Mallee has every produced, particularly in terms of both biomass and height.

Pests and diseases have been a priority in recent times and ascochyta/black spot in peas, leaf rust in barley and wheat crops and stripe rust in wheat are at the forefront of growers' minds. Stripe rust resistance in some varieties has broken down where 'hot spot' areas have developed, and previous BCG research has found that control after head emergence is difficult.

Those who held off spraying for aphid control would have been rewarded with good activity from beneficials. But the spring weather has seen an increase in Russian wheat aphids and damage is apparent. Preliminary information from efficacy trials funded by GRDC has shown both Lorsban and Pirimor are the most reliable for control. In pulses, heliothis, blue green aphids and etiella moths are now appearing in crops.

Crops have been advanced all year. Consequently, growers have been cutting oat and vetch hay one to two weeks earlier

The BCG Main Field Day on September 14 saw growers having to negotiate mud to hear from leading researchers and industry representatives.

District Reports…

September–October 2016

Crops submerged in water have been a common sight across the Mallee in spring 2016.

than normal and are faced with the logistical challenges of continual showers. The hay market is good with high quality the important factor.

In between fungicide and insecticide applications, farmers are preparing machinery for harvest and making decisions such as windrowing or direct heading canola. This decision will greatly depend on logistics at harvest and whether they have access to a pick-up front or a header front suitable for direct heading. With significant biomass and large amounts of rain there's also a lot of lodged barley across the district.

It is expected to be a bumper year with wheat yields expected to be in excess of 3.0 tonnes per hectare… provided the season concludes in farmers' favour. Low grain prices have forced some growers to purchase more silos, silo bags (plus machinery) and/or built bunkers in order to hold on to high quantities of grain in anticipation of a price increase.

We now await the home stretch of the growing season.

Ciara Cullen, Extension and communications – BCG
September 26, 2016

WESTERN MURRAY VALLEY

It has been an above average rainfall period for winter in the Western Murray Valley. Total rainfall for the year is 410 mm to date and 320 mm growing season rainfall. After last year's drought and disaster its certainly a drastic change for the district.

The excellent rainfall has caused some issues with low lying areas becoming waterlogged and any sodic soil types not draining and crops beginning to suffer. Wheat, oats and canola have been able to cope in these wet conditions as opposed to field peas and barley. An exceptional crop for handling this season's waterlogging has been faba beans. Sub clover on irrigation has also performed well.

But what most growers will lose on the wet ground will be made up for on the better soil types.

Wet weather delays

Over the past three to four weeks growers have been trying to get some operations done in between rainfall events. Stripe rust protection has been extensive across the region with crops reaching flag leaf emergence by mid August. Wheat and barley crops have all had varying levels of cereal aphid and army worm infestations and growers are treating these whilst putting preventative fungicides on for stripe rust or spot/net blotch on barley.

Summer croppers are eagerly getting organised to plant rice and corn. Wet weather has made spraying out paddocks difficult and those that have been able to control weeds are now struggling with the excessive amount of decaying feed on the paddock.

High sheep numbers to remove plant residues have been essential and even the sheep are finding it hard to get on top of the feed. Some are considering cultivation methods such as rotary hoes or speedtill/multi disc operations just to manage the immense level of organic matter.

Currently Murray Irrigation Limited irrigators water allocation is 42 per cent. This is a fantastic start to the irrigation allocation and allows us to plan ahead for summer crops, irrigating winter crops in October (maybe not this year?) and also planning ahead for next autumn pre-irrigation.

The temporary water market is down to $70 per megalitre and this is exciting as we can use water and buy more to grow corn, rice, winter crops and even pastures profitably.

Rice price indicators for this season have been forecast from

Mark Howarth farms near Bunnaloo in the WMV. Both his Latrobe (right) and Compass (left) barley crops are powering away in this very good season but Mark is concerned that Compass may be prone to lodging as harvest nears.

This photo shows Mark Howarth's Compass barley (left) next to a paddock of Latrobe barley. Lodging has been an issue for Compass in good seasons particularly when chasing high yields with increased nitrogen inputs.

District Reports...

September–October 2016

Stripe rust spraying is underway in the WMV. Self-propelled sprayers are the preference but the wet weather is forcing growers to utilise planes.

$300–400 per tonne and some growers took an option and contracted earlier at $400 per tonne.

Corn prices are hard to find as overseas markets begin to harvest and the domestic barley/wheat feed prices become a competitor. Grit pricing at $320–340 per tonne has encouraged corn growers to chase the gritting market over feed corn with the uncertainty of the feed pricing come autumn (some early predictions are around $250 to 270 per tonne).

With the excellent start our pasture growth has been exceptional. But many run-down pastures are now one to two feet tall and full of barley grass. Many sheep producers are acutely aware of eye issues with their sheep and have been pasture topping with gramoxone and glyphosate with outstanding results. The pasture topping has reduced the prevalence of eye problems while keeping the pastures palatable.

The difficulty in doing this successfully is having even head emergence on the barley grass and the result is later tillers may still push out viable seed heads. This will have to be monitored as pastures are grazed and further heads emerge.

On the cusp of cutting hay

Vetch, oats and clover paddocks are all locked up and on the cusp of being cut for hay. With the continued wet weather many hay producers are getting nervous about when to cut hay to make sure they can get a curing window.

Correct varietal choice of vetch has been essential with the longer season varieties like Morava, Popany and RM4 still flowering and yet to set any pods compared to Rasina which has podded up and is forcing growers to begin cutting. This season has been conducive to disease build up and vetch crops have been treated with fungicides (not a common practice). Those that didn't have a large disease build up under the canopy have powered away.

Hay producers are hoping for some warm October days!

As long as spring rains are average and we get some sunlight and warmer days, the crops in the WMV will be fantastic. We are currently looking at most dryland crops yielding well above average with canola 2.0 to 2.5 tonnes per hectare and wheat and barley around 4.0 to 5.0 tonnes.

Field pea crops have taken on a lot of disease and some have drowned on the heavier soil types and yields will be variable.

Growers are excited about yields and less about prices.

With barley over the past five years being exceptional, this crop may let us down financially this year.

This reiterates the importance of having a solid cropping rotation – not only for weeds and soilborne disease – but also production risk and pricing.

Fingers crossed for an 'average' rainfall in spring and some sunshine for a dry harvest and easy summer crop planting!

Laurence Pearce
Agronomist – IK Caldwell, Deniliquin NSW
October 1, 2016

Northern region

LIVERPOOL PLAINS

Just like most of eastern Australia, the Liverpool Plains has had its fair share of recent rains.

Winter crops are looking good across the Plains while crops in some low lying areas are being affected by waterlogging.

With the talk of sorghum prices being quite low this coming season, there looks like being a big swing towards cotton and mungbean planting on the Plains. But with the recent rain it has meant that cotton planting is being pushed later and later. Most farmers are still preparing paddocks for the upcoming cotton plant.

On our farm we are waiting for the soil to dry out so we can start soil testing prior to sorghum planting at the end of October or the start of November.

Let's hope the rain eases off until winter crops are harvested and summer crops are in the ground.

Lauren McGavin,
Precision Seeding Solutions, Premer
October 1, 2016

DARLING DOWNS

Weather conditions

Rainfall has been excellent for building up soil moisture for the summer planting period, and for those winter crops planted on limited moisture – but the rain has caused headaches with the spread of disease, particularly in the chickpeas.

August rainfall was 250 per cent of the average, and September's rain is already that with more forecast in the last week of the month, so the breakdown of last season's El Niño event has delivered... in spades!

District Reports…

September–October 2016

Winter crop

Chickpeas are the number one management issue with crops ranging from early flowering to pod fill. The cool weather has slowed the pod formation so all crops have some way to go. The crops facing the most disease pressure are the early sown paddocks, which have closed in the canopy and created an ideal micro-climate for disease. Ascochyta blight has now been found in almost every chickpea paddock, and most paddocks have had two to three fungicide sprays which are holding the disease at bay, although further rainfall will create more pressure.

Botrytis grey mould has been found on the western Downs, and this is the major risk for chickpea crop survival. There has also been waterlogging in patches leading to root diseases. On the plus side, helicoverpa pressure is still light.

But the wheat and barley are enjoying the conditions. There has been some leaf disease but most crops have good yield potential – particularly the barley crops which were sown earlier.

The later sowing of wheat has reduced the amount of tillering, but most crops are in head or boot stage.

Summer crop

Soil temperatures have been moving up and down with the weather – from warm enough to plant most crops to too cold for sorghum and cotton. Planting has been underway for the past fortnight with corn the main crop sown.

There has been strong interest in gritting corn, and feed and silage corn for the feedlots in the spring plant, leading to seed supply shortages.

Sunflowers have been planted, and early crops of sorghum and cotton are going in, along with a few spring sown mungbeans.

The sorghum area is expected to be down to around 70 per cent of normal, whilst the cotton area will be up 50 per cent on last season due to the better prices. This cotton increase will mainly come from dryland plantings.

The mungbean area will be big again but most of this crop will be planted in the December–January period.

The soil moisture profiles are now fairly good, with the rain falling as steady rather than storm rain leading to good infiltration. Many growers will now be looking at their double cropping options as conditions improve.

A chickpea crop on the Darling Downs struggling with ascochyta. Due to continually wet weather, a ground-based fungicide spray has not been possible.

The pronounced and very favourable change in the season during early spring on the Darling Downs is depicted here with newly emerged corn next to a flourishing wheat crop.

Hugh Reardon-Smith
Agronomist, Landmark Pittsworth
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ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

The tractor is a Scottish 3 wheeled Glasgow, which is on display at the Victorian Swan Hill Pioneer Settlement.

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