AUSTRALIAN GRAIN

www.ausgrain.com.au

May–June 2013

Australian Grain
PO Box 766
Toowoomba 4350
P: 07 4659 3555
F: 07 4638 4520
E: grain@greenmountpress.com.au
www.ausgrain.com.au

Advertising
Michael Cook
(National Advertising Manager)
P: 07 4659 3555
F: 07 4638 4520
E: advertising@greenmountpress.com.au

Editor
Lloyd O'Connell

Associate Editor
David Dowling

Production and Design
Mick Allan

Office Manager
Catherine O'Connell

Published by Berekua Pty. Ltd.,
40 Creek Street, Brisbane
Registered by Australia Post Publication No. PP100002295. ISSN 1449–2970.

Published bi–monthly.
Grain Yearbook published in April

FRONT COVER

USDA scientists have developed a new tool for studying root architecture – one that brings them out in three-dimensional colour. It's a major step forward. Root structure, health, and formation have become important traits of interest as scientists search for crop varieties with roots that equip them to adapt to, for example, drier habitats. See page 29.

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

Editorial... Lloyd O'Connell

THERE were an anxious few weeks in many regions of the national grainbelt before *Hughie* finally sent down enough moisture to get the winter crop underway. While not exactly the eagerly anticipated two or three days of steady, widespread rain to herald the seasonal break, most districts have had some very handy showers, spread over a week or two, which has been enough to get the dry-sown crops up and away and the remainder of the seeding program completed.

Good follow-up rainfall is now at the top of the shopping list to make sure the 23 million hectares of wheat, coarse grain, oilseed and pulse crops – forecast by ABARES to be planted this autumn/winter – gets a flying start. This anticipated national winter crop area is an increase on last season of around 500,000 hectares.

With international grain prices, expressed in US dollars, continuing to hover at historically high levels – and our Aussie dollar finally showing signs of weakening against the US greenback – growers could well be in for some reasonable grain prices this coming marketing season. 'All' we have to do is grow plenty of high yielding, healthy crops to cash-in – simple really. Well, really, as we all know it's not quite that simple.

On the agronomic front alone, the task of growing high-yielding and money-making crops seems be more challenging as each season passes. Fertiliser is now the number one expense for many farming businesses and with across-the-board and declining wheat protein concentrations – as well as nutrition-related issues with other crops – the spotlight this year is very much focused on improved nutrition and disease/pest management strategies.

There are plenty of articles in this issue to help you get the optimum performance from your crops. Extensive research and individual paddock monitoring over several seasons is shedding more light on getting the biggest bang for your fertiliser buck – including the increasingly important role of a legume pasture phase in the cropping rotation (see articles beginning page 14).

There's still time to come on board, but be quick

There's nothing quite like overseas travel with like-minded people – and the opportunity to meet with some of the world's best farmers and ag researchers – to help hone your innovative farming skills. Mixed in with the must-see cultural and scenic sights of the various countries we visit, joining one of our farm study tours is a great way to get off the beaten track and see how those countries 'really tick' and how their farmers cope with challenges not too unlike our own.

There is still time to join one of the tours listed below but you'll need to be quick. Visa applications for our South American and Eastern European tours can take up to a month to process.

Our 3-week farm study tours happening this year are:

- UK and Ireland (*Old Blighty Odyssey*) departing July 9;
- South America (*Galloping Gauchos*) departing Aug 5; and,
- Turkey & Eastern Europe (*Black Sea Sojourn*) departing Aug 21.

Visit www.greenmounttravel.com.au for more details or call the office on 07 4659 3555.

Hope it's a great start to the winter crop in your neck of the woods.

AUSTRALIAN GRAIN
www.ausgrain.com.au

In this issue...

Everything You Need to Go All Out

Extra versatility for your get-it-done attitude.

JOHN DEERE

Go all out with the John Deere 9R/9RT Series Tractors. With up to 412 kW of engine power (560 hp†), they've got the right power and performance to help you get every job done faster than ever. What's more, the refined PowerShift Transmission with Efficiency Manager™ will help you get it done with less diesel. Combine that with the advanced GPS and information-management technologies from John Deere, and you'll get it done better than ever – all while riding in the spacious and comfortable CommandView™ II Cab.

And now you can get more jobs done with a highly powerful track or four-wheel-drive tractor thanks to a wider selection of options, which include increased hitch-lift capacity and hydraulic flow, plus an available PTO on all models.

The John Deere 9R Series Tractors with 265-412 kW of engine power (360-560 hp†) and 9RT Series Track Tractors with 338-412 kW of engine power (460-560 hp†). Highly powerful tractors built for your go-all-out-and-get-it-done attitude. Visit your local John Deere dealer today.

Nothing Runs Like A Deere™

† Rated engine hp (ISO) per 97/68/EC.

JohnDeere.com.au

Australian continent takes a big drink

DEVASTATING at the time, the major floods of 2011 have since brought a vital benefit by recharging Australia's depleted reserves of underground water. Scientists from Australia's National Centre for Groundwater Research and Training (NCGRT) say they have been impressed with recharge rates of groundwater following the 2011 floods in Queensland and Victoria.

"Prior to the floods, water levels in the Lockyer Valley were becoming perilously low in this prime agricultural region of southeast Queensland," says Dr Matthias Raiber, postdoctoral research fellow at the NCGRT and Queensland University of Technology and now with CSIRO.

"Although the response of groundwater was highly variable owing to the complexity of the Lockyer Valley, in some regions we saw levels rise as much as 10 metres. This kind of response is overwhelmingly positive from the perspective of water availability in the region."

As a dry continent without glaciers, or large and abundant permanent lakes, groundwater is a critical resource for large parts of Australia. Its importance is only likely to increase in a future where rainfall patterns are expected to become less predictable, while surface supplies may become ever more stressed due to competing pressures from evaporation, population growth, industry and agriculture.

Major food bowl

The Lockyer Valley is a major food bowl for Queensland, with recent council figures in January showing that annual turnover for agriculture, forestry and fishing in the region was $230 million in 2010–11.

"Given the importance of our groundwater reserves, it is crucial that we better understand how our aquifers recharge and at what rate. Even within the Lockyer Valley, there are many different processes for recharge which depend on the hydrology and geology of a location," says Matthias.

Figure 1 shows a section through the central Lockyer Valley 3D geological model which depicts the groundwater situation

FIGURE 1: Central Lockyer Valley (Qld) groundwater model at the height of a long-term drought, 2007

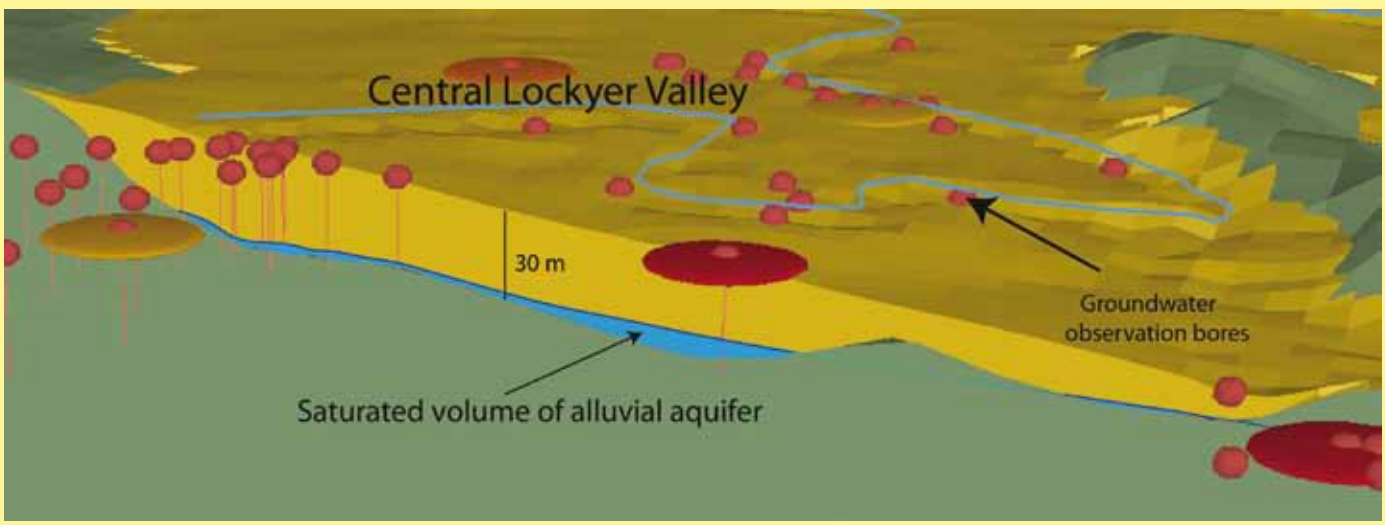
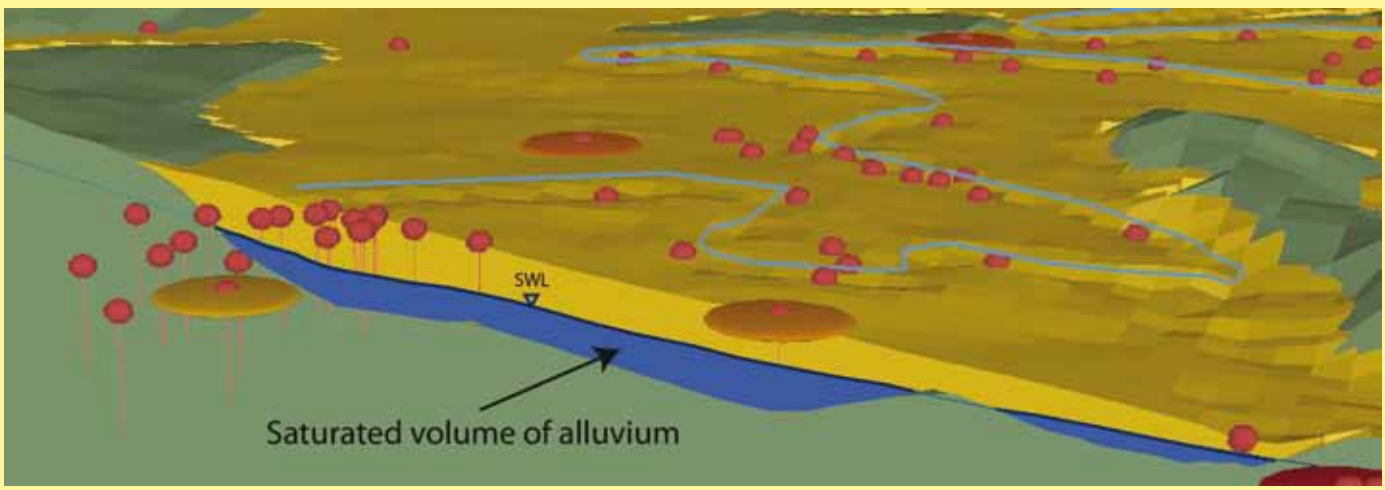


FIGURE 2: The same central Lockyer Valley region after the floods of 2011



Clean up in more ways than one

BAYER

VELOCITY®

Use Velocity® herbicide on selected paddocks and improve your return on investment

- ✓ Trial Velocity in a few paddocks to prove for yourself that spraying early helps boost yield and profit
- ✓ Use Velocity to clean up your problem broadleaf weeds
- ✓ Rotating Velocity around your farm also helps to keep other herbicide options effective for longer

Download the latest Velocity product guide from our website to find out more

www.bayercropscience.com.au

BAYER 150 Years
Science For A Better Life

BCB0648/EAST/D

Collecting water samples as part of the Australia-wide groundwater flow and river interaction research.
(Photo: Connected Waters Initiative (CWI), University of New South Wales)

of this region in 2007. It also shows groundwater bores (red points and lines) and the groundwater level at the climax of the drought in June 2007. The alluvium is shown in yellow, the underlying bedrock is green.

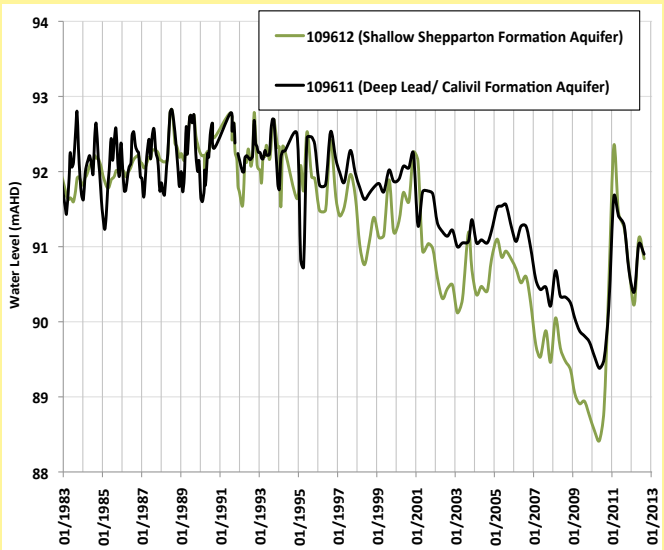
In 2007 the water levels in this central part of the Lockyer Valley were very close to the base of the alluvium, and there was virtually no groundwater left in some areas. Only about 20 per cent of the alluvial aquifer was below the groundwater table (shown in blue).

In these areas of very low water levels, the groundwater quality also became increasingly poorer with very high salinities, due to upwards seepage of more saline groundwater from the underlying bedrock induced by continuous pumping during the drought.

Figure 2 shows the same section through the central Lockyer Valley in June 2011 after the January floods of that year. You can see the dramatic rise of groundwater levels, and now almost 50 per cent of the alluvium is saturated (the area below groundwater level, shown in blue).

In many parts of the Lockyer Valley, including in this section, the water levels have recovered to about the same – or even above – the level that had been measured before the drought in the early 1990s.

FIGURE 3: Water level changes in the Calivil and Shepparton Formation aquifers of the Loddon River catchment during the past 30 years



"Using a variety of complementary techniques, my colleagues and I are building a picture of the ways in which our groundwater reserves are replenished, something that has been 'out-of-sight and out-of-mind' for too long, especially given its importance in Australia's past, present and future," said Matthias.

Northern Victoria also replenished

Sanjeeva Manamperi, another researcher at NCGRT and PhD candidate at LaTrobe University, is studying recharge rates in a different part of Australia, the Loddon River catchment in Northern Victoria. His results show a similar response followed the flooding in early 2011.

"In most places that I have examined, groundwater levels recovered by about 70 per cent in early 2011. This is quite remarkable when you think that this region suffered a 13 year drought from 1997 to 2010," says Sanjeeva.

"A smaller flooding event in 2010 improved the rate at which recharge could occur in 2011 because the surface layers were already saturated when the floods arrived.

"But it was the intensity of the rainfall during the 2011 event that resulted in such spectacular recharge of many of these aquifers. The large volume that accumulated in such a relatively short period of time meant that recharge occurred immediately through fractures in the rocky regions, but also seeped through the soil in other areas.

Figure 3 shows the water level changes in nested bore sites in the Calivil and Shepparton Formation aquifers during the past 30 years. At nested bore sites, there are two or three bores located next to each other, but screened in different aquifers.

The Calivil Formation aquifer is the most important in the Loddon catchment as farmers extract thousands of megalitres from this aquifer annually.

The chart clearly illustrates the gradual drop in the groundwater level of both aquifers from 1997 due to the drought – then a quick jump after the flooding event in January 2011.

"Obviously flooding events cause serious problems on the surface - but underground they help replenish stores of water that are running out. For the time being, the 2011 floods have taken the immediate pressure off water use in northern Victoria.

"Nevertheless, we cannot be complacent in our conservation of water resources as the long-term availability of groundwater will depend on the frequency of flooding events in Australia, something that is difficult to predict."

Researchers at the NCGRT are making estimates of Australian groundwater availability in the future based on what they are learning about the processes of recharge during floods. In doing so they hope to provide state and federal water authorities with a clearer picture of the demands that can be sustainably placed on Australia's underground reserves.

NCGRT director Professor Craig Simmons says most countries do not know the extent of their groundwater resources when they begin extracting them, or how long they take to recharge. Without this vital knowledge they cannot manage them.

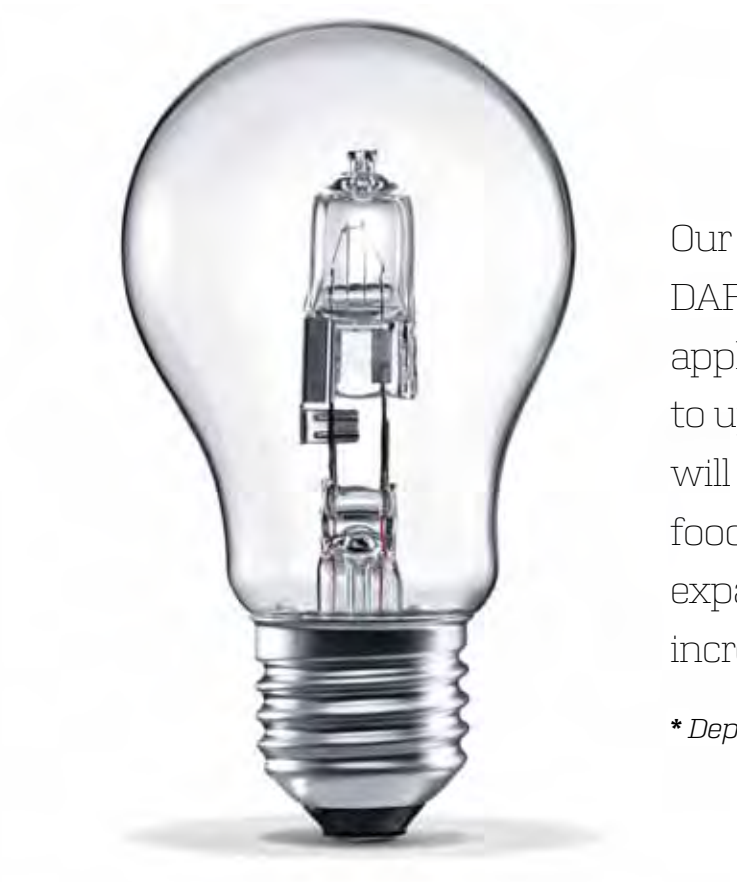
"Reliable water supply is not only a fundamental element of economic prosperity for any country, but also vital for national security. Research being conducted at the NCGRT is therefore key in providing Australia with the know-how to sustainably exploit its precious underground reserves of freshwater, which are literally Australia's 'buried treasure'," he says.

The National Centre for Groundwater Research and Training is an Australian Government initiative, supported by the Australian Research Council and the National Water Commission.

Further information: Dr Matthias Raiber, NCGRT and QUT, Ph: 07 3833 5758 or 0415 845 440 – Sanjeeva Manamperi, NCGRT and LaTrobe University, Ph: 03 9479 1316 or 0425 619 355. Also visit – www.groundwater.com.au ■

Think **Inside** the Box!

CONTAINER LAMINATION



Our Container Lamination initiative is a DAFF* approved transparent film that is applied to the interior walls of a container to upgrade it to a food quality container. This will ensure you have a stable and reliable food quality container supply chain thereby expanding your business opportunities and increasing profit.

***** *Department of Agriculture, Fisheries and Forestry: DAFF*

Visit: **www.maerskline.com/australia**
Email: **response.australia@maersk.com** and quote 'Container Lamination' in the subject.

MAERSK LINE

Think outside the drum

IF herbicides alone were the answer to all of our weed problems we would have eradicated crop weeds years ago. Most of us now realise that to achieve true weed control success we need to add non-herbicide tools into the mix. It doesn't matter which weed, which crop, or which country we are talking about, the benefits of good cultural practices apply everywhere.

Some excellent long term Canadian research has confirmed how important it is to combine good cultural practices with herbicide use. The Agri-Food Canada trials show that after nine years of full herbicide rate, high barley seeding rate, and a diverse crop rotation, there were zero wild oats in trial plots.

Any reduction in seeding rate, diversity of rotation, or herbicide rate always resulted in more wild oats in crop and a higher wild oat seed bank.

Increasing crop competition with weeds results in more crop and less weeds. Why not try increasing the cereal seeding rate on a weedy paddock and check the results at harvest?

Wild oat is Western Canada's worst crop weed, and now over 20 per cent of this vast region's cropland has herbicide resistant wild oats.

Canadian researchers John O'Donovan and Neil Harker from Agriculture and Agri-food Canada established four long term trials in Western Canada (Beaverlodge) in 2001. Two of these trials continued until 2009 (Table 1).

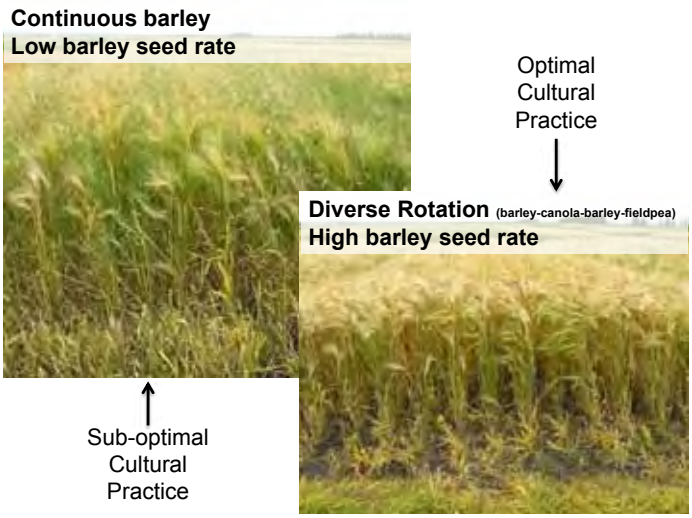
Treatments investigated

- Semi-dwarf versus tall barley cultivars;
- Two barley seeding rates – normal (200 seeds per m^2) and twice the normal rate;
- Two rotations – continuous barley or a diverse rotation of barley-canola-barley-field pea; and,
- Herbicides applied at 25, 50 or 100 per cent of recommended rates.

It is a pretty simple message. Full herbicide rate combined with crop competition and sound crop rotation results in more crop and fewer weeds.

Anecdotal evidence by the Canadian researchers suggests that herbicides tend to be more effective when applied to small plots in ideal conditions compared to those applied on a vast scale on large farms.

The reduced herbicide rates in this trial are an attempt to simulate resistance and/or the variability of the efficacy that can occur at the farm level due to factors such as weather, stages in weed development and general application errors. Other research has confirmed that reduced herbicide rate often results in faster resistance evolution. These trials were conducted on weeds with very low resistance levels.



Cultivar differences?

There was no difference in wild oat biomass or seed bank between semi-dwarf or tall barley varieties. The semi-dwarf variety used was a better performing variety than the tall variety.

The semi-dwarf, well adapted variety competed equally with weeds as the taller variety.

The Australian Herbicide Resistance Initiative (AHRI) works in partnership with the farming community and industry to develop research programs targeting herbicide resistance and to disseminate resistance management messages to encourage sustainable cropping across Australia.

For more information see: www.ahri.uwa.edu.au

TABLE 1: Summary of key research findings from the Beaverlodge (Western Canada) site

Herbicide rate (%)	Barley seeding rate	Crop rotation	Wild oat seedbank in 2009 (seeds/m^2)	Barley yield in 2009 (kg/ha)
25	low	Continuous barley	3640	2310
25	high	Diverse	1560	3720
50	low	Continuous barley	2730	2600
50	high	Diverse	195	5130
100	low	Continuous barley	37	4340
100	high	Diverse	0	5020

Note: Wild oat seed bank was measured by taking soil core samples and sieving in 2009. Barley yield was measured in 2009 at the completion of the trial. All plots were sown to barley in 2001 and 2009.

Das Tractor

Introducing CLAAS AXION 900, the new benchmark in broadacre farming. With up to 410 hp of made-to-measure power, continuously variable transmission, unique four-point cab suspension, cutting-edge on-board technology and intuitive control systems, AXION 900 delivers the same exacting levels of performance, efficiency, versatility, reliability and comfort that have made CLAAS the world leader in harvesting technology. Contact your CLAAS Harvest Centre today and find out how AXION 900 can drive the productivity of your business even further.

since 1913 100.claas.com

CLAAS Harvest Centre
www.claasharvestcentre.com.au

CLAAS

LPA12330AG

Broad spectrum coverage now available for key cereal crops

IT'S hard to predict which fungal diseases are likely to threaten out wheat, barley or oat crops each season, and crop protection is often a delicate balance between a range of fungicides targeting specific diseases. But there is a new broad-spectrum and cost effective control option.

Syngenta is about to release Cogito, a new fungicide that's set to be a game-changer for cereal crop protection. By bringing together the strengths of two active ingredients – propiconazole and tebuconazole – in one high quality formulation, Cogito offers affordable cover against all major diseases, even in medium to low rainfall areas.

These two proven active ingredients are already on the market as single active products (Tilt from Syngenta, and Folicur from Bayer) – but this is the first time they have successfully been combined to deliver a broad-spectrum foliar fungicide, offering growers a more flexible control option.

Effective control made simple

Stripe rust is a major financial risk for Australian farmers, and has caused significant loss to wheat yield and grain quality in the past. The yellow leaf spot epidemic in 2010 also highlights the need for more effective fungicides to help farmers minimise the risk of yield and financial loss from cereal fungal diseases.

"Our recent dry summer means there hasn't been a lot of stubble breakdown, so we may see increased pressure from yellow leaf spot again," says Garth Wickson, Solutions Development Lead at Syngenta.

Syngenta's Garth Wickson warns that the dry 2012–13 summer has meant limited stubble breakdown and higher yellow leaf spot risk this season.

"So, with Cogito we're bringing what could be called a 'super-tebuconazole' to the market. It offers tebuconazole levels of stripe rust control, with the added benefits of effectively controlling other key diseases such as Yellow Leaf Spot."

He likens it to an umbrella, with full coverage against all major pathogens, including barley leaf rust, yellow leaf spot, blotches, barley scald and powdery mildew, and explains that if you're relying on only propiconazole or tebuconazole right now 'your umbrella may have a few leaks.'

Syngenta's focus on building rural prosperity through better crops, better returns for growers and improved farm productivity is underpinned by a global $1.2 billion investment in R&D. Cogito has already been proven in selected international markets, and recent local trials indicate it is ideal for Australian conditions.

Proven protection and local performance

In registration trials since 2010, Cogito has demonstrated it can provide control over key diseases equal to, or in some cases better than, individual actives (Figures 1 and 2).

The severity of stripe rust dropped from 92 per cent (untreated) to 25 per cent with 250 ml per hectare Cogito – and the yield more than doubled.

FIGURE 1: Stripe rust severity

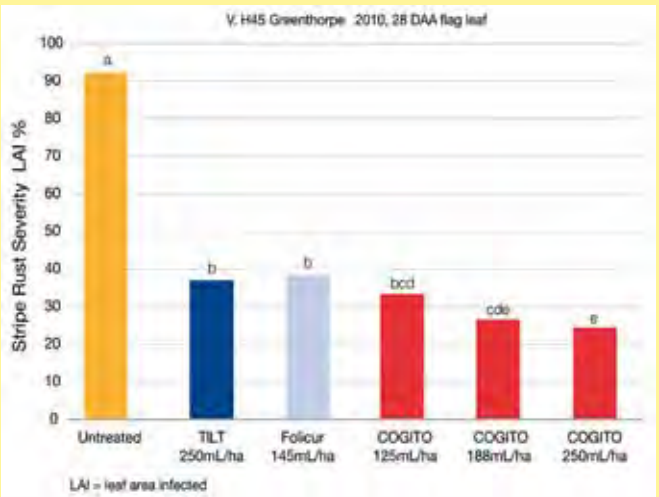
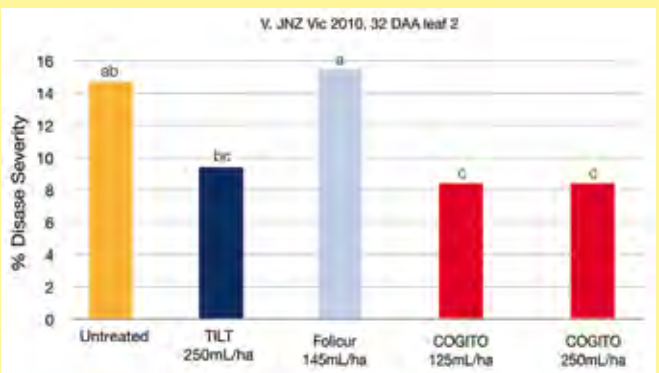


FIGURE 2: Yellow leaf spot, % disease severity



Unlock your Phosphorus with FertiCoat- the ultimate solution for Phosphorus availability. Call today to find out how.

FertiCoat
The ultimate fertilizer coating

Perfect for granular coating, mixing with UAN for stability and liquid soil injection.

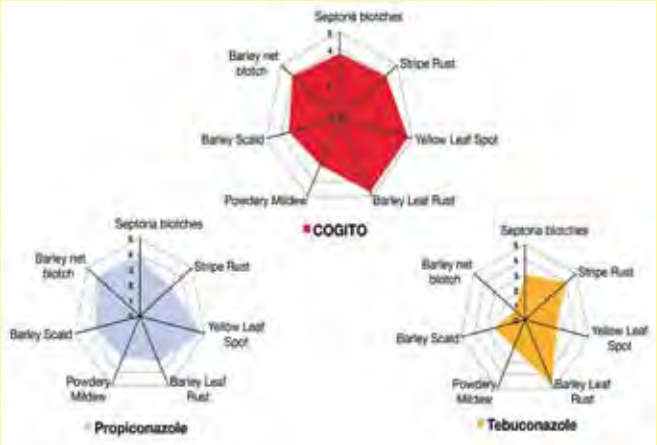
Brendan Lauman
Specialist Agronomist - QLD, NSW
0438 776 480
blauman@omnia.net.au

Jan De Jager
Specialist Agronomist - WA, SA, NT, Vic
0429 898 131
jdj@iinet.net.au

omnia NUTRIOLOGY*
*the science of growing

03 5133 9118 **omnia.com.au**

FIGURE 3: Fungicide formulations



Cogito matches the success rates with Tilt in treating yellow leaf spot, while Folicur alone makes no impact. When used to treat powdery mildew, incidence of infection drops from 37 per cent (untreated) to five per cent using 250 ml per hectare Cogito.

The reason for this high performance lies in Cogito's unique formulation (Figure 3)..

Cogito 125 ml per hectare contains 31.25 gai (grams active ingredient) propiconazole and 31.25 gai tebuconazole, the equivalent of 62.5 gai total triazole active ingredients per hectare. This makes it equal to 250 ml per hectare of Tilt or 145 ml per hectare Folicur, and provides consistent strength in treating a wider range of fungal pathogens.

Greg Giblett of Agromax Consulting in the Liverpool Plains of northern NSW, checking for cereal fungal disease.

More effective than conventional formulations

Cogito can therefore offer more effective control than conventional tebuconazole and propiconazole formulations. The single product also has some logistical advantages. With one fungicide protecting against seasonal fungicides, you'll no longer need to buy and store separate products for different cereal crops or pathogen risks.

Cogito is ready to use, with no other additives needed, and includes a unique adjuvant system to boost efficacy.

Syngenta sees Cogito being used at growth stage 30–32 as an inoculum management tool, suppressing early disease development. The new fungicide equally supports flag leaf protection in situations where growers are looking to use a cost effective treatment.

Greg Giblett, of Agromax Consulting in the Liverpool Plains, of NSW, attended a recent presentation on Cogito's trial performance.

"The preliminary research indicates that the combination of dual actives, propiconazole and tebuconazole, may give slightly better control over yellow spot and stripe rust than either active alone," he said. "We'll be keen to give Cogito a trial on cereal crops this winter."

Syngenta plans to launch Cogito in late May 2013. Please contact your local sales representative for more information, call the Syngenta Technical Product Advice Line on 1800 067 108, or visit www.syngenta.com.au.

Folicur is a Registered Trademark of Bayer. ■

The new combination cereal fungicide that fills the gaps.

Introducing Cogito, the new cereal fungicide that features the powerful combination of Propiconazole and Tebuconazole. Yellow spot, blotches, rust and powdery mildew can no longer sneak through the cracks.

Cogito®

syngenta®

For further information please call the Syngenta Technical Product Advice Line on 1800 067 108 or visit our website at www.syngenta.com.au

™

THE RESEARCH VIEW

Will low protein become the new norm?

By Rohan Brill, Matthew Gardner, Rick Graham, NSW DPI and Neil Fettell, UNE

AUSTRALIA – and particularly the northern grains region – has traditionally produced wheat of a relatively high grain protein concentration – but in recent seasons, those associated with the wheat supply chain from producers to end users have observed a reduction in grain protein concentration.

Receivals of low protein wheat grades (less than 11.5 per cent protein) were greater than high protein grades for GrainCorp's Dubbo Zone (NSW) for the harvest of 2012/13, with low protein grades representing 60 per cent of total receivals (Table 1). The Dubbo Zone spans from Nyngan and Tottenham in the west, Coonamble in the north and to Birriwa (SE of Dunedoo) in the east.

The nitrogen requirement of a crop is set by the water-limited yield potential (stored moisture plus in-crop rainfall), the crop species (eg. wheat, barley, canola), the desired grain protein concentration and crop management (disease, phosphorus supply, weed control and sowing time).

The N supply for crops in moderate to low rainfall areas comes mainly from decomposing organic matter and this is controlled by the amount of organic matter, the quality of the organic matter (carbon to nitrogen ratio, particle size, age), soil type and suitable temperature and moisture conditions for mineralisation.

Fertiliser N usually accounts for a small proportion of total N supply but can still be crucial for achieving desired yield and protein targets.

THE NITROGEN SITUATION AT A GLANCE…

- Soil tests from throughout the northern region in 2012 indicate that soil mineral nitrogen contents were low in comparison to years prior to 2010, which may help explain why grain proteins were generally low in 2012.
- Soil mineral nitrogen contents were low primarily due to high rates of nitrogen removal (in grain) in the previous seasons. Denitrification may also have contributed to lower mineral N levels – but this is hard to clearly define.
- There has been a reduction in the number of paddocks tested for nitrogen in recent seasons and this may be contributing to poor nitrogen decisions.
- There were exceptions to the '11% protein rule of thumb' in 2012 where maximum grain yields were achieved at grain protein concentrations between 9 and 10 per cent.
- N fertiliser recovery in grain was moderate at best in 2012 Variety Specific Agronomy Packages (VSAP) trials.
- Longreach Spitfire seems to have a grain protein concentration advantage over other varieties at a given yield level; but the effect of variety choice on grain protein concentration is small compared with the effects of agronomic management.
- Based on a range of trials and varieties that had plus or minus crown rot treatments, the impact of crown rot on grain protein concentrations was negligible.
- To ensure N does not become a major factor limiting yield, N supply needs to be enhanced using a combination of legume crops/pastures and tactical fertiliser N applications.

Consultants' Corner

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

Soil mineral N reserves

The low protein levels observed in 2011 were largely the result

TABLE 1: Wheat receival grades as a percentage of total wheat receivals (705,000 tonnes) for GrainCorp's Dubbo Zone for the 2012/13 harvest

	Grain protein minimum (%)	Proportion of wheat receivals (%)
APH2	13	10
H2/AUH2	11.5	30
APW	10.5	23
ASW/AGP1	No limit	37

What is behind the nationwide drop in grain protein?

TABLE 2: Distribution (%) of soil mineral nitrogen contents (0–60, 10–60, or 0–100 cm depth) across Qld, NSW and Victoria, 2005 to 2012

Mineral N (Kg/Ha)	2005	2008	2010	2011	2012
<30	21	19	13	38	42
30–60	17	20	26	33	39
60–120	40	31	40	24	16
>120	22	30	21	5	3
Number of samples	5506	3669	2001	2001	2316

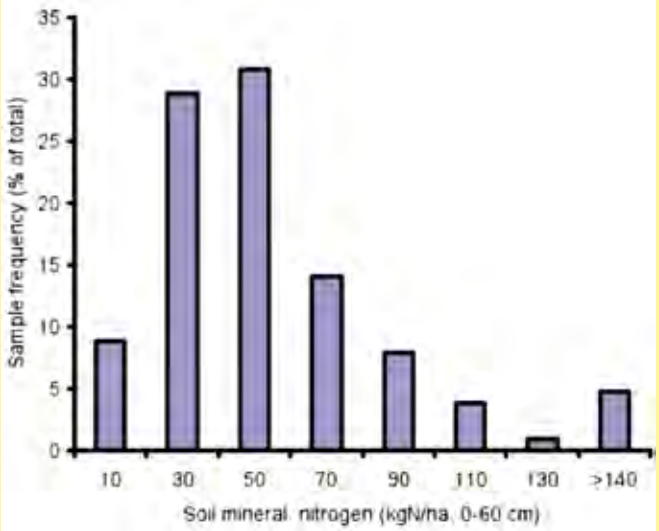
Data courtesy of Jim Laycock, Incitec Pivot Ltd

of low soil nitrogen supply. This observation is supported by the results from pre-sowing soil testing (Figure 1), where 64 per cent of samples tested in north-central NSW had less than 60 kg of mineral nitrogen to a depth of 60 cm and only 10 per cent had more than 100 kg.

While these numbers may not be truly indicative of all cropping paddocks (for example, those thought to be high are less likely to be tested) they do show that many were low in mineral nitrogen. The dry winter and spring conditions in much of the region are likely to have inhibited in-crop mineralisation, further restricting soil nitrogen supply.

Since 2010 there has been a distinct shift in the distribution of soil mineral N contents in the eastern states. Compared to 2005 the percentage of samples testing less than 30 kg N per hectare has doubled while those exceeding 120 kg N per hectare has dropped from more than 20 per cent to less than five per cent.

FIGURE 1: Frequency distribution of soil mineral nitrogen test values for 520 sites in north-central NSW in 2012



Sampling depths varied so values have been adjusted to estimate a 0-60 cm soil layer. (Data courtesy of Jim Laycock, Incitec Pivot Ltd)

Similarly the proportion of soil mineral N contents between 60 and 120 kg N per hectare has reduced from 40 per cent to less than 20 per cent.

Apart from the soil mineral N results, Table 2 indicates there has also been a significant drop in sample number, which may suggest that soil testing practices have declined. The decline in

TABLE 3: Crop sequence effects on soil mineral nitrogen at sowing and subsequent barley grain yield, protein and grain nitrogen recovery at Condobolin, 2012

Crop sequence			Soil mineral N	Grain yield	Grain protein	Grain N content
2009	2010	2011	(kg/ha, 0–60 cm)	(t/ha)	(%)	(kgN/ha)
Pea	Wheat	Barley	56	2.67	8.4	36.1
Wheat	Barley	Barley	64	3.25	8.9	46.3
Lucerne/Fallow	Wheat	Barley	76	2.77	9.1	40.4
Wheat	Pea	Wheat	77	3.46	10.7	59.1
Lucerne/Fallow	Wheat	Pea	82	3.41	10.7	58.2
Barley	Pea	Barley	83	3.24	10.3	53.7
Pea	Wheat	Lupin (poor)	101	3.07	11.8	58.2
Lucerne	Lucerne/Fallow	Wheat	117	3.27	11.8	61.8
Wheat	Barley	Pea brown manure	121	3.21	12.8	65.4
Lucerne	Lucerne	Lucerne/Fallow	126	3.23	13.4	69.0
		F pr.	*<.001*	*<.004*	*<.001*	*<.001*
		LSD	*35*	*0.39*	*1.5*	*11.4*

soil mineral N along the eastern wheatbelt might partly result from changing sample numbers and locations – but it is still likely that there has been a major drop in soil nitrogen supply.

This shift in soil mineral N observed from the Incitec Pivot Ltd (IPL) soil testing has coincided with a general decline in grain protein, particularly in northern NSW.

Rotation effects on mineral N

There may be a range of factors that have contributed to the lower soil mineral N including high 2010/11 grain yields, low residual nitrogen contribution from pulse crops, denitrification, depletion of deep N or organic reserves and insufficient fertiliser inputs.

The 2010 and 2011 seasons received above average rainfall throughout the entire northern region that created ideal conditions for high yielding winter and summer crops. It was not uncommon for winter cereals to be yielding in excess of five to six tonnes per hectare west of the Newell Highway under dryland conditions.

If these crops were achieving 11 per cent protein then they were removing more than 110 kg N per hectare in grain. These seasons were also high yielding years for sorghum which would have removed similar quantities of N as the winter cereal crops.

Pulse crops were also high yielding with chickpea yields exceeding 3 to 3.5 tonnes per hectare. In 2010 pulse crops had large crop biomass which would have contributed to soil N through N_2 fixation, but pulse area was less than 20 per cent of the total crop area. Pulse area decreased in 2011 – then with a dry start to the season followed by a wet finish – many pulse crops had a high harvest index, effectively removing (as grain) the majority of N they fixed.

Graeme Schwenke and fellow researchers conducted a survey in northern NSW in the 1990s and found that the net residual nitrogen benefit of chickpeas was on average close to zero, while for faba beans the net benefit was, on average, 42 kg per hectare.

In a trial at Trangie Agricultural Research Centre over two seasons (2011 and 2012) the grain yield and grain protein concentration of EGA Gregory wheat following chickpeas was similar to wheat following canola that was fertilised with 46 kg per hectare N. The application of 46 kg per hectare N in June 2012 to the wheat significantly increased the 2012 wheat yield by 400 kg per hectare and 1.4 per cent protein regardless of previous crop.

In land adjacent to the above mentioned trials, three varieties of wheat were sown over a 2011 chickpea 'time of sowing' trial and over a 2011 faba bean time of sowing trial.

The average yield of the three wheat varieties was 400 kg per hectare more where sown over the 2011 faba bean trial than where sown over the 2011 chickpea trial.

There was also a 1.2 per cent grain protein advantage where the previous crop was faba beans compared to chickpeas.

The effect of crop sequence was clearly demonstrated in a trial at Condobolin in 2012 (Table 3). Mineral nitrogen values at sowing varied from 60 kg N per hectare after successive cereal crops up to 120 kg per hectare after lucerne, and as well as higher yields, this was reflected in a protein increase from 8.4 up to 13.4 per cent.

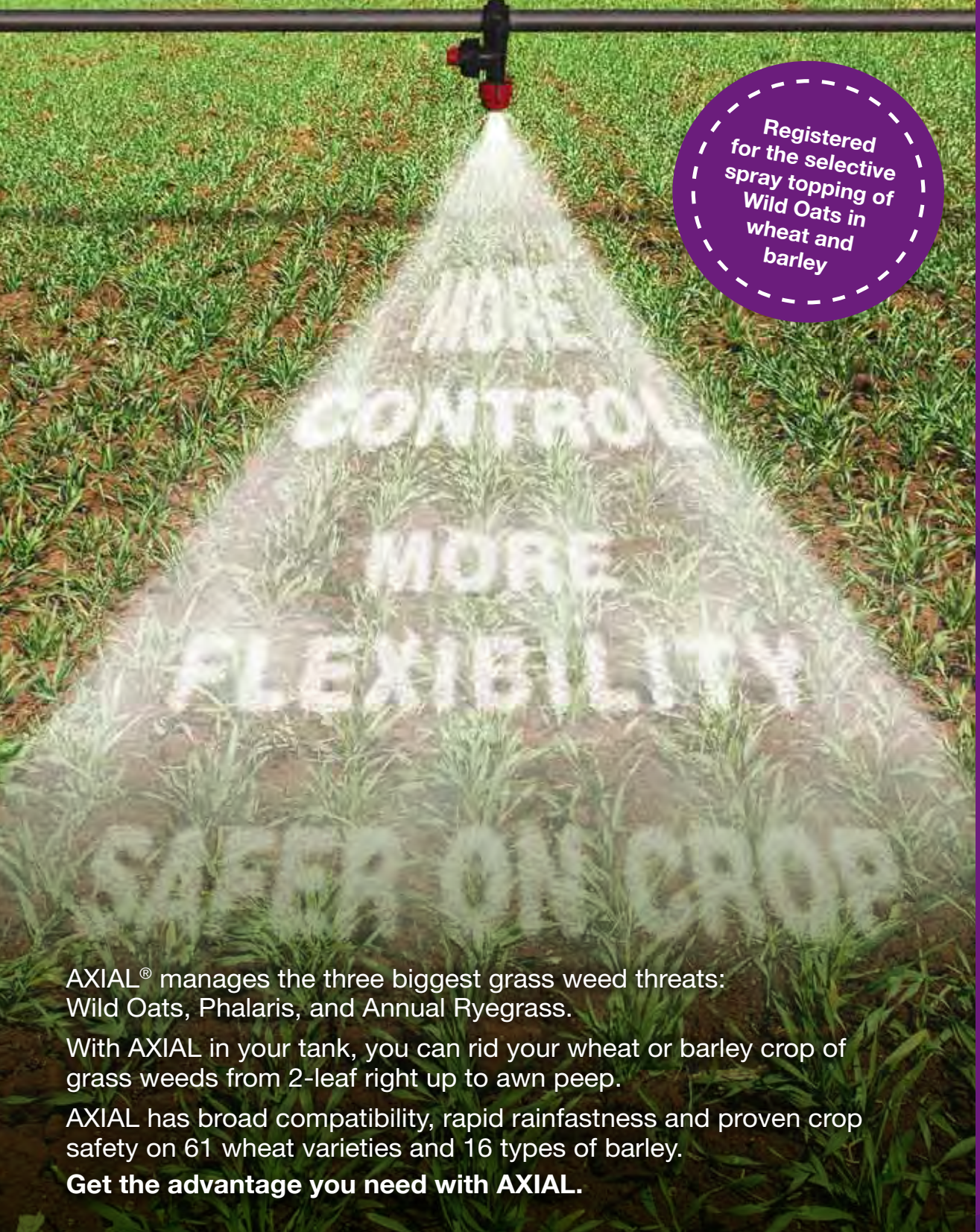
The pea brown manure treatment (sprayed out in September) gave high yield and protein and is of interest to some growers particularly where annual grass weeds are also a problem.

Effect of denitrification on mineral N reserves

During 2010 and the 2011/12 winter fallow period a number of paddocks throughout the northern grains region were inundated with water, essentially creating ideal conditions for N loss via denitrification with these soils being warm and anaerobic. Biological denitrification is where plant available nitrate N is converted to a gaseous form and enters the atmosphere as either nitrous oxide (N_2O) or dinitrogen (N_2).

Once in the gaseous form the N is lost from the system and cannot be recovered by plants. Reports of N losses from denitrification range anywhere from 5 to 250 kg N per hectare in heavy clay cropping soils depending on environmental conditions and nitrate available in the soil profile. Measurements on classical crop production systems (non-irrigated) show maximum N losses in the temperate climate of about 20–30 kg N per hectare during the growth period of annual crops.

Some local data produced by a nitrous oxide emission study at Tamworth indicated that the denitrification process was rapid



Registered for the selective spray topping of Wild Oats in wheat and barley

AXIAL® manages the three biggest grass weed threats: Wild Oats, Phalaris, and Annual Ryegrass.

With AXIAL in your tank, you can rid your wheat or barley crop of grass weeds from 2-leaf right up to awn peep.

AXIAL has broad compatibility, rapid rainfastness and proven crop safety on 61 wheat varieties and 16 types of barley.

Get the advantage you need with AXIAL.

Axial®

syngenta®

For more information speak to your agronomist or visit www.syngenta.com.au

TABLE 4: Average grain yield (t/ha) and grain protein concentration (%) of five trials including wheat, durum and barley varieties that had a plus or minus crown rot (CR) treatment applied

Site	Year	Number of varieties	Protein (%)		Yield (t/ha)	
			Plus CR	Minus CR	Plus CR	Minus CR
Bellata	2012	18	10.9	10.8	3.8	3.9
Weemalah	2012	18	9.7	9.5	3.0	3.2
Coonamble	2011	18	14.2	14.2	2.6	3.3
Mungindi	2011	18	10.8	10.7	3.8	3.9
Coonamble	2009	16	12.9	13.0	3.0	3.3

occurring within a 48 to 72 hour period of the onset of anaerobic conditions (Schwenke et al. 2012). In this study key denitrification events were identified immediately following planting of wheat in July 2010 and sorghum in October 2010.

Shortly following planting of the wheat and sorghum, 68 and 60 mm of rainfall was received on the individual sites, respectively, which initiated high emissions of N_2O immediately. It should be noted that the soil was already moist prior to rainfall events and rainfall did not cause inundation.

Based on the N_2O emissions it was estimated that denitrification losses from applied N (80 and 40 kg N per hectare for the wheat and sorghum, respectively) were between 9 and 14 kg N per hectare for both situations.

These losses are in the order of a 12 to 25 per cent loss of applied N. Undoubtedly there will be large variation in the quantity of N lost to denitrification between regions and paddocks in the 2012 season, but this does highlight the need to soil test in paddocks that were suspected of having denitrification losses in 2012 to give an indication of what is available for the 2013 winter crop.

Removal of N in grain

The inherently fertile nature of soils throughout the northern grains region has provided a basis of good crop yields and protein achievement with minimal fertiliser inputs. A 20 to 30 year history of minor fertiliser inputs has mined the natural resource base in the soil including the organic N content.

This organic N provides the basis for mineralisation in addition to the crop residues that are cycled near the soil surface. Over the years there has been little response to fertiliser application (especially in western regions) as the organic N supply has been sufficient to meet crop demands.

But with their continual depletion there has been a reduced ability of soil N reserves to fill the gap between moisture yield potential and N yield potential. Therefore, the last few seasons of low grain protein may be an indication that soil N supplies will need to be boosted by a combination of legume crops or pastures combined with applications of N fertiliser to meet yield and protein targets.

Above are some plausible reasons that may have contributed to the current trend of declining soil mineral N contents over the past three years. They also provide a reason to get a soil test of paddocks that have performed poorly or were at risk of losses from denitrification in the past couple of seasons.

This is not a recommendation to test every paddock but rather a number of representative paddocks so that a re-evaluation of soil mineral contents can be made. Once a starting N point is established in paddocks where it was previously unknown, simple budgeting tools can be used to estimate N additions and losses.

Targeting yield or protein without a starting N value, or a ballpark figure at least, ensures that there is a large possibility of either undersupplying or oversupplying N to the crop, both of which can reduce the return on cropping investments.

Crown rot and grain protein

There has been some speculation throughout the region that crown rot was responsible for low grain protein and poor N use efficiency. In Table 4 there are a collection of trials from throughout the northern grains region that included bread wheats and durum varieties (Bellata and Weemelah) or a combination of barley, durum and bread wheat varieties.

A plus or minus crown rot treatment for each variety was implemented where the plus treatment had durum seed colonised by five different isolates of *Fusarium pseudograminearum* sown with the plot seed.

The plot seed and inoculated seed were thoroughly mixed prior to sowing to ensure even infection across the plots. The plus or minus crown rot treatments had no significant impact on grain protein when averaged across all varieties within each trial despite the plus crown rot treatment reducing grain yield at Weemelah and Coonamble in 2009 and 2011.

At the Coonamble 2011 site crown rot infection reduced grain yield by 0.7 tonnes per hectare without changing protein content, therefore, in this scenario crown rot has limited the quantity of N removed per hectare. Yield loss from crown rot is related to moisture stress post anthesis. Under conditions of moisture stress, the crown rot fungus restricts water movement from the roots through the stems, producing whiteheads that contain either no grain or lightweight, shrivelled grain.

This restriction of water movement within the plant also restricts the movement of N within the plant, which may limit the potential to accumulate protein in the grain even when adequate N is present in the plant.

Optimising N supply

Optimising N supply is difficult in western regions (of the eastern states) given the highly variable seasons. Excessive application of N may increase water use by enhancing early vegetative growth leading to greater water stress during flowering and grain fill, resulting in poor grain set or shrivelled grain.

This was the case in a Variety Specific Agronomy Packages (VSAP) trial at Coonamble in 2012, where increasing the rate of N applied at sowing from nil to 100 kg per hectare significantly increased the average dry matter production of eight wheat varieties at anthesis (GS65) by greater than 1.5 tonnes per hectare. For dry matter measured at maturity (GS99), there was a significant increase for the 25 kg per hectare N rate compared with the nil rate, with no further increase in dry matter from increased N applications above 25 kg N per hectare.

At the highest N application rate, there was only a small dry matter gain in the period from anthesis to maturity. The excessive N application had led to the water supply to the crop being exhausted by anthesis, so the wheat plants were forced to rely on stored assimilate for grain fill. In the case of this trial at Coonamble, stored resources were not enough to meet the yield potential of the crop, resulting in a yield reduction compared with where lower N rates were applied.

Averaged across the eight varieties, the 100 kg per hectare N rate led to a significant yield reduction of 250 kg per hectare compared with the nil N rate.

TABLE 5: Grain yield (t/ha) and grain protein concentration (%) of four wheat varieties averaged across varying nitrogen rates in six VSAP nitrogen trials in 2012

	EGA Gregory		Suntop		LR Spitfire		Livingston	
	Grain yield (t/ha)	Grain protein (%)	Grain yield (t/ha)	Grain protein (%)	Grain yield (t/ha)	Grain protein (%)	Grain yield (t/ha)	Grain protein (%)
Trangie	2.6	8.8	2.3	9.2	2.3	9.6	2.3	9.5
Coonamble	3.9	9.4	4.4	9.7	3.9	10.9	3.7	9.2
Gilgandra	4.4	10.0	3.6	10.3	3.7	11.4	3.7	10.7
Wongarbon	2.7	8.0	2.6	8.7	2.3	9.1	2.5	9.0
Moree	3.7	9.0	3.8	9.2	3.7	10.0	3.6	9.4
Spring Ridge	4.6	14.0	4.7	14.2	4.3	16.3	4.6	14.6
Average	**3.7**	**9.9**	**3.6**	**10.2**	**3.4**	**11.2**	**3.4**	**10.4**

11 per cent protein 'rule of thumb'

With the application of N, yield will generally increase to a maximum level, whereas protein may continue to increase beyond this level with further N application. This was shown in a trial at Parkes in 2011, where wheat yield responses to N application diminished where N was applied at 30 kg per hectare increments.

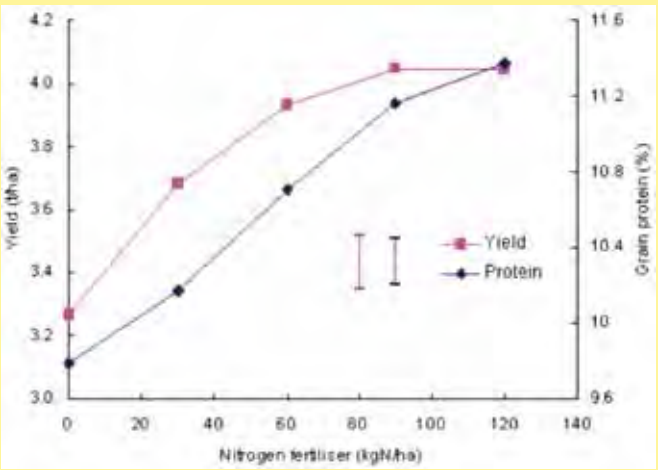
Yield was maximised at 90 kg N per hectare. Protein increased linearly for each 30 kg per hectare increment up to 120 kg per hectare N. In this trial, yield appeared to be maximised at a grain protein concentration of 11.2 per cent (Figure 2). The figure of 11 per cent protein has generally been considered a 'rule of thumb' for where the yield of wheat is maximised.

Going against the 11 per cent protein rule of thumb, there were situations in 2012 where yield was maximised at a lower grain protein level. At Coonamble, grain yield of eight wheat varieties was maximised at a grain protein concentration of 9 per cent, with 100 kg per hectare N required to raise grain protein by 2 per cent but also reduce yield by 250 kg per hectare.

At Moree, grain yield of four wheat varieties was maximised at a grain protein concentration of 9.7 per cent and it took a further 80 kg N per hectare to shift protein from 9.7 to 11.7 per cent.

The reasons for this defiance of the 11 per cent protein rule of thumb are not clearly understood and require further investigation.

FIGURE 2: Grain yield (t/ha) and protein concentration (%) from 10 wheat varieties with 0, 30, 60, 90 and 120 kg/ha applied nitrogen in a trial at Parkes in 2011



Apparent recovery of fertiliser N

Apparent fertiliser N recovery provides a measure of the yield and protein benefit as a result of N application. Recovery is determined by calculating the additional N removed in grain above the nil N rate, divided by the quantity of N applied and is expressed as a percentage.

This calculation does not represent total nitrogen use efficiency, which relates to soil N supply and mineralisation as well as N fertiliser applications.

There were six VSAP Nitrogen trials planted across the northern grains region in 2012. As the rate of applied nitrogen increased, the efficiency of applied N decreased.

The efficiency of applied N ranged from moderate (with the exception of Coonamble) at the low N applications to low (with the exception of Trangie and Moree) at the high N applications. Lack of in-crop rain may have reduced the uptake of applied nitrogen; but seasons that start with a good profile of moisture then follow with low in-crop rain are common in the northern region.

In each of the VSAP trials the middle N rates were split into two application timings:

- Seedbed + stem elongation;
- Seedbed + anthesis; or,
- Both.

On average, total N recovery was less with the later applications of N than where all N was applied at sowing.

The only exception was at Spring Ridge, where splitting the 80 kg per hectare N rate into 40 kg at sowing followed by 40 kg at stem elongation resulted in higher yield for EGA Gregory and Suntop (and hence greater N uptake) compared to where 80 kg per hectare of N was applied at sowing.

Across all trials in 2012 there was no significant increase in grain protein concentration from delaying some nitrogen to either stem elongation or anthesis.

The lack of protein response to an anthesis application of N is most likely due to the lack of rainfall after that application to facilitate uptake, combined with the inherently inefficient nature of increasing grain protein from late fertiliser applications.

The 2012 season highlights the difficultly of relying on in-crop N application in the northern grains region where in-crop rain is highly variable.

Economics of N application

Based on the six northern VSAP nitrogen trials mentioned previously, the return on investment (ROI) of nitrogen application in 2012 was, at best, moderate.

The ROI is calculated as the profit as a result of N application relative to the cost of the N application.

The ROI was greatest at low N rates, decreasing with increasing rates of N application at all sites. For all N application rates of 50 kg per hectare or less, the average ROI was 93 per cent.

For N application rates of 80 to 100 kg per hectare ROI was on average 48 per cent.

While this may seem an acceptable ROI depending on your attitude to risk, it contrasts with an estimated ROI of fallow spraying at Dubbo of 876 per cent (Hunt and Kirkegaard 2011).

Variety choice for grain protein concentration

The effect of legumes and fertiliser are the two most important factors in N management for grain protein – but there does appear to be some difference among common wheat varieties for grain protein concentration for a given yield level.

There were four common wheat varieties planted in each of the six VSAP nitrogen trials;

- EGA Gregory;
- Suntop;
- Longreach Spitfire; and,
- Livingston.

Averaged across all nitrogen rates, EGA Gregory and Suntop were the highest yielding varieties and Longreach Spitfire had the highest grain protein concentration (Table 5). This higher grain protein concentration of Longreach Spitfire is partly due to the negative correlation between grain yield and grain protein concentration. But where Longreach Spitfire had similar yield levels as EGA Gregory (Coonamble and Moree) it also had a grain protein concentration of at least 1 per cent more than EGA Gregory.

Suntop performed relatively well for grain yield, but did not display a grain protein advantage over EGA Gregory.

The protein advantage of Longreach Spitfire on average was 1 per cent greater than the other varieties, which is consistent with previous findings. The expression of this protein advantage appeared to be greater under high N conditions where the difference between Longreach Spitfire and EGA Gregory was 2.3 per cent, whereas at the low soil mineral N site, Wongarbon, the protein advantage was 1.1 per cent over EGA Gregory. ■

THE COMMERCIAL VIEW
CHASING YIELD NOT PROTEIN


Keith Harris.

Keith Harris, consultant to Romani Pastoral Co (Liverpool Plains, NSW) and GRDC northern panellist says unlike many growers across northern NSW he is not concerned by lower than expected protein levels.

"We've gone away from trying to target protein at Windy Station," Keith said.

"We seem to get wet weather at harvest time two years out of three so we are now aiming to produce as much grain as we can.

"We are picking the varieties that will give us the highest yield, even if they fall back into feed wheat. This shows up in our gross margins which we are reviewing all the time.

"If we can grow an extra tonne to tonne-and-a-half to the hectare and need to sacrifice some protein of $20 to $30 per tonne to do so, we are still better off."

Pastures the answer to beat long-term N decline

By Deanna Lush

SAVE MONEY ON NITROGEN…

A simple way to estimate the value of biological N fixation by pastures is to multiply the amount fixed by the cost of fertiliser.

Using the estimated mean rate of N fixation for Temora, NSW, at 87 kg a hectare, multiplied by the 2012 price of N fertiliser, $1.40 per kg, gives an estimate of $122 per hectare.

This does not account for:

- The value of animal production due to the fixed N;
- The time delay in N becoming available to subsequent crops; or,
- The effect of hydrogen fixation on crop growing after a pasture.

When these factors are included, the estimated value is $100–$130 per hectare.

FOR grain growers who thought they were already shovelling out the nitrogen every year, here's a sobering thought. In 10 years' time, the CSIRO estimates continuous croppers will be applying 40 per cent more fertiliser N just to keep up with current yields.

This assumes the crop's demand is constant at 94 kg per hectare and takes up half each of the mineralised N and fertiliser N.

And if you are still farming in 40 years' time – or your children have taken on the farm – the rate of N application must double to maintain yields (Table 1). With N prices climbing, the bill will be more than twice its current value too.

CSIRO research fellow John Angus says the reason for this is two-fold – the fact continuous cropping leads to an exponential decrease in soil total N and the absence of pasture N fixation.

N in continuous cropping

The rate of N decrease depends on inputs and outputs. John says the rate of decrease appears to be linear over 10 to 30 years but after about 50 years, turns out to be curved and soil N eventually flat-lines.

Soil N levels can be expressed as a half-life, in a similar way to radioactive elements. For example, research has shown the level of total soil N decreases naturally at about two to three per cent a year – or 5–10 kg per hectare – in moist temperate regions when there is no other N input. A two to three per cent per year decrease gives a half-life for total soil N of 34 years.

At the Waite Institute in Adelaide, long-term trials of continuously cropped wheat with no added fertiliser gave a half-life of total N in the top 10 cm of soil of 27 years.

But N soil measurements taken at a CSIRO tillage experiment near Harden, NSW, has shown more N was removed than first thought, where N's half-life was only 14 years.

An experiment at Wagga Wagga showed that adding fertiliser N each year at 50 kg per hectare only increased the half-life by four years.

John Angus believes lucerne-based pasture phases have a big role to play in our cropping systems as nitrogen prices rise.

TABLE 1: N mineralisation and fertiliser N requirement (kg per hectare) over the next 40 years

Year	N from mineralisation	Fertiliser N requirement
2013	108	80
2023	76	112
2033	54	134
2043	38	150
2053	27	161

This assumes: 1. Constant crop N demand of 94 kg per hectare, the calculated average for Temora, NSW. 2. Half the mineralised N and half the fertiliser N is taken up by the crop. 3. Soil total N half-life is 20 years. 4. N mineralisation is proportional to soil total N.

The Harden trial compared four systems – zero tillage, one-pass tillage, stubble burning and stubble retention – but showed little difference in the decline in soil N between the four practices.

The level of soil total N is extremely sensitive to moisture – in lower rainfall areas, changes in total soil N are equal to the N removed by crops but in wetter areas, denitrification means more soil N is lost than crops remove.

This was widespread in southern NSW in autumn 2012, where waterlogging led to more than 50 kg a hectare of N disappearing from soils as microbes responsible for denitrification found perfect conditions in warm and anaerobic soil conditions after floods.

Biological N fixation

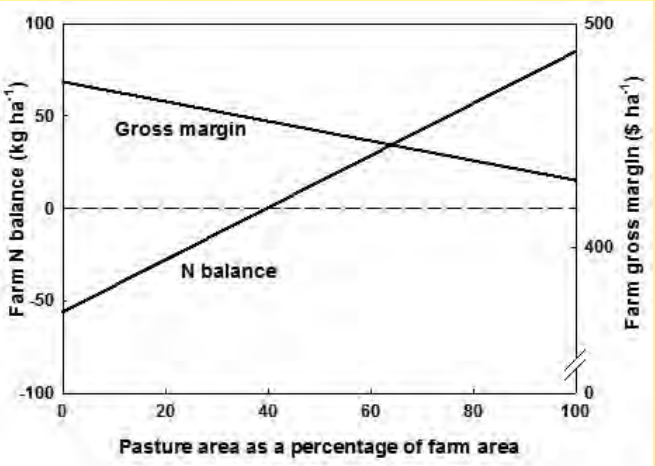
John says the short-term price of N fertiliser will continue to fluctuate but in the long term, the price is likely to rise as fertiliser manufacture approaches a maximum efficiency.

"If that happens, cropping in phased rotation with lucerne-based pastures growing at water-limited potential is likely to be more profitable and stable than continuous cropping," he said.

Research last year by John and CSIRO's Mark Peoples evaluated the value of N fixation by phased pastures – both in soil and in dollars.

They found a farm with 60 per cent crop and 40 per cent pasture maintained a stable amount of soil N. Less pasture meant total soil N decreased (Figure 1). This assumed lucerne-based pastures and wheat grew at their water-limited potentials.

FIGURE 1: Nitrogen balance and gross margin estimated for farms in southern NSW



John says in farming systems that include pasture phases, there is generally sufficient soil mineral N for crop growth up to stem elongation. Then top-dressed N can supply the rest of the crop's needs.

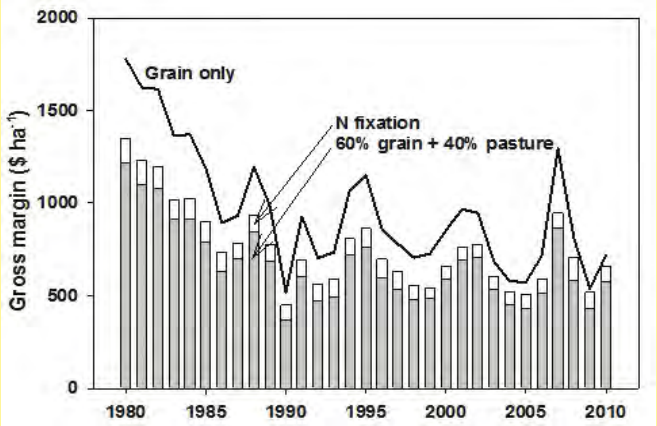
"As soil N levels go down, the crops will start to experience N deficiencies earlier in their life cycle so there will be a need for more N at sowing.

"That's clearly a risk because if a lot of fertiliser is added to the top soil at the time of sowing there will be rapid early growth and if the season goes pear-shaped you have a problem with haying off in spring.

"The way around that is for continuous croppers – who are starting to use more N at or before sowing – to consider low-release forms of N."

He says there is likely to be more interest in polymer-coated fertiliser and denitrification and urease inhibitors and the less expensive option of banding urea or anhydrous ammonia at sowing for slow release N.

FIGURE 2: Comparison of gross margins using 2011 variable costs and 1980–2010 prices for grain-only farms (line) and mixed farms on which 60 per cent of the land produces grain and 40 per cent producing pasture (solid bars) and the value of biologically fixed N (open bars)



All values are expressed in 2011 dollars using the consumer price index.

Profit from pastures

Using data from NSW Agriculture, John and Mark found farm gross margins were relatively insensitive to the proportion of crop on the farm.

They compared the 60:40 crop pasture system with continuous cropping from 1980 to 2010 (Figure 2).

While the gross margin for a continuously cropped farm was considerably greater than for the 60:40 farm in the early 1980s, by 2010, the gap nearly closed. This was because of higher returns for animal products.

John says it is likely that gross margins underestimate the profitability of the mixed pasture-crop system by not accounting for other synergies between pastures and crops.

These synergies include overcoming herbicide-resistant weeds and the hydrogen fertilisation benefit.

"It has long been known that N fixation by rhizobia is accompanied by release of gaseous hydrogen," he said.

"Normally, when that hydrogen is released into the soil it only moves a few millimetres where it is picked up by other beneficial microbes which stimulate the growth of the following crop. It looks as though that's worth about 10 per cent on the yield of the following crop and it's not a N effect.

"It is interesting that we are seeing a growth effect on the following cereal, apart from the N benefit, which may mean in some circumstances that the crop can respond to fertiliser N.

"This is possible in favourable seasons when topdressing may be profitable on a cereal growing after a legume. Part of the reason for a big crop after a legume is because hydrogen stimulates growth-promoting microbes."

John says this means croppers will receive the main benefit of pastures in the first year after a legume.

"Don't fret about getting extra yield in second and later years after a legume – you have to cash in on the first crop, try to make a winner out of that.

"Phased pasture systems appear to be more profitable than continuous cropping. Minimising strategic inputs of fertiliser N will provide a comparative advantage over cropping systems with a high dependence on fertiliser N. The essential role of fertiliser N in a variable climate is topdressing and other tactical applications in response to favourable seasons.

"If you continuously crop, soil N will fall almost no matter what you do. To minimise these falls, you have to apply sufficient sulphur and phosphorus to maintain the stable ratios of C:N:P:S in humus, as CSIRO's Clive Kirkby has shown. In practical terms, the only way you can do that is with pastures or green manure."

Log on to www.grdc.com.au/GRDC-News-PasturesAnswerToLongTermNDecline to see at video of John Angus at the Harden trial site. ■

MANAGEMENT TOOLS…

- THE GRDC has supported a series of projects to develop a yield and nitrogen estimation calculator for dryland cropping. *The Generic Yield and N Calculator* – based on user inputs of growing season rainfall.
  Your Soil's Potential Calculator – designed for farms with annual rainfall less than 500 mm. It estimates water limited potential grain yields and nitrogen fertiliser requirements. Download the free calculators at http://www.clw.csiro.au/products/ncalc/index.html
- *Yield Prophet* is a crop monitoring and forecasting tool to manage seasonal variability to maximise profit in good years and cut costs in bad years. It was developed by the CSIRO and BCG based on the Agricultural Production Systems Simulator (APSIM). See www.yieldprophet.com.au
- *Cropmate* is a web-based application that helps grain growers analyse climate and weather information to make informed planning and management decisions at different points during the crop cycle. See http://cropmate.agriculture.nsw.gov.au/

SOUTHERN AUSTRALIA FOCUS

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

THE RESEARCH VIEW

Sclerotinia stem rot of canola – the why, what and how

TAKE HOME MESSAGES…

- Sclerotinia has the capacity to develop quickly in canola crops where mild moist conditions prevail during flowering.
- Canola crops grown in high rainfall areas should be monitored closely for sclerotinia stem rot. Good spring growing conditions for canola usually means good conditions for sclerotinia.
- Consult the *Managing Sclerotinia Stem Rot in Canola* guide for further information.

SCLEROTINIA stem rot had a notable impact on canola plantings in parts of southern New South Wales last year when the disease infected individual crops by as much as 60 per cent.

Plant pathologist Kurt Lindbeck, of NSW Department of Primary Industries, says 2012 epidemics of sclerotinia in southern NSW were confined to high rainfall districts which received good rainfalls in spring. These included districts east of Cootamundra, south of Henty and around Corowa and Howlong. Sclerotinia outbreaks were also observed in canola crops in the south east of South Australia and the southern region of Western Australia.

"Infection levels observed in some southern NSW crops were as high as 30 to 60 per cent," says Kurt, who is based at the Wagga Wagga Agricultural Institute where he leads research on the management of pulse and oilseed diseases in southern NSW.

"In other districts, crop infection levels were generally low with most infections developing in late spring with later rainfall events."

Kurt says growers will not observe sclerotinia stem rot every year due to its disease cycle.

"The disease cycle of sclerotinia stem rot is complex compared to other plant diseases, which is why the disease tends to be sporadic in appearance between years and districts.

"For sclerotinia stem rot to develop, soil moisture and temperature conditions have to be favourable for fruiting bodies to develop and release ascospores. This has to occur in the presence of a flowering canola crop for petal infection to result, and leaf wetness is essential for the ascospores to colonise flower petals."

Kurt says moisture also has to be present for fallen flower petals to become lodged and infect canola stems.

Weather conditions during flowering play a major role in determining the development of the disease.

Consultants' Corner

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

Plant pathologist Kurt Lindbeck says 2012 epidemics of sclerotinia in southern NSW were confined to high rainfall districts which received good rainfalls in spring.

"The presence of moisture during flowering and petal fall will determine if sclerotinia develops. Dry conditions during this time can quickly prevent development of the disease, hence even if flower petals are infected, dry conditions during petal fall will prevent stem infection development."

How does the disease develop?

Kurt says the fungal pathogen that causes sclerotinia stem rot is called *Sclerotinia sclerotiorum*. This fungus can infect over 300 plant species, mostly broadleaf plants, including many crop, pasture and weed species.

"This includes plants such as canola, lupin, pulses, sunflower, lucerne, cape weed, and shepherds purse.

"The main feature of the sclerotinia stem rot pathogen is the production of hard, black, survival bodies on infected plant tissue called sclerotia which enable the fungus to survive for up to eight years in the field."

The main features of the disease are:

- Airborne spores of the fungus, which are released from apothecia (small, golf tee-shaped structures, 5–10 mm in diameter), germinate from sclerotia in the soil. For this to occur, prolonged moist soil conditions in combination with moderate temperatures of 15°C to 25°C are considered ideal. Only sclerotia in the top five cm of the soil will germinate and produce apothecia. Sclerotia that are buried deeper will remain dormant for extended periods and may germinate if moved closer to the soil surface. Most sclerotia will remain viable for up to three to four years then survival slowly declines.
- Spores of the sclerotinia pathogen cannot infect canola leaves and stems directly. They require petals as a food and energy source for spores to germinate, grow and colonise. When the petal eventually drops, it may become lodged in a leaf axil or at branch junctions along the stem. If conditions are moist the fungus grows out of the petal and invades healthy plant stem tissue which will result in a stem lesion and production of further sclerotia within the stem which will be returned to the soil after harvest.
- Sclerotia also have the ability to germinate in the soil, produce mycelium and directly infect canola plants in close proximity, causing a basal infection. These plants are identified in the field by having infection at the stem base and often infection extending into the upper taproot. In the past, this type of infection was generally rare. In 2012, higher levels of this type of infection were observed, suggesting that some paddocks have a high level of viable sclerotia present.

If I had sclerotinia in my canola crop last year, what should I do this season?

One of the biggest challenges in managing sclerotinia stem rot is deciding whether or not there is a risk of disease development, according to Kurt.

"Research in Australia and Canada has shown that the relationship between the presence of the pathogen (as infected petals) and development of sclerotinia stem rot is not very clear due to the strong reliance on moisture for infection and disease development," he says.

"Epidemics of sclerotinia stem rot generally occur in districts with reliable spring rainfall and long flowering periods for canola.

"Paddocks with a recent history of sclerotinia are a good indicator of the potential risk, as well as those paddocks that are adjacent."

Important management options include:

- Sowing canola seed that is free of sclerotia. This applies to growers retaining seed on-farm for sowing. Consider grading seed to remove sclerotia that would otherwise be sown with the seed and infect this season's crop.
- Separate this season's paddock away from last year's canola stubbles. Not only does this work for other diseases such as blackleg, but also for sclerotinia.
- Rotate canola crops. Continual wheat/canola rotations are excellent for building up levels of viable sclerotia in the soil. A 12-month break from canola is not effective at reducing sclerotial survival. Consider other low risk crops such as cereals, field pea or faba bean.
- Follow recommended sowing dates and rates for your district. Canola crops which flower early, with a bulky crop canopy, are more prone to developing sclerotinia stem rot. Bulky crop canopies retain moisture and increase the likelihood of infection. Wider row spacings can also help by increasing air flow through the canopy to some degree until the canopy closes.
- Consider the use of a foliar fungicide. Weigh up yield potential, disease risk and costs of fungicide application when deciding to apply a foliar fungicide.

When is the best time to apply a foliar fungicide?

Kurt says research in Australia and Canada has shown that an application of foliar fungicide at the 20 to 30 per cent flowering stage can be effective in reducing the level of sclerotinia infection.

"The objective of the fungicide application is to prevent early infection of petals while ensuring that fungicide also penetrates into the lower crop canopy to protect potential infection sites (such as leaf axils and stems).

"The chemical is only active on that plant tissue that is present at the time of spraying.

"The fungicide will not protect petals that emerge after

spraying, but fungicide coverage within the canopy will help to restrict stem infection."

Kurt says timing of fungicide application is critical. Often the fungicides are applied too late, resulting in poor sclerotinia control.

"Growers and advisers should also be aware that foliar fungicides will have no effect on managing basal infection by sclerotinia, as this infection occurs under the soil surface and beyond the activity of foliar fungicides."

Further information is available from the GRDC publication, *Managing Sclerotinia Stem Rot in Canola*, which can be viewed and downloaded via www.grdc.com.au/GRDC-FS-ManagingSclerotiniaStemRotInCanola.

To assist canola growers with management of crop diseases, the GRDC has also just released a new *Diseases of Canola Back Pocket Guide*. It is available for viewing and downloading via www.grdc.com.au/GRDC-BPG-CanolaDiseases.

Contact details: Kurt Lindbeck, NSW DPI, Wagga Wagga Agricultural Institute, phone (02) 6938 1608, email kurt.lindbeck@dpi.nsw.gov.au ■

THE CONSULTANT'S VIEW
SCLEROTINIA STEM ROT OF CANOLA

Sandy Biddulph.

During his 26 years in the Cootamundra region of NSW, consultant Sandy Biddulph has witnessed intermittent outbreaks of sclerotinia stem rot, including a substantial occurrence of the disease in the 1990s.

"It's often there but at low levels," Sandy said. "But last year it had a devastating impact in some canola paddocks in the predominantly higher rainfall areas east of Cootamundra."

Once the disease was noticed, it was basically too late to address.

"Sclerotinia stem rot requires a preventative control rather than a curative one," Sandy said.

"It generally is first seen during mid to late flowering in spring – while a fungicide spray at the 10–30 per cent flowering stage is required if crop losses are to be minimised."

Sandy said the relationship between weather and the development of sclerotinia stem rot remained a 'conundrum'.

"Last spring it was a lot drier than in previous years, yet there was substantial damage in 2012.

"A rain event must have occurred just at the right time to stimulate the disease. The disease cycle means that receiving rain at the right time plays an important role in the development of an outbreak."

Sandy said a greater understanding of the disease and the associated risk factors were required to enable growers and advisers to make more informed decisions.

"After the damage that occurred in the mid 1990s, the next season crops were sprayed as a precaution yet the conditions were not conducive to sclerotinia that year and as a result growers received no return on their investment in fungicides.

"With further investment in research into the fungal disease, we will hopefully become equipped with the understanding and knowledge needed to predict the likelihood of an outbreak and to successfully reduce the impact on crops."

Keep blackleg at bay with regular changes in your canola cultivars

CANOLA growers can reduce potential yield losses and the probability of blackleg disease resistance breakdown occurring by changing cultivars every three years. That's according to blackleg authority Steve Marcroft who says sowing the same cultivar every year is likely to break the cultivar's resistance to blackleg – the most severe disease of canola in Australia.

Speaking at recent Grains Research and Development Corporation (GRDC) grains research Updates throughout the southern cropping region, Steve has told growers and advisers that every year a cultivar is sown from the same resistance group, the number of virulent isolates that can attack that particular cultivar increases.

"The fastest cases of resistance breakdown have occurred over three years, but in most regions it will take longer than three years," said Steve, of Marcroft Grains Pathology, based in Horsham (Victoria).

"Therefore, the best policy is to monitor the level of blackleg in your cultivar on your farm. If you observe the level of disease increasing, then switch to a different group. If blackleg severity is not increasing, you can continue with your current cultivar."

Dr Steve Marcroft says sowing the same canola cultivar every year is likely to break the cultivar's resistance to blackleg.

Blackleg disease causes yield loss and in some circumstances total crop failure.

"It is managed by breeding disease resistance into canola cultivars and by crop management practices," Steve said. "However, the blackleg fungus is adept at overcoming cultivar resistance, leaving many crops vulnerable to significant yield loss."

Cultivar resistance has been overcome in many regions around Australia, the most recent being in Hyola50 which went from a rating of resistant to susceptible on the Eyre Peninsula in South Australia last year. Fortunately, according to Steve, Hyola50 is still resistant in most other growing regions.

Steve advised that if growers detected a blackleg problem and were growing a susceptible cultivar, their first action should be to change to a cultivar with higher levels of resistance.

Steve said growers and advisers should refer to the *Blackleg Management Guide* that is updated in March each year. The guide includes current blackleg ratings and blackleg resistance groups.

From 2011 onwards, all cultivars and NVT lines have been classified for their type of blackleg resistance. Steve said there were two types of resistance to blackleg – seedling and adult plant resistance.

"We use individual blackleg isolates to identify the seedling resistance and we use stubble that is releasing blackleg sexual spores to screen plants for stem canker adult plant resistance. Using the combination of the seedling and adult data we classify all cultivars into seven different groups."

Resistance checklist

Steve recommends the following method for determining whether a cultivar is in danger of having its resistance overcome:

- Monitoring your crop should not take any more than 30 minutes.
- Observe your crop at or just prior to windrowing.
- Look for cankered and dead plants, if you see cankered plants yield loss is occurring. Pull up dead plants to confirm that they have died from stem canker.
- Walk approximately 200 metres in a W-shaped transect, randomly select (pull out of ground) 15 plants along each leg of the W.
- With a pair of secateurs cut the roots off at the crown (point where the roots join to the stem).
- Score each plant for stem canker internal infection, look at the cross section of the cut stem and estimate the area that is discoloured from blackleg infection. Stems should be scored as 0, 5,10, 20, 30, 40, 50, 60,70, 80, 90 or 100 per cent infection. Score any dead or fallen plants as 100 per cent. Work out the average infection score and keep this score as a comparison for future years.
- You can repeat this process for different parts of the paddock. For instance, you may wish to determine disease levels at the edge of the paddock which was near to last year's canola stubble and then in the middle of the paddock which was 500 metres away from last year's stubble.

As a rule of thumb, plants with 50 per cent or more internal infection will have significant yield loss. If you have plants with more than 50 per cent infection, consider changing your current blackleg management.

To assist canola growers with management of blackleg and other crop diseases, the GRDC has also just released a new *Diseases of Canola Back Pocket Guide*.
It is available for viewing and downloading via:
www.grdc.com.au/GRDC-BPG-CanolaDiseases. ■

Right variety for Walebing wheat grower

WALEBING, WA wheat grower Graham Popplewell wants to grow wheat that works well at both ends of the season and, in particular, is low fuss at the business end of the season.

"At harvest, of course I want high yields, but I also want a wheat that isn't difficult to harvest," he said.

InterGrain's short season AH wheat variety, Emu Rock, did the right thing for him in 2012.

Graham planted 22 hectares of Emu Rock in the middle of a Wyalkatchem paddock so he could directly compare the two varieties.

"Emu Rock started well, with head emergence five to seven days earlier than the Wyalkatchem and then at the business end, its harvestability was much better," he said.

"Some wheats are definitely better to harvest than others and the evidence is there now, with virtually no self-sown Emu Rock after recent rains, compared to Wyalkatchem, which visually confirmed what the grain loss monitor was telling me – the performance of Emu Rock in the harvester was obviously superior."

Walebing, WA wheat grower Graham Popplewell wants a wheat that works well at both ends of the season and InterGrain's short season AH wheat variety, Emu Rock, did just that for him in a tough 2012.

Along with a one per cent protein advantage, Emu Rock also yielded an average of 15 per cent higher than the adjacent Wyalkatchem. This was measured in the header's yield monitor as the machine passed certain points in the paddock eight times on the division of varieties.

In shorter and drier seasons, Emu Rock will increasingly have a good fit in wheat growers' programs, according to Graham.

"Emu Rock shapes as a very handy variety if weed pressure is making you wait for germination, or you're going into old pasture that may not dry-seed very well and when you need to get a variety in at the end of your main program.

"From my experience with Emu Rock, you can be quite confident it'll compete better than Wyalkatchem and then yield favourably at the business end of the season," he said.

Opportunity to diversify

InterGrain wheat breeder, Dr Chris Moore, believes growers should consider Emu Rock as an opportunity to diversify for effective disease and risk management.

On the risk management front, the variety fits well when growers approach the end of their programs, as its large grain size means it has a lower tendency to produce screenings.

"Emu Rock boasts a good disease package, offering growers stripe rust resistance diversity (MR-MS rating) and a useful level of crown rot resistance (MS-S), similar to one of its parents, Kukri," Chris said.

A crown rot resistance rating of MS-S is considered among the highest of commercially available varieties. ■

10-year study reveals most farmers financially strong

A STUDY of farm performance in Western Australia over a decade has produced the perhaps surprising result that most broadacre farmers in the state's grainbelt are in a strong or growing financial situation.

This generally good performance occurred during a period of challenging market and environmental conditions, including a warming and drying climate.

Economist Ross Kingwell, of the Australian Export Grains Innovation Centre (AEGIC) and the University of WA (UWA), said the results might be applicable to other Australian agricultural regions, especially where favourable conditions had been experienced following the 'millennium drought'.

Results of the study of 249 farm business records – covering the period from 2002 to 2011 – were presented to Perth's 2013 Agribusiness Crop Updates, which were supported by the Grains Research and Development Corporation (GRDC) and the Department of Agriculture and Food (DAFWA).

Farm business data, from most agro-ecological zones in WA's agricultural region, was provided by three agricultural consulting firms.

The research was funded by the National Climate Change Adaptation Research Facility (NCCARF) and the Department of Agriculture and Food (DAFWA).

It was also supported by AEGIC – an initiative of the Western Australian state government and the GRDC.

Ross Kingwell, who is also chief economist at DAFWA, acknowledged that although most businesses surveyed were in a strong financial position, some areas – particularly parts of the central, eastern and south-eastern grainbelt – experienced financial difficulties during the survey period.

"Overall, of the farms surveyed, 15 per cent were not financially secure (Figure 1), but this figure would be much higher in these sub-regions," he said.

"In light of poor seasonal conditions in 2012 and low margins forecast for 2013, more farmers are now likely to be under financial stress than indicated in the study."

Farm equity

Ross said that although most farm businesses surveyed increased their farm business wealth, they also increased their debt.

"Most WA farmers increased the size of their operations but over that decade they borrowed funds to expand their businesses," he said.

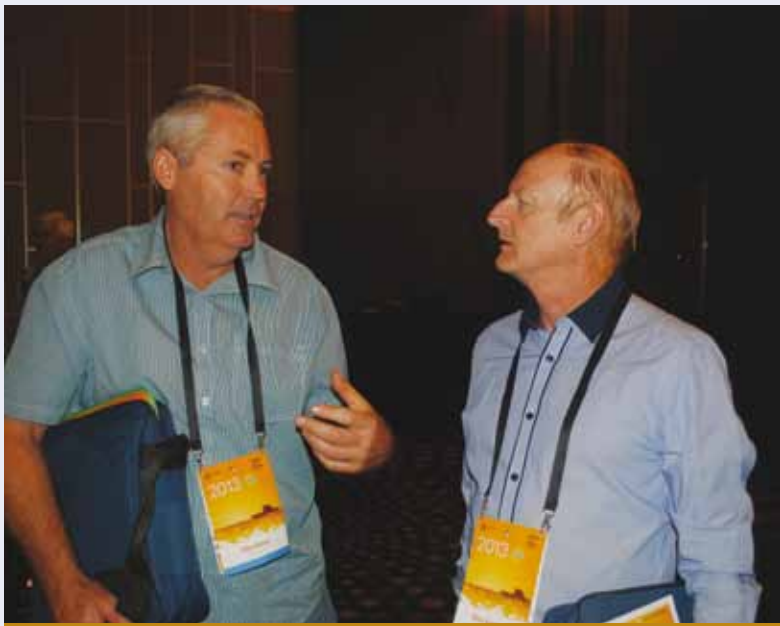
"So their wealth/farm equity has increased in dollar terms, but their equity in percentage terms has, on average, decreased over the 10 year period."

He said that in spite of the study period being warmer and drier, the high rainfall regions did not record the highest proportion of farms that were growing financially.

"Rather, the northern moderate rainfall zone, comprised mostly of crop specialists, displayed the highest proportion of farms that are growing," Ross said.

"On average, the farms in all performance categories increased their cropping area from 2002 to 2011.

"Farmers' increased dependence on wheat growing as a principal source of farm income appears to have been a sensible and profitable adaptation strategy in many cases.



Doodlakine grower Matt Steber, left, and Ross Kingwell, of AEGIC, at the 2013 Agribusiness Crop Updates.

"Moreover, the prospects for wheat yield in many parts of the study region generally appear very sound, even in the face of projected ongoing climate variability.

"But the downside to increased cropping is the increase in profit volatility which increases risk exposure."

Operations expanded

Ross said most farm businesses, especially growing and strong businesses, expanded the size of their farm operations through land purchases or leasing.

"These farmers displayed a range of managerial and social characteristics that have enhanced the productivity and profitability of their farm businesses during a period of challenging environmental and market conditions," he said.

FIGURE 1: Financial situation survey results

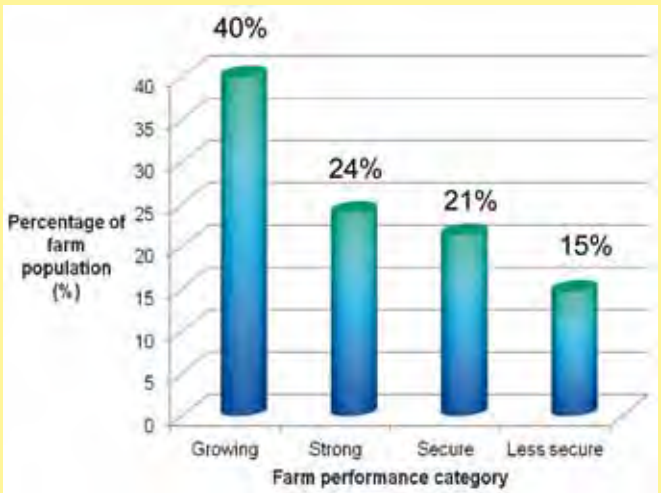


FIGURE 2: Emerging dryness in WA's south-west

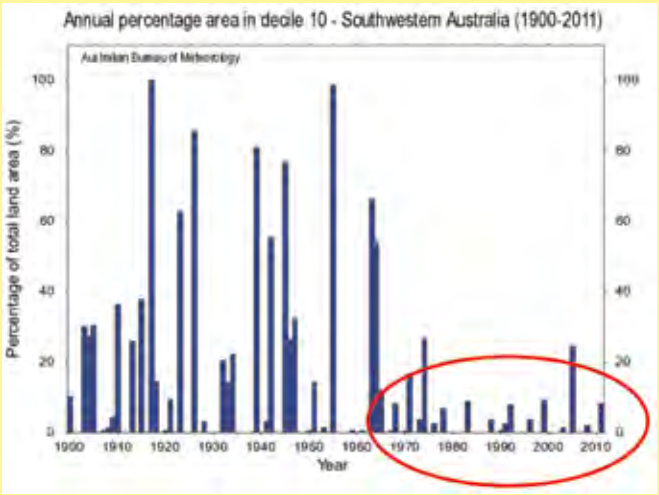
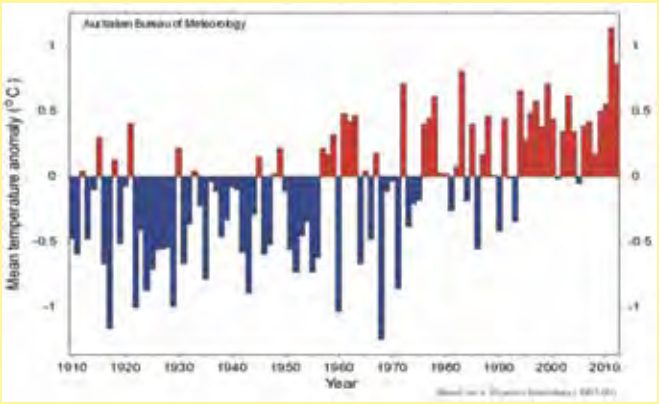


FIGURE 3: Annual mean temperature anomaly – south-western Australia (1910–12)



Growing farms, when compared with the less secure farms, tended to:

- Be larger;
- Generate a higher rate of return to capital and equity;
- Carry less debt per hectare;
- Be slightly more crop dominant;
- Have higher personal and machinery replacement expenses yet similar debt repayments;
- Have a much lower debt to income ratio;
- Have slightly higher equity in percentage terms;
- Generate similar livestock income per hectare but higher crop income per hectare; and,
- Generate much higher profits.

Growing farms also had, on average:

- Adopted more cropping management innovations over the past decade, and continue to use them;
- Made greater use of leasing, contractors, superannuation funds, succession planning, Farm Management Deposits and off-farm assets;
- Adopted and made greater use of farm business software, marketing strategies, decision support tools, precision agriculture technology, electronic paddock recording and Global Positioning Systems (GPS) technology;
- A greater commitment to the maintenance of their cropping equipment; and,
- A greater involvement in their local community and expressed more care regarding their work-life balance. ■

Nitrous oxide losses from cropping in low rainfall areas

■ By De-Anne Ferrier, Justine Severin (BCG) and Ashley Wallace (DEPI)

INCREASINGLY, agriculture is being held accountable for rising greenhouse gas emissions (GHG) and the industry is being called on to respond. But while it is understood that grain growing produces nitrous oxide (N_2O) emissions, there has been limited research into the level of emissions produced by dryland farming systems, particularly in the low rainfall environments of south east Australia.

In a bid to better understand N_2O risks in the Wimmera and Mallee, Birchip Cropping Group (BCG), in conjunction with the Department of Environment and Primary Industries (DEPI), the Low Rainfall Collaboration Group (LRCG) and Department of Agriculture Fisheries and Forestry (DAFF), is undertaking a project that will attempt to measure N_2O emissions from soils under varying cropping regimes.

The overall intention of the study is to:

- Communicate to growers and agribusiness when, how, why and to what extent N_2O emissions affect farming systems;
- Increase farmer knowledge of N_2O emissions created by fertilisers and legumes;
- Demonstrate potential options to reduce N_2O emissions; and,
- Provide information about nutrient use efficiency which maximises productivity.

Why the interest in N_2O?

Nitrous oxide is a greenhouse gas which has worldwide agricultural, environmental and political implications. It has a global warming potential 298 times that of carbon dioxide (CO_2) and cropping soils are an important source of N_2O production,

BCG's nitrous oxide demonstration plots at Rupanyup.

particularly those with high levels of nitrogen that periodically suffer waterlogging.

Nitrous oxide is produced by two chemical processes – nitrification and denitrification. The process of nitrification requires oxygen and a moist, but not waterlogged soil. Denitrification occurs in waterlogged, anaerobic soils.

Recent surveys have revealed that many growers have a poor understanding of N_2O emissions and how their farming practices can influence nitrogen losses. At the BCG Trials Review held earlier this year, only 32 per cent of the 80 growers and advisors surveyed described their understanding of nitrogen losses as being excellent (3%) or good (29%). When asked to describe how much they knew about N_2O emissions and its effect on productivity and GHG, 80 per cent responded with nothing (57%) or a little (23%). These results mirrored findings from surveys carried out by the Eyre Peninsula Agricultural Research Foundation (EPARF).

Of the 70 growers and advisors surveyed by EPARF, 83 per cent claimed to know nothing (33%) or not much (50%) about N_2O emissions from farming.

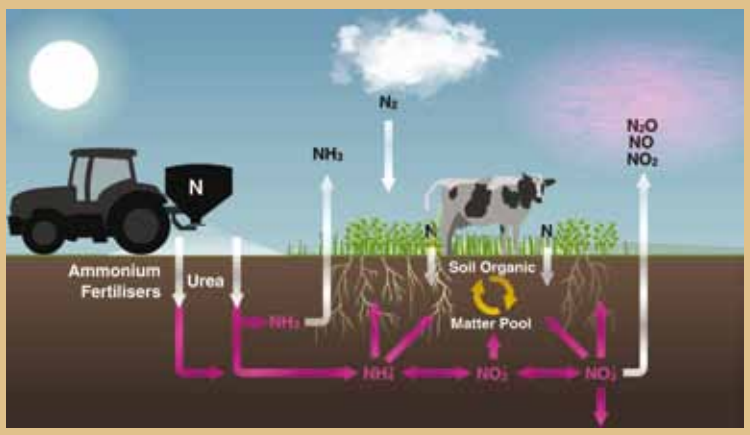
Research underway

BCG is taking part in a four year project that will examine how cropping practices in medium to low rainfall regions contribute to N_2O emissions and the effect on production. The project commenced last year with BCG managing research trials that compared the N_2O output when various rates of nitrogenous urea fertiliser were applied to Derrimut wheat crops grown at Rupanyup (0, 180 and 450 kg per hectare urea) and Birchip (0, 138 and 258 kg per hectare urea). How this affected wheat yield and quality was also studied.

After an initial fertiliser application of 50 kg per hectare of MAP at sowing, the three urea treatments were applied prior to rainfall events during the season. Nitrous oxide measurements were obtained in September for each treatment one day prior to rainfall, one day after and one week following rain and measurements of N_2O were taken at 0, 30 and 60 minute intervals.

To measure the N_2O emissions, static chambers of approximately 30 cm diameter were positioned in between the crop rows (305 mm spacings) and N_2O was drawn from air tight chambers

FIGURE 1: How farming practices contribute to nitrous oxide emissions (N_2O is circled)



Modified from Victorian Resources Online

Nitrous oxide chamber in between the rows of a wheat crop. The N_2O is captured in the chambers and evacuated into vials using medical syringes. A small fan on the underside of the lid circulates air.

via medical syringes into evacuated vials (see photos). Later, the replicated treatments in this trial were harvested and grain quality was analysed. The difference in income between each urea treatment was also determined.

While this trial only offers a snapshot of N_2O emissions at that period of time, as expected, the lowest N_2O emissions were measured where applied nitrogen levels were the least, while the highest emissions occurred where nitrogen levels were the greatest. Variability in the results was evident but even so, maximum losses after the season's small rain events were low, particularly from a productivity perspective (4.5g N_2O N per hectare per day at Rupanyup and 0.45g N_2O N/ha/day at Birchip). This was the case even under the high urea treatments (450kgN/ha).

Further research with greater replication is being conducted by DEPI as part of the DAFF funded National Agricultural Nitrous Oxide Research Program in both the Wimmera and high rainfall zone which aims to improve understanding of the impacts of management on N_2O loss and provide a more complete picture of emissions throughout the season

In terms of yield, quality and income, there was no significant difference between the yields nor the return from each treatment when the cost of urea was deducted from the income. But higher nitrogen increased protein significantly and therefore, quality parameters.

Research into N_2O emissions from low rainfall cropping systems will continue for the next two seasons. BCG projects will particularly focus on demonstrating how the tools mentioned might be used to limit N_2O emissions.

A win/win

Initial results from BCG research have shown that high nitrogen applications in September can increase wheat protein, but the price differential between segregations influences the advantage of this. Trial work confirmed that high nitrogen applications will not increase yield if growing season rainfall is low.

Taking this into consideration, in low to medium rainfall environments, strategically matching nitrogen applications to crop demand will benefit both the farm business and the environment. Tools such as soil testing and *Yield Prophet* crop models, used in conjunction with paddock history and weather forecasts, can help inform fertiliser application decisions.

What can be done?

Use it. Don't lose it.

- Increase nitrogen use efficiency;
- Improve timing of top-dressing – use weather forecasts to try and ensure N is applied in front of appropriate rain events;
- Plan rotations that make the most of N produced on farm;
- Consider products that can help minimise losses, such as slow release fertilisers (further research needed); and,
- Use available tools – *Yield Prophet*, soil tests and budgets.

For more information phone De-Anne Ferrier at BCG on (03) 5492 2787 or Ashley Wallace (DEPI) (03) 5362 2111. ■

NORTHERN FOCUS
COVERING NORTHERN NSW AND QUEENSLAND

Switch to 12 metre gear increases efficiency for Jimbour farmer

JIMBOUR, Darling Downs, farmer St John Kent has increased fuel efficiency by up to 30 per cent through modifying his farming plant from 9 metres to 12 metres. The final step came with the recent widening of his three-year-old JD4730 spray rig from 27 to 36 metres, an exercise that cost $50,000, including upgrading the tyres.

This mobile phone (centre of photo), on what should be flat ground, shows up the sideways tramline subsidence in a paddock on St John Kent and family's property 'Coondarra'. To combat the problem, tramlines are regularly renovated to help protect machinery and minimise ponding in tracks.

"This machine is very heavy and the standard tyres are too narrow, so we put bigger tyres and rims on to stop it from making such deep tracks," St John said. "What we're now trying to do is come up with the ideal ground pressure per square inch for flat-tread tyres – load-carrying flotation tyres for agricultural use – and when we've worked that out we'll do the same for the tractors," he said. "We think that's going from 18.4" (490 mm) to about 680 mm for the tractor."

St John's grandfather came to the Jimbour district in 1931, and St John Kent became the manager of the family property 'Coondarra', eight kilometres west of Jimbour, in 1979. Since the late 1990s, St John has been farming in a unique partnership with neighbour Brett McLaren. While Brett and family have their own property and St John and family have 'Coondarra', they also own and lease country jointly. Together that gives them six blocks

St John Kent's son Hamish, 14, renovating tramlines with a reincarnated centre section from a John Deere chisel plough with disc hillers fitted prior to winter-crop planting.

totalling 1800 hectares, and St John believes the ideal economies of scale for the gear they now have is 2600 hectares.

"We try to keep our investment in 'rust' to a minimum so we use trucking contractors at harvest to fill on-farm storage and for local delivery." Brett owns the tractor and planting equipment, and St John the spray rig and nurse truck. They own the header and auto-steer equipment jointly.

Soil types range from lighter box country to self-mulching Waco plain soils between the Cooranga and Jimbour creeks. Given the variability of most rain events and soil types across their country, most work programs can be spread out over a reasonable period. "We start where we need to start and don't get hung up on whose farm it is."

Disturbing the soil as little as possible is a key to the operation's success. "We achieved the early version of conservation tillage by the mid 1980s but the equipment to apply fertiliser and plant into heavy stubble wasn't available for quite some time. "That was in the days when Roundup at $16 or $18 was the same price per litre as Bundaberg rum in 1984 – in those days the big problem was cost of herbicide.

"These days the big problem is the cost of fertiliser and the ever-increasing amounts of herbicide we are using, as every year

A close-up of the tillage assembly on the converted John Deere chisel plough used to renovate tramlines.

The weather station on 'Coondarra'.

A crop of sorghum on 'Coondarra' a week before the 2012 Australia Day weekend rains.

the weeds are getting tougher. Our tool is the soil – it holds about one-third more water than Brigalow country can.

"We are farmers of moisture. That means in the right years we can double-crop chickpeas straight into sorghum stubble and we can keep cropping frequency at 100 per cent – the agronomic cornerstone of the operation is no bare ground."

It's a maxim that can't always be observed, but it's one that St John said he has been working towards for 30 years.

"Ideally our sorghum should be in by the end of September but it didn't rain when we'd have liked it to so we had to wait for the rain and we started planting on November 11 and finished on January 2."

The Kents are budgeting on a sorghum yield of six tonnes per hectare when the crop comes off in May, three months later than normal. Chickpeas will be direct drilled into some sorghum stubble if there is more than 600 mm of sub-soil moisture.

Tramline maintenance is an annual operation on the heavier country. It's done as soon after harvest as practical with a reincarnated John Deere chisel plough with disc hillers fitted. St John is hopeful this operation will only be necessary every other year when wider tyres on the tractor are fitted to ease the pressure on tramlines and eliminate the sideways subsidence. Well-maintained tracks are essential as rough tracks knock your machinery around and deep tracks hold water.

'Coondarra' has been growing mostly sorghum and chickpeas for the past six years. The previous 15 years were devoted to cotton. At the moment for cotton, 'the risk doesn't equal reward'. Even without a lot of rain, they can still grow a fairly respectable sorghum crop with good sub-soil moisture.

"And chickpeas? We love 'em!" St John said. This past season they made around $500 a tonne, and they'll stand a lot more wet weather at harvest time than wheat. "They also sit very well as a double crop after sorghum, which fits in with our rule of thumb that we'd like to grow one-third winter crop and two-thirds summer crop.

The partnership's single-disc winter-crop planter is set on 50 cm rows for both wheat and chickpeas. The summer-crop planter is based on John Deere MaxEmerge units on 75 cm rows on a 'Day Break' lift-assist tool bar. St John said "Both planters are just like a Meccano set – all bolted not welded – and the idea is that it's totally interchangeable so we can change to 50 cm spacings for wheat and chickpeas, 75 cm for sorghum and 1500 cm for cotton."

The Kent-McLaren farming operation grows very little wheat as a rule. Since the late 1980s, they have doubled yields in

A Finch Engineering field bin which has been fitted with flat-tread tyres to minimise compaction.

everything but wheat, and disease and quality issues make it a fairly unattractive option. St John and Brett market what they grow on their own properties independently, and what they grow on their joint operation together. St John targets the container market for export crops like chickpeas and also sorghum when there is a surplus to domestic requirements.

On-farm storage for better marketing

"We elected to build a lot of on-farm storage to control the product to end-user because the moment we drop it into the central handling system is costs us a minimum of $30 a tonne, whereas putting it in our own silos costs us about $17 in ownership costs per tonne plus carry and handling costs."

St John believes that nine times out of 10, the price for stored grain will go up after the heat of harvest has passed. Quality issues can be managed and spread delivery deals can be made direct with end-users and container packers. "I'm a believer in deregulation," St John said. "Last summer for example, sorghum was at a harvest low of $160 a tonne, and a season high of $240 a tonne or better after about six months."

'Coondarra' has 1100 tonnes of storage, and the partnership has 3500 tonnes all up. Some silos have a drying mode and all are aerated.

Average annual rainfall is supposed to be 680 mm, but St John works on a rolling 12 month average, which prior to the system created by Tropical Cyclone Oswald, stood at 445 mm.

"What we are doing to try and stay ahead of the game is farming bigger areas with less horse and manpower. This is just a merry go round; the world is not going to starve in my life-time as production is price related. There is a lot of productive land in Australia and the world that is producing little or nothing. Our challenge into the future is to cut down on our dependence on oil-related inputs, fertiliser and chemical, as the price of grain and oil track each other."

St John said he believes the answer may be growing more legumes or nitrogen-fixing wheat, or weed control by other than oil-based chemistry (SEQ microwave research). The possibilities are endless if we are prepared to look outside our little square.

"Remember back to the early 1980s when rum and Roundup were the same price? 'It will never work on my farm' was a constant comment that I remember," reflects St John.

Article courtesy Conservation Farmers Inc.
For more information and membership enquiries see: www.cfi.org.au or contact Executive Director, Michael Burgis on 0428 385 356. ■

Spotted larvae reveal true colours

MUNGBEAN growers are reporting large numbers of spotted larvae in crops across southern Queensland but not all inflict crop damage.

Hugh Brier, Department of Agriculture, Fisheries and Forestry Qld (DAFFQ) senior entomologist, Kingaroy, says the spotted larvae of the bean pod borer remain a significant pest of mungbeans but spotted fungus-eating ladybird larvae pose no threat to crops.

"Despite a slow start to the wet season of 2012–13, podborers are present in many late mungbean crops, albeit in not as high numbers as last year and not as far inland," Hugh said.

"In recent years, significant populations of bean podborer larvae *(Maruca vitrata)* have been reported in crops as far west as Surat.

"This is a considerable distance west of their normal range which is in coastal and sub coastal regions, with occasional major incursions onto the Darling Downs."

Hugh says as a rule, pod borer activity is much higher in wetter seasons, with populations of more than 100 per square metre recorded in the summer of 2011–12.

"The cool and rainy weather also favours the larvae of the fungus-eating ladybird *Illeis galbula*.

"Recent weather conditions favour the growth of fungi that they (adults and larvae) feed on, including sooty mould and powdery mildew."

Hugh says fungus eating larvae are readily differentiated from bean podborer larvae by the six rows of black spots, a bright yellow head, and legs that splay out sideways from the body.

Podborer larvae have four rows (two main rows) of black spots, a black or brown head, and legs held under the body. Fungus-eating ladybirds are found on the leaves, whereas podborer larvae feed in flowers and pods, he said.

"Fungus-eating ladybird larvae can easily be distinguished from predatory ladybirds, as their basal colour is white, whereas predatory ladybird larvae are usually black with orange or yellow bands.

"The adults are instantly recognizable as they are bright yellow with black markings, whereas the predatory ladybird adults are orange with black markings."

The Grains Research and Development Corporation (GRDC) funds research into crop pests and advocates an integrated pest management (IPM) approach.

This includes conserving beneficial insects by using more selective pesticides, minimising pest damage by the best practice timing and application of pesticides, and maximising the crop's ability to compensate for damage by improved agronomic practices that boost crop health.

Growers should note that an emergency use permit (PER 14020 – valid to 31 May 2013) has been secured for the use of Altacor (chlorantraniliprole) against bean podborer in mungbeans, at the rate of 70 g–100L plus a non-ionic surfactant at 125g ai–100L.

This product gives good residual caterpillar control but has no impact on predatory or fungus-eating ladybirds, or other beneficial insects, Hugh said.

For more information on GRDC-supported research, visit www.grdc.com.au ■

Growers are urged to watch for larvae of damaging pod borers in mungbean crops.

How one sorghum gene could help to feed the world

UNIVERSITY of Queensland scientists have identified a sorghum gene which could lead to development of more digestible animal feedstocks and much-improved nutrition for some of the world's poorest nations.

Known around the world for its drought-tolerance and florid heads of grain at harvest time, a more digestible sorghum would allow better uptake of vital nutrients.

For people living on marginalised farmland and dependent on sorghum as a fodder or food crop, these findings could prove to be life-saving, while also maximising water and land-use efficiency.

A team led by UQ plant scientist Professor Ian Godwin and colleagues from the Queensland Alliance for Agriculture and Food Science (QAAFI) has shown that selecting for a specific sorghum gene could mean the grain from these hardy plants will be much easier to digest.

Lower digestibility

"Sorghum is drought tolerant and can grow in regions otherwise unfit for other cereals, but unfortunately suffers from lower digestibility compared with other cereals," Ian said.

"Most importantly, while the gene identified appears to improve digestibility, the gene's presence does not appear to diminish a sorghum plant's growth or yield."

Queensland Minister for Agriculture, Fisheries and Forestry John McVeigh said the research was a major boost for Queensland, with sorghum already contributing an estimated $600 million to the rural economy annually.

"Any improvement to the digestibility of sorghum will add value to the grain and have a knock-on effect for the myriad of rural producers who use sorghum as a feedstock," John said.

"This is a significant milestone for the UQ and Department of Agriculture, Fisheries and Forestry scientists who have been working on the project.

"We have a goal to double the value of our food production by 2040 and this is another step in the right direction towards fulfilling that commitment and making Queensland a world leader in food and fibre production."

While the gene variant is at low frequency in most sorghum populations, QAAFI scientist A/Professor David Jordan and collaborators at the Queensland Department of Agriculture, Fisheries and Forestry have shown that the gene is already in elite germplasm, arising from their sorghum pre-breeding program.

Preliminary studies have been done using a lab system which mimics monogastric digestion. UQ postdoc Dr Ed Gilding has demonstrated the variant gene leads to higher activity of an enzyme involved in starch biosynthesis in the developing grain.

Next step in the research will be to grow significant quantities of the selected sorghum line to test its digestibility, initially, in pigs and poultry.

The group's findings are published in *Nature Communications*. ■

Crop nutrition needs to be spot on this season

GROWERS planting high yielding varieties this winter crop season will need to get nutrition – including nitrogen, phosphorus and sulfur – spot on to achieve high protein levels. That's the message from Sharon O'Keeffe, Grains Research and Development Corporation (GRDC) manager regional grower services – north who says ensuring value from upfront fertiliser is key this season.

"Some parts of the northern region have experienced flooding this past summer so we're certainly going to see denitrification," Sharon says.

"Other areas unfortunately haven't had the summer rainfall so we've got a lot of stubble sitting on the ground which may, with a rainfall event prior to planting, tie up a lot of nitrogen in the initial growth of the crop.

"Put the information together for your area, your farm and your climate to ensure you are doing the best by your crop from the get-go."

Sharon O'Keeffe, GRDC manager regional grower services – north, says growers aiming for high protein levels need to get crop nutrition spot on this year.

Sharon says low protein levels can be an indicator that the organic matter has run down.

"That means we basically have less flexibility in our nitrogen regime, we don't have those buffers that we previously had; a few big flood years will result in that. It could also be quite simply a slow decline and soils are just reaching the tipping point."

No easy or single solution

She says there's never an easy solution and nor just one reason for crop events.

"We had a lot of small environmental indicators which pushed us into that situation of lower nitrogen and certainly having late season rainfall didn't help.

"For the areas that had virtually no rainfall from early in the 2012 season the research indicates some of that nitrogen just wasn't able to be accessed by the crops."

The recent GRDC Updates across the northern region focused on exploring and explaining some of the causes of low protein.

"Some of the low protein was quite simply due to insufficient applications of nitrogen prior to planting or, in regions such as Central West NSW, growers missed their second chance to put on their canopy management applications of nitrogen.

"Growers should use the range of tools available to calculate the amount of nitrogen you need for the targets you are trying to get.

"That includes doing soil tests to a deep level for nitrogen and interpreting those results. Growers can access private services and/or use *CropMate* on the NSW DPI website."

GRDC funds the *More Profit from Crop Nutrition* program which includes work from Queensland Alliance for Agriculture and Food Innovation (QAFFI), Department of Agriculture, Fisheries and Forestry Queensland (DAFFQ) and NSW Department of Primary Industries (NSW DPI) researchers.

For more information, visit www.grdc.com.au ■

Early vigour a promising trait for dry seeding

KEY POINTS...

- This WA-based research is applicable to other wheat-growing states.
- Wheat varieties vary in how sensitive they are to a lack of water during germination, establishment and the seedling and tillering phases.
- Early vigour may be a useful trait to maintain yield in environments experiencing early water deficit.
- Post-establishment water deficit will rarely be severe enough to cause crop death.

RECENT research indicates that 'early vigour' may be a promising trait to improve wheat variety performance when crops are exposed to dry conditions after seeding. This is one of the findings from a research project led by the Department of Agriculture and Food (DAFWA) and conducted at the 'Managed Environment Facility' (MEF)* at Merredin in Western Australia.

The research found that wheat varieties show genetic variation for their responses to limited soil moisture during germination and after emergence, and confirmed that early water shortages rarely cause crop death in wheat.

Supported by the Grains Research and Development Corporation (GRDC), the project aims to characterise and exploit genetic diversity in wheat and barley for tolerance to water deficit during germination and crop establishment.

Although conducted in WA, DAFWA senior researcher Bob French said the research was likely to be applicable to other cropping areas in Australia.

Bob presented the findings recently during a dry seeding 'focus session' at the 2013 Agribusiness Crop Updates in WA, and last year at the Merredin Research Station field day.

He said the imperative for growers to sow crops early – often into dry conditions – combined with rainfall variability at the start of the growing season, exposed WA crops to the risk of a severe water shortage following crop establishment.

"This research aimed to characterise the effects of early water deficit on growth and development of wheat crops, and to identify genetic variation potentially useful for improving the resilience of Australian wheat cultivars under such conditions," Bob said.

He said a lack of water early in the season affected wheat crops in a number of ways.

"Limited soil water during germination can delay emergence and reduce total plant numbers," Bob said.

"Water deficit soon after emergence reduces early biomass accumulation and may eventually reduce grain yield.

"If the stress is severe enough, flowering may be delayed, but stresses this severe are probably uncommon in the WA wheatbelt."

Bob said wheat varieties exhibited genetic variation for these responses.

"Early maturing varieties experience greater flowering time delays and yield depression in response to early water deficit," he said.

"This may be related to differences in when varieties are prone to stress during their development, and these early maturing varieties having less time to compensate when stress is relieved.

DAFWA senior researcher Bob French and Merredin MEF project officer Michelle Murfit with one of the high vigour CSIRO lines at the end of September, 2012.

"Early vigour shows promise as a trait to improve wheat variety performance in environments experiencing early water deficit, but further work is necessary to confirm its value given the confounding effects of other traits."

Bob said the research confirmed earlier findings that wheat rarely died from early exposure to dry conditions.

"After emerging on a total of only 26 mm (irrigation and rain) seedlings did not show signs of mortality until close to 30 days without rain," he said.

How the research was done

Two experiments were conducted at the Merredin MEF in 2012. In the first, 32 wheat genotypes were sown into dry soil with knife points in small replicated trial plots on April 18.

Nine irrigation treatments increasing from 15 to 55 mm in 5 mm increments were applied between April 23 and 27.

Seedling emergence and survival, early biomass, tiller numbers, and heading and anthesis dates were recorded.

In the second experiment 36 wheat genotypes were sown into moist soil on June 14, 2012 with disc openers in small replicated trial plots.

These genotypes included six selected from a breeding population developed for early vigour by Greg Rebetzke of CSIRO.

Rain was excluded from July 1 to August 23 using rain shelters, but during this time half of the plots were irrigated with about 10 mm water each week.

After the rain shelters were removed, the stressed plots were irrigated with 55 mm of water so that all treatments had the same amount of water overall.

All seed for both trials came from the same source.

What we found

Experiment 1

After the 15 to 55 mm received at sowing, and 11.2 mm rain up until May 5, this experiment received no rain until June 6 and 7 when 20 mm fell.

During this period soil volumetric moisture content at 10 cm

DAFWA senior researcher Bob French in a rain shelter during the treatment period, with 'early stress' plots in the foreground and well watered plots in the background.

depth in the 15 mm treatment fell from about 10 to 5 per cent (only just above wilting point); and from about 15 to 10 per cent in the 55 mm treatment.

Water deficit in the seedbed delayed seedling emergence by up to a week, and reduced the total number of seedlings which emerged.

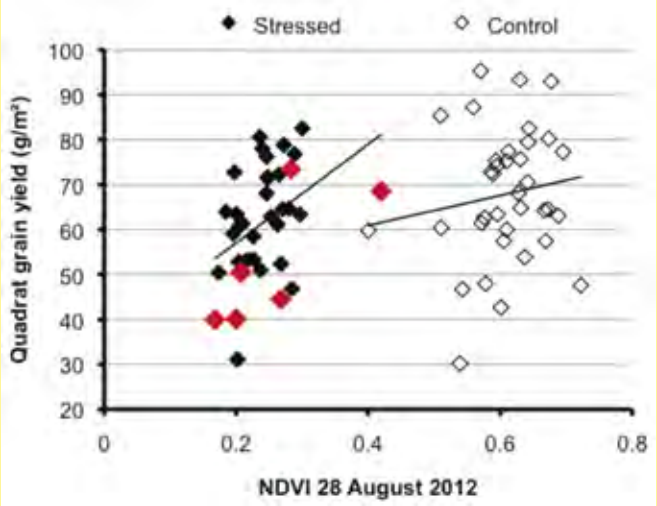
Emergence in the 15 mm treatment plot ranged from 71 to 104 per cent of that in the 55 mm treatment, depending on genotype.

In early June at the end of the dry spell many plots in the 15 mm treatment plot were extremely stressed.

Some were completely wilted with dead lower leaves.

Nevertheless, after two weeks and 40 mm of rain, most of these plants had recovered.

FIGURE 1: The relationship between quadrat grain yield and Normalised Difference Vegetation Index (NDVI) at the end of treatment period in Experiment 2



The NDVI measures plant growth, vegetation cover and biomass. Data for lines from the CSIRO vigour population, subjected to early stress, is highlighted in red, showing a correlation between NDVI and grain yield. These lines used in the trial were selected from a population developed by CSIRO to display low to high early vigour, within a similar genetic background.

Prolonged water deficit following establishment delayed heading and anthesis (when a flower is fully open and functional) by up to 27 days.

There were no significant delays to heading and anthesis except in the two severest treatments (15 and 20 mm initial irrigation) and delays were greatest in the earliest flowering genotypes.

Experiment 2

This experiment received 45.4 mm of rain before the rain shelters were erected, by which time the crop had fully emerged.

By the end of July, soil volumetric water content in the stressed treatments was about 10, 20 and 28 per cent respectively at 10, 20, and 30 cm (this soil contained more clay and therefore held more water than that in Experiment 1).

It declined only slowly throughout August at each of these depths, recovering after the post-stress irrigation.

In contrast, in the irrigated treatments water content was about 20 per cent at 10 and 20 cm, and 37 per cent at 30 cm during the treatment period, but declined rapidly after irrigation ceased in late August, and soil water content approached wilting point by late September.

Stress during the treatment period was not as severe as the most severe in Experiment 1.

Although growth was clearly reduced, severe wilting was not observed, and heading and anthesis were not delayed.

Measurements during and after the treatment period indicated that the ability to maintain biomass production during early water deficit varied significantly between genotypes.

There was a more than two-fold range in NDVI (Normalised Difference Vegetation Index) after early stress, indicating some genotypes are much better able to maintain growth under these conditions than others.

But it is worth considering that the grain yields were from small quadrats, which are more variable than whole plot yields.

They show an influence of biomass at the end of the treatment period on grain yield, but it is obviously confounded with the effect of maturity and other factors (Figure 1).

Early maturing genotypes seemed more sensitive to early water deficits.

To sum up

Bob said water deficit after germination could reduce wheat crop establishment and early growth, with the magnitude of these effects depending on the severity of the stress. The impact on crop production depended on how often the water deficits occurred.

He said many WA crops experienced early water deficits in 2012 which affected establishment and early growth. Analysis of weather data would reveal the future likelihood of similar conditions occurring across key cropping locations in southern Australia.

"Significant variation between varieties means breeding should be able to improve variety tolerance to these conditions," Bob said.

"Our research found that early vigour is one trait associated with better yield after early stress, although this needs to be confirmed under a wider range of stress patterns.

"We will investigate this in 2013, paying particular attention to how stress levels following tillering affect the ability of crops to recover from early stress."

***Trials at the GRDC-supported MEF facility at Merredin, as well as its sister sites at Yanco and Narrabri in New South Wales, are helping researchers and breeders to better understand drought tolerance traits and to develop more consistent yielding, better quality crops for variable rainfall areas.** ■

How do Australian values compare?

Profarmer Grain AUSTRALIA
www.profarmer.com.au
MAY 22, 2013

WE have highlighted on a number of occasions the strong premiums Australian old and new crop wheat values are trading at compared to CBOT wheat futures (strong basis). This indicates current Australian prices are expensive relative to CBOT wheat futures as a benchmark.

Comparing Australian values to recent actual trades of physical wheat is potentially a more accurate way of benchmarking whether current Australian prices are strong or weak relative to elsewhere in the world.

We have made an attempt at doing this below, effectively working back a few recent transactions to an 'Australian Port Track Price Equivalent' for comparison with current values.

NOTE: The below transactions occurred May 8 and May 21 – the market was moving; freight and fobbing costs can vary depending on ports; the timing of deliveries also impact price significantly given northern hemisphere new crop is approaching (the two Korea trades are for July/August delivery); Canadian spring wheat is high protein (more than 12.5 per cent).

RECENT GLOBAL PHYSICAL TRANSACTIONS			
Tonnes	**45,000t**	**50,000t**	**130,000t**
Commodity	Wheat	Wheat	Corn
Quality	Canadian Spring	Feed	Feed
Destination	Indonesia	Korea	Korea
Price traded CNF (US$/t)	365	290	277
Freight Costs (US$/t)	20–25	20–25	20–25
Fobbing Costs (US$/t)	38–42	38–42	38–42
A$/US$	0.98	0.98	0.98
Price Australian Track Equivalent (A$/t)	**304–314**	**227–237**	**214–224**

Despite the limitations of the above figures they provide a useful comparison.

Competition from northern hemisphere new crop supply is on the radar. Northern Hemisphere origins are beginning to quote and do business for their coming harvest (July forward delivery), which is discounting current old crop Australian prices by A$10 to $60 per tonne depending on grade and port zone. It also indicates new crop Australian values are in the vicinity of A$10 to $20 per tonne over the competition.

The above analysis indicates Australian values are strong relative to other parts of the world and that there is potential for downside on a export equivalent basis for both new and old season wheat prices.

A$ weakness helping grain values

The A$ has now dropped from US$1.0374 at the start of the month to sit at 0.9812 as at Tuesday, May 21. This has added in the vicinity of A$14–15 per tonne to the value of CBOT wheat futures in Australian dollars, and also the value of Australian wheat as a depreciating dollar makes Australian exports more competitive.

What has been the driver?

The depreciating A$ has largely come as a consequence of a stronger US economy and better than expected US corporate earnings. This has led to consumer confidence in America reported at the highest level in almost six years in May. Separate data increased confidence of US small businesses to a six-month high in April. US retail sales also rose, but manufacturing data was weaker.

This has seen the US$ rally relative to a basket of other currencies as money from around the world is flowing back into the US as it looks like a more promising investment.

So where to from here?

It is fraught with danger trying to pick currency moves (just like picking wheat price movements) as many uncontrollable factors will have an impact.

A common expectation by many commentators is for quantitative easing (printing money) in the US to be wound back as the US economy improves. It is also a view shared by many analysts that this will correspond with a possible increase in US interest rates.

These actions would both be viewed as supportive to the US$, which would possibly see weakness in the A$/US$ currency.

But the US Federal Reserve Chairman Ben Bernanke has said he would continue with the stimulus until the jobless rate falls to 6.5 per cent (7.5 per cent in April) or inflation rises above 2.5 per cent (1.1 per cent in April).

Meanwhile the Reserve Bank of Australia cut the underlying cash rate at the start of May to 2.75 per cent citing pockets of weakness in the Australian domestic economy and subdued inflation.

Australian grain prices remain strong.

Due to these factors many are expecting the A$ to trade closer to US$0.90 by the end of the year.

UBS interest rate strategist Matthew Johnson recently indicated on *Financial Review Sunday* on Channel Nine that the longer term, fair value for the Australian dollar is 'somewhere between US$0.80 and US$0.90'.

But the other school of thought is the A$ will remain well supported by Chinese growth, which whilst it has slowed, remains robust and potentially more sustainable.

National Australia Bank group chief economist Alan Oster, expects the A$ may trade around US$0.98 in the short term as it remained a proxy for Chinese growth for global investors.

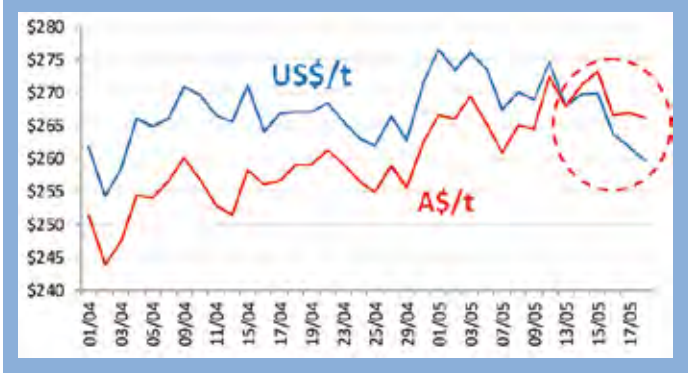
CBA updated their currency forecasts mid May putting the short-term outlook on the A$/ US$ to lift back to 1.03 at some stage in the coming months.

What does this mean for Australian grain?

Do not bank on a falling A$ to maintain or lift grain prices into the back end of this year.

Whilst the A$ has fallen from just under US$1.06 in January to 0.9812 as at May 21, translating into around a A$19-21 per tonne benefit for Australian grain prices, CBOT Dec13 wheat futures have fallen from 820 USc/bu to just above 700 USc/bu. This converts to a net negative on A$ values of A$38 to $42 per tonne. Refer chart below.

CBOT DECEMBER 13 FUTURES



If a downward movement in international wheat prices eventuates, a weaker A$ will help to buffer the impact on our local grain prices but it is unlikely to maintain or increase A$ wheat prices.

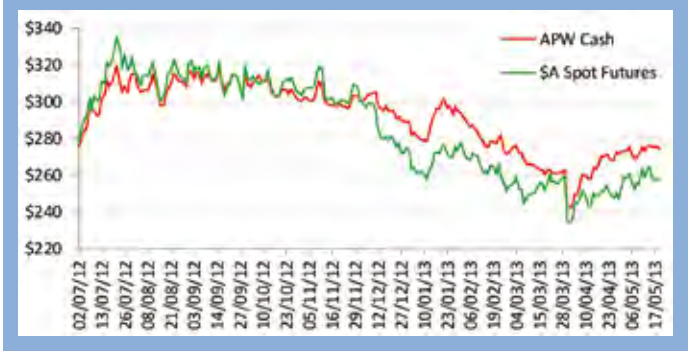
Obviously this is only of some help to us if the A$ falls – which is still a guessing game. ■

Grain market outlook

Wheat

Week on week wheat price movements in late May were a mixed bag for old season wheat, with some port zones falling only slightly such as Brisbane, Newcastle, Geelong and Port Adelaide; whilst other port zones had more substantial falls such as Kwinana and Port Kembla. Basis levels for old season crop in Eastern Australia continue to strengthen due to local end users buying feed as they need it.

2012–13 WHEAT PRICES



New season wheat prices were consistently lower across Australian port zones. Prices were between $6.50 per tonne and $9.00 per tonne lower whilst CBOT Dec13 wheat futures fell A$6.13.

Despite prices being lower than they were at harvest for both old season and new season, Australian prices remain strong relative to a number of measures, such as:

- Strong premiums to Chicago.
- Premiums to physical transactions in the global market with the northern hemisphere harvest approaching.

There is now a different set of circumstances surrounding global supply and demand than there was at our harvest time. Market prices are reflecting this.

Barley

Old season

Old season F1 barley was flat in late May, which is a good effort given international feed grains ended the week lower.

Relatively tight old crop supplies, as Australian domestic use remains robust, is keeping pressure on exporters to push values higher if they need to cover off some commitments. Newcastle and Brisbane ports continue to trade at significant premiums to elsewhere in Australia for this reason.

The *Australian Crop Forecasters* weekly shipping stem shows exports of barley out of Port Adelaide and Port Lincoln in SA have been strong for April-May.

Old season malt barley is attracting premiums in Geelong and to a lesser extent Port Kembla port zones with GrainCorp stepping in to cover some domestic maltster requirements.

New season

New season feed barley prices ended the week lower in the

FREE APPLE iPAD 2 WHEN YOU PURCHASE A PRO 700 UPGRADE KIT FROM CASE IH

Go from this…

to this…

and get this FREE!

Upgrade your Case IH Axial-Flow® 7010, 8010, 9010, 7120, 8120 or 9120 Combine Harvester's display from the AFS Pro 600 to the AFS Pro 700

Advantages of the upgrade include …

- **Enhanced processing speed**
- **Up to 4 times more memory**
- **Data recording to USB**
- **3 camera / video inputs**

Designed to maximise your harvesting potential, the AFS Pro 700 display is your point of reference for machine function and productivity information as well as adding the possibility to now have 3 camera inputs from around your combine harvester.

As an added bonus, when you have this upgrade fitted by your Case IH dealer to your Case IH Combine Harvester before 30/06/2013, you will be able to redeem an Apple iPad 2 16GB WiFi + 3G, worth $569, absolutely free from www.rewardscaseih.com.au

Terms and conditions apply. Available from participating Case IH dealers only, while stocks last. You need to self-claim your Apple iPad 2 from the www.rewardscaseih.com.au website before 15/07/2013. Please see your local Case IH dealer for details. Apple and iPad 2 are trademarks of Apple Inc.

Visit www.rewardscaseih.com.au for details of this offer!

CASE IH AGRICULTURE

CIH 1071

main exporting ports of WA, SA and Victoria – mainly in-line with international feed grain values. Prices held in NSW and Qld as the market remains very domestic-centric currently given strong demand by domestic feedlotters.

If we consider recent international trades and assume the average discount of feed barley to feed wheat is roughly $20 per tonne, it suggests current new crop feed barley prices are roughly uncompetitive by $20 per tonne. More so in Brisbane where premiums for feed barley are significant, which is not unusual given limited barley up there.

Canola

Australian canola

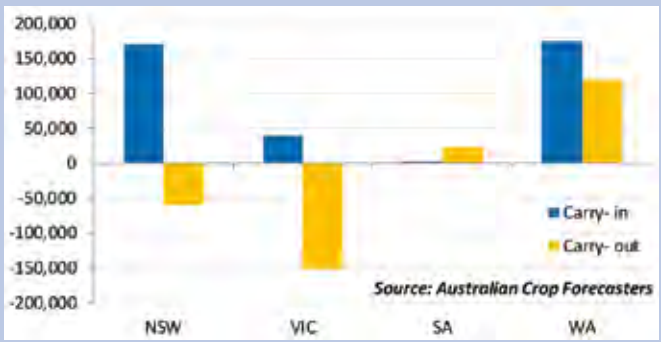
Old season canola values were stronger towards the end of May except in WA where prices fell. This was driven by a very tight Australian domestic situation in eastern Australia and Winnipeg canola futures finishing strongly higher on the back of a similarly very tight situation in North America. Despite the gains in Australian values, local basis against Winnipeg canola weakened considerably as the July contract makes new contract highs, except Port Adelaide which was unchanged.

In terms of why WA values are not following those on the east coast of Australia, *Australian Crop Forecasters* report WA is where the canola stocks are held (see chart).

The chart takes into account current stock levels, last year's production estimates and current expected exports. Obviously we do not think NSW and Victoria will run-out of canola let alone go into negative stocks. Price will, and is, reacting to ration demand.

The chart simply paints the picture that stocks are extremely tight in eastern Australia and more abundant in WA. If there was not such a tight squeeze on for old season canola in eastern Australia, eastern Australia growers could expect they would be receiving values closer to WA values on offer currently (ie. a $40–50 per tonne discount to current prices in eastern Australia).

2012–13 Canola stocks



ICE canola July 13 (blue) vs November 13 (red)

International oilseeds

- Towards the end of May, the discount forward oilseed futures contracts traded at relative to spot contracts, continued to increase (see ICE canola chart).
- This is due to the market grappling with rationing very tight old season supplies with an expectation that the new season crop will be large. But the new season harvest of soybeans and canola in the US and Canada does not begin until around September. A long way to go before new crop becomes available.
- The US weekly export report in mid May confirmed that old crop export demand has pretty well finished due to South American supplies.
- China bought 275,000t of the new season sales confirming they will be a strong buyer again this year.
- Despite the lack-lustre old crop export demand; some risk premium was built back into price due to uncertainty over how long a port worker strike in Brazil will last.
- This could mean some demand switched back to the US in the short term amongst very tight US old crop stock levels.
- Weakness in the Canadian dollar relative to the US helped support Winnipeg (ICE) canola futures.

Pulses

Local

As Australian plantings are underway, *Australian Crop Forecasters* are predicting on a national basis that the area of field peas, chickpeas and faba beans will be lower by around three to six per cent this year compared to last year. Australian plantings of lentils are expected to be higher.

International

Pea, lentil and edible bean prices were little changed through North America over the May 20–24 week due to very light trade as the focus is on planting.

Seeding of this year's pulse crops accelerated in some of the key producing areas of the US and Canada during mid May – however it still remains behind the average.

Canada's visible stocks of field peas were reported at 177,100 tonnes; up 77,500 tonnes from last year.

India's Agriculture Department reported adequate quality seed for this year's monsoon or kharif season crop cycle. Total seed needs for all crops is forecast at 1.4 million tonnes, total seed available is 1.54 mt. ■

2012–13 PULSE PRICES

21–05–13		May 20–24	Previous week	Change
Peas	Adelaide	$379.00	$379.00	$0.00
Faba beans	Adelaide	$405.00	$400.00	$5.00
Nipper lentils	Adelaide	$660.00	$630.00	$30.00
Lupins	Kwinana	$315.00	$315.00	$0.00
Chickpeas	Brisbane	$520.00	$520.00	$0.00

Supplied May 22 by *ProFarmer* Australia. Information available at www.profarmer.com.au or call 1300 302 143

New tools for studying the root of the matter

■ By Dennis O'Brien, Agricultural Research Service – USDA

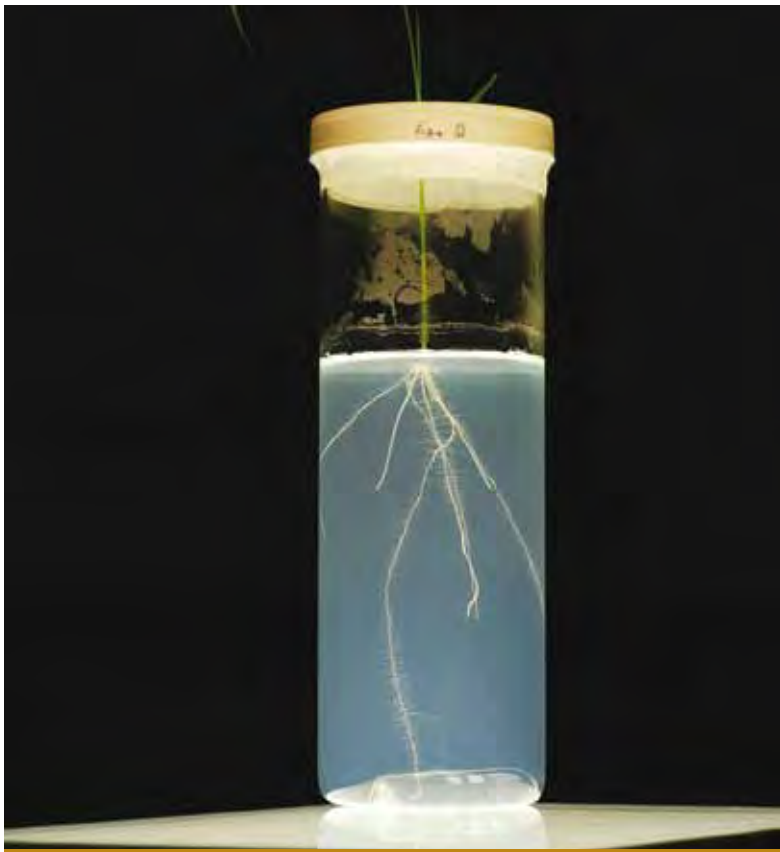
LIKE any structure, a plant root has its own architecture. Some roots burrow straight down into the soil. Others scatter weblike tentacles. However they turn out, root systems play a critical role in the health and survival of today's crops. That's why Agricultural Research Service scientists in Ithaca, New York, have developed a new tool for studying root architecture, one that brings them out in three-dimensional colour. It's a major step forward in a challenging field.

Studying root-system architecture can be extremely difficult because the opaque nature of soils makes it hard to capture and visualise the root structures. Also, field conditions, such as soil chemistry and soil moisture, can vary from one site to the next, and changing conditions dramatically affect the shape, size, and health of a root system. But root structure, health, and formation have become important traits of interest in recent years as scientists search for varieties of crops with roots that equip them to adapt to drier habitats and changing climates.

Scientists have grown plants hydroponically in pots and on plates and have used tools ranging from magnetic resonance imaging to computer-assisted tomography to study root architecture.

The latest technology includes transparent gels that allow them to observe roots at different stages of development as the root and plant grow together in a kind of suspended animation. With computers and digital photography, researchers have even developed two- and three-dimensional imaging systems to record roots as they develop in the transparent gels.

Leon V. Kochian, director of the ARS Robert W. Holley Center for Agriculture and Health in Ithaca, and Randy Clark, a Cornell University doctoral student working with him, have developed a three-dimensional imaging system and software package that



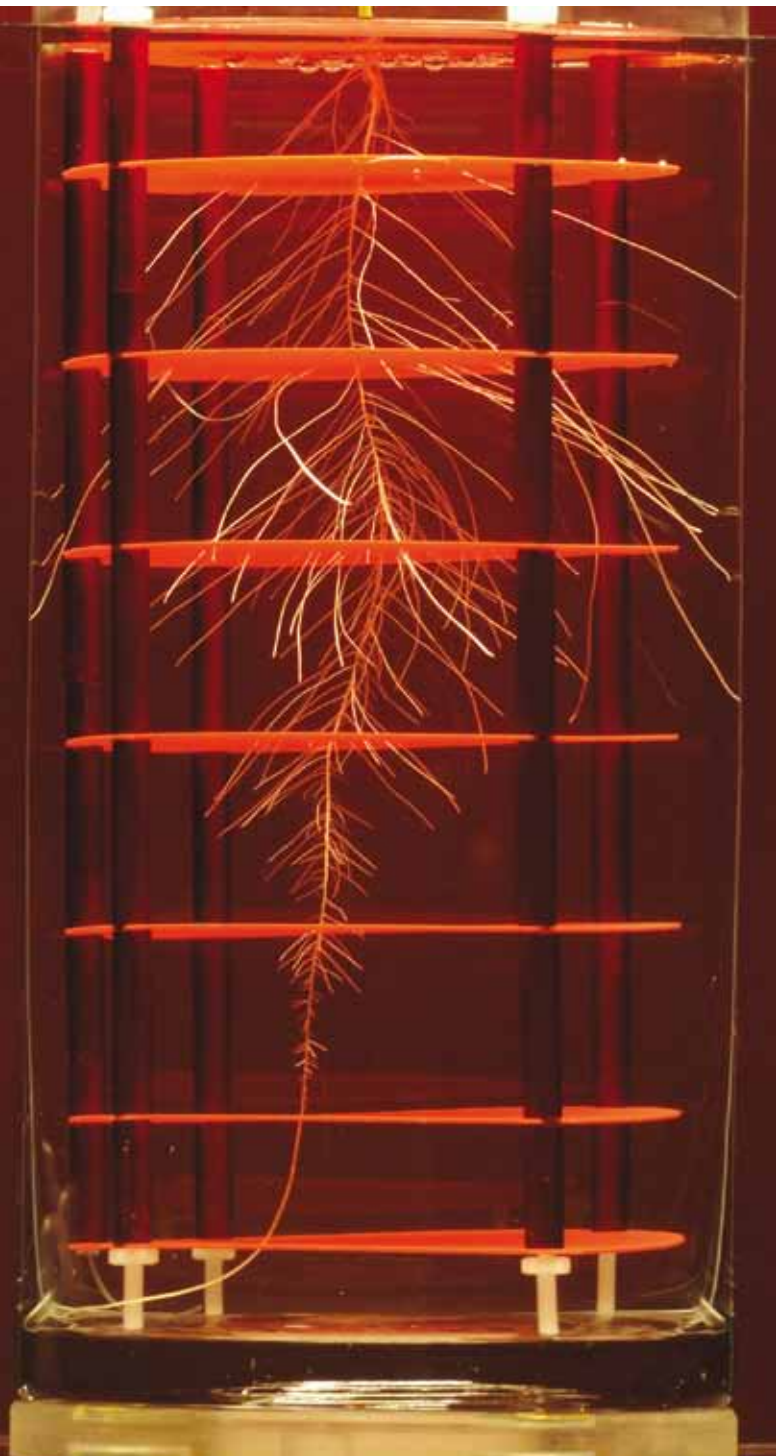
Azucena rice, an upland cultivated variety, growing in a growth cylinder system used to capture the dynamic growth of root systems in three dimensions. (PHOTO by Randy Clark)

allows scientists to collect data on root systems faster than ever before and study root architecture in unprecedented detail.

Called 'RootReader3D', the system gives scientists the ability to analyse root structures and growth patterns, compare one root system with another, and genetically map and explore traits that give plant roots the capacity to reach into the soil and collect water, phosphorus, and other nutrients, Leon says.

Testing the system on rice

To test their system, the researchers grew two varieties of rice in transparent gels and tracked root growth by imaging the plants and their roots for 10 days. "We put the plants on a computer-controlled rotational stage and took digital images of the root system at every nine degrees of rotation, so there were 40 images of each plant. The entire imaging process takes about five minutes per plant," Leon says.



A sorghum plant growing in a newly devised hydroponics growth cylinder system used for analyzing root system architecture of large cereal crops under an array of nutrient and stress regimes. (PHOTO by Randy Clark, Jon Shaff, and Brittany Green)

They chose rice for the analysis because rice root systems are extremely complex, and the way rice adapts to environmental changes can vary widely from one type of rice to the next. Cultivated rice ranges from highly managed, irrigated systems to types grown in unmanaged fields. The researchers intentionally selected two very different types of rice – Azucena and IR64 – for analysis. IR64 is a lowland rice grown in flooded rice paddies, while Azucena is an upland rice adapted to nonirrigated fields.

In more recent experiments, the researchers have imaged the entire root systems of 400 different rice lines in a rice-diversity panel; this has involved phenotyping the root systems of 2000 rice plants and then developing three-dimensional images of each root system. They scored the root systems for 27 traits that describe both the individual root types, such as the primary root, crown roots, and lateral roots, as well as the architecture of the whole root system. They noted when each root component first appeared and tracked its growth.

The ability to isolate and track such root components will help scientists make comparisons among crops and characterise the developmental and genetic differences in root systems, with the ultimate goal of identifying genes underlying control of root system architecture, Leon says.

Scientists elsewhere had previously taken two- and three-dimensional images of root systems of plants grown in gels. But those systems required up to an hour to collect enough data for a single three-dimensional image. The RootReader3D system offers more detailed results and is much faster. With it, scientists can image more than 100 root systems a day, providing the information needed to conduct genetic-mapping experiments of root traits.

The most detail ever achieved

The researchers found that the RootReader3D system was able to delineate, in greater detail than ever before, significant differences between two rice root systems. The results showed that Azucena rice had deeper roots than its irrigated cousin IR64 and that the two root systems were significantly different in terms of their 'bushiness', how their root volume was distributed, and the vertical position of the centre mass of the root system.

Results were published in and featured on the cover of the June 2011 issue of *Plant Physiology*, with Randy Clark as lead author and Leon as senior author. The work is part of a long-term collaboration between Leon's research unit and Susan McCouch, a professor of plant breeding at Cornell. The research was partially funded by the National Science Foundation. The RootReader3D software is available at www.plantmineralnutrition.net/rootreader.htm.

The researchers hope to use the data they collect using RootReader3D in future studies that identify genes controlling important root developmental traits. The ultimate goal is to be able to help plant breeders develop varieties of rice – and other crops – with roots that make them better equipped to handle drought, heat, poor soil quality, and other stresses in a changing world.

"It will be an enormous help, not only in comparing different root systems, but also in exploring the molecular basis of root formation and root architecture to gain an understanding of the genetic mechanisms that give plants the ability to form the kind of roots they need to survive and thrive," Leon says.

Leon V. Kochian is with the Robert W. Holley Center for Agriculture and Health, Cornell University, Tower Road, Room 121, Ithaca, NY 14853-2901; Ph: +1 607 255 2454. ■

The road to the Isles

Part two – The tractor collection – found?

By Ian M. Johnston

A chance encounter at Ullupool

My old school friend Donald had alerted me to the existence of an island based classic tractor collection, which he assured me was to be found on the remote Outer Hebrides, that chain of rugged islands located in the Atlantic Ocean off the West Coast of Scotland. But he was vague when asked to specify which island, as there are several in the group. However the lure of the search was too tempting to ignore.

Accordingly, accompanied by Margery Daw, (who is my Girl Friday, my minder, my secretary, my accountant and oh yes – also my betrothed), we shipped the rental Rover to the islands and commenced a thorough search of the entire chain, island hopping along the way. Each day I received the same negative reply to my inquiries. By the time we eventually arrived at the most northern of the group – Lewis – it became disappointingly clear that there was no classic tractor collection in existence anywhere in The Outer Hebrides.

But we managed to remain philosophical, for after all we had experienced the magnificence and solitude of a remote part of Scotland that few people are privileged to see!

I drove the car up the ramp onto the Caledonian MacBrayne Island ferry for the return voyage across The Minch. Three hours later we berthed at Ullapool, a small fishing centre, located on Scotland's rugged west coast with road connections to the outside word. An appetising fragrance of fish and chips and malt whisky emanated from the ancient hotel adjacent to the jetty, and it seemed the obvious course to check in for the night.

The road north from Ullapool winds through some dramatic scenery. (Photo M Daw)

A view of Scappa Flow. (Photo IMJ)

A crofter's cottage near Durness. (Photo M Daw)

The following morning we breakfasted on porridge, local kippers and oat cakes. Suitably nourished, I wandered down the jetty and spent an enjoyable half hour inspecting the colourful array of stout small craft secured by their hawsers to the sturdy bollards.

On returning to the hotel, I found Margery engaged in conversation with a middle aged chap I had noticed earlier in the dining room. I was introduced and learnt that Margery had been telling him of our failed mission to The Outer Hebrides.

"No, there are certainly no tractor collections out in The Hebrides," said the man emphatically.

"You speak with conviction," I said, observing him speculatively. "Have you an interest in old tractors?"

"As a matter of fact I have and happen to own a couple of restored old Fordsons," he responded. "But I am also a co-ordinator with The North of Scotland Regional Tourist Bureau and travel around extensively. It is my business to know what goes on in my territory," he added. Then continued, "The only collection you will find on an island up here in the north is a long way from Ullapool I'm afraid."

I took a deep breath, "Give me the bad news."

"Well I know there is a collection on one of the islands in the Orkney group, and as I said, that is a mighty long way from here," he replied apologetically. "But I also know that if you are searching for a tractor collection on a Scottish island, then I guarantee that is the only one. But I am sorry I can't be more specific as to which Orkney island."

He spoke confidently and I had no reason to doubt the accuracy of his information. Obviously Donald had got his islands mixed up, which should not have surprised me as he was bit of a dunderhead at school! But now the challenge of tracking down this elusive island tractor collection was becoming an obsession. For all I knew it might consist of merely two common-or-garden Fergusons! But I obstinately simply had to find out!

Margery contemplated for a moment, then with a twinkle in her eye said "No use standing around. You had better get us to Orkney."

The drive north

Ullapool lies at the head of Loch Broom in the shadow of the towering mass of Beinn Eiledeach. The only road north is the A835 which steadily curves its way up through the Cromalt Hills to Ledmore, where it is joined by the road that leads from Inverness and Tain. The Rover negotiated the breathtakingly beautiful glens and steep passes effortlessly. The descent to the eastern shores of Loch Assynt presented us with a sweeping panorama and we gazed in awe as we drove past the dramatic relic of ancient Ardveck Castle, rising from the still waters, a reminder of the tempestuous period of Scottish history over a thousand years ago.

Our planned destination that night was The Durness Hotel, on the most northerly point of North West Scotland, where The Atlantic constantly pounds the rugged coastline. We hastened along the narrow road, with its pull-in places should two cars meet head on. However we drove for an hour without sighting another vehicle, until eventually arriving at Durness, which consists of the small hotel and a handful of bleak cottages. But the hotel was closed for the season!

It was now late afternoon. The watery sun cast weird hues through the ribbons of sombre clouds, as it commenced its disappearance over the horizon. The gloaming was settling in and the countryside prepared for sleep. But no rest for us! A close perusal of the AA Road Atlas left us in no doubt that the nearest village and hotel was Tongue. This meant a lengthy tedious drive along a single track roadway that curved torturously along the northern coast before almost circa-navigating the sea inlet – Loch Eriboll – then across the moors to The Kyle of Tongue, and hopefully a hotel that was not closed for the season!

Eventually Tongue was reached, having crossed the spindly viaduct over the Kyle. We were the only guests at the crumbling hotel, but enjoyed a hearty meal of poached local salmon followed by roast venison in front of a cosy peat fire, plus a hot bath and a sound sleep in an old fashioned creaking bed.

The following morning we made an early start and pointed the nose of the Rover east in the direction of Thurso. Unlike the vast majority of Highland terrain, the strip along the northern region is relatively flat and almost heath like. On the approach to Thurso I swung a left turn which took us to the ferry terminal of Scrabster, the place of embarkation for Stromness, the principal port of Orkney.

Orkney

The Orkney Islands are separated from the Scottish mainland by a stretch of water known as The Pentland Firth. Although only a few kilometres in width, it has the reputation of being the stormiest water crossing in the world! I had prepared Margery to expect the worst. She tends to suffer from mal-de-mere even on dry land!

The St Olaf was obligingly awaiting our arrival (it would seem) alongside the jetty at Scrabster. This cavernous ferry had been custom built to cope with the huge seas that so often prevented conventional ships from venturing out into The Firth. It obviously had an uncommonly deep draft and broad beam, in order to help stabilise the vessel in high seas. Large trucks were accommodated deep down in the bilge area, while the lighter cars were directed to the higher decks.

With the car safely stowed away, Margery and I ventured out on the upper deck, where we witnessed a comical sight which had us chuckling. The captain (no less) was leaning over the rail of his bridge with a fishing rod and line, whilst peering hopefully down into the water! It occurred to us that he probably preferred a fresh fish for lunch rather than the cook's frozen variety in the galley!

Margery suspected me of exaggerating when I had warned her of the mountainous seas normally experienced in The Pentland Firth. That day the surface of the water resembled that of a mill pond. The St Olaf quietly surged its way across the flat sea on its journey to Stromness. On our starboard bow the island of Hoy rapidly took shape. But it was The Old Man of Hoy upon which our attention was focused. Rising dramatically out of The Atlantic to a height of 449 feet (137 metres) this needle-like red sandstone stack has been separated by the erosive power of wind and wave from the cliffs of Rora Head. It stands like a sentinel and is considered the UK's most challenging climb.

Stromness is a typical island port, grey and sombre, having endured centuries of huge seas and battering winds. We located a modern B&B cottage on a rise overlooking the town where we were warmly welcomed by a cheerful lady with a most captivating Orcadian lilt to her dialect, whose name was Alison Clouston. Importantly she was the repository of all the 'goings ons' on the islands.

"Yes of course, to be sure I ken of the tractor collection. After all, everybody knows of Billy Dass out on Bhu Farm," she said pointedly.

I let out a sigh. Thank goodness! We were now on the home run.

Bhu farm is located on The Isle of Burray. This involved us in a scenic drive through rich farming country and clusters of stone cottages. No trees grow on these islands on account of the perpetual winds constantly bombarding the landscape. Indeed the soil is rich in phosphate due to aeons of winds crashing against the cliffs and hurling seashells the breadth of the land. Barley for the local distilleries is one of the principal crops.

Stromness. (Photo Scottish Tourist Board)

We drove east following the road around the northern shore of Scapa Flow, that historic sheltered naval sanctuary, which features so prominently in the maritime history of both world wars.

A pause for lunch in the main commercial centre of Kirkwall was followed by a quick tour of St Magnus Cathedral, a majestic edifice in pristine condition dating back to the twelfth century. Then it was south to the Isle of Burray, which included driving across an artificial causeway – part of the Churchill's Barriers

designed to protect the naval ships in Scapa Flow from U boat attacks during World War 2.

There are three wee villages on Burray – Northtown, Southtown and Burray Village. A tractor pulling an overfull dung cart was emerging through a field gateway and I inquired from the driver if he knew of Bhu Farm.

A Stromness life boat, powerful and fast – can handle any storm. (Photo IMJ)

Billy Dass of Bhu Farm. (Photo IMJ)

An early David Brown 30 D in Billy Dass's collection. (Photo IMJ)

"Of course," he retorted, seemingly amazed that anyone would not know of its whereabouts. "Ye canny miss it," and with that he proceeded to wave his arms indicating a farm along the road.

Success at last!

The stout oak door was opened and a rotund jolly figure appeared.

"Aye, whit can I do for ye?" he asked, somewhat aggressively I thought.

"I am looking for Mr Dass. A fellow along the road said this was Bhu Farm," I explained.

"No person here of that name," he retorted sharply. I was perplexed, the tractor driver was quite positive with his directions.

"Are ye frae the tax department?" he asked suspiciously.

"No, certainly not!" I was taken aback by the suggestion. "I am from Australia. I write books about tractors and I am searching for The Bhu Farm collection," I shot back at him.

"Och weel. That's all richt then. You'd better come awa ben. I'm Billy Dass and you and yer wife are very welcome. I'll pour oot a wee dram and then I'll introduce ye to my collection of David Broons."

And this is where the story ends. Billy Dass proved himself to be quite a character. We were introduced to his wife and enjoyed afternoon tea, following the inspection of his David Brown tractors.

Did our lengthy search end in an anti-climax? Absolutely not! Was it worth all the time and effort to finally track down Billy's collection? Yes! Have I forgiven Donald for his vagaries? Most definitely! The search encouraged us to travel through some stunningly beautiful country, we otherwise possibly would never have visited.

As for that elusive collection? Certainly so far as tractor collections go, it could only be rated as average. But, I can now boast of having seen the collection closest to the North Pole! How good is that? Not many of my fellow tractor enthusiasts can match such an achievement! ■

IAN'S MYSTERY TRACTOR QUIZ

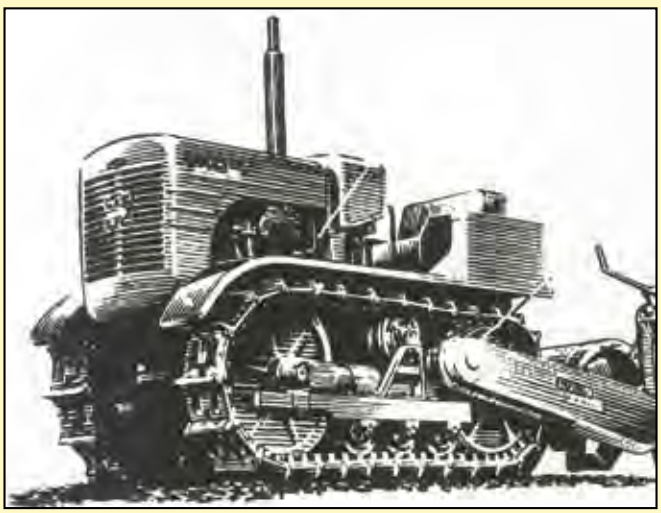
Question: Can you identify this little crawler?

Clue: Notice the attachment!

Degree of difficulty: This is a stinker!

Answer: Page 48.

(Photo IMJ archives)



You manage your land...

Why not your drums?

Buy eligible *drum*MUSTER chemicals for a safe, easy route for disposal

drumMUSTER

www.drummuster.com.au

1800 008 707

ChemClear

www.chemclear.com.au

1800 008 182

What should public-sector ag extension look like in 10 years?

THE Australian Farm Institute recently invited some leading agricultural researchers and extensionists to ponder the followings questions:

- What is the future of agricultural extension in Australia given the gradual starvation of funding by state governments and the increased reliance of landholders on private sector advisors? and,
- What should the Australian extension 'model' look like in 10 years if the aim is to maximise agricultural productivity and profitability?

Commercial reality will set the scene

David Pannell and Sally Marsh, UWA

David Pannell.

Sally Marsh.

OUR focus is on what should happen in the public sector, on the grounds that it is not helpful to ask what 'should' happen in the private sector. The private sector will develop in response to commercial opportunities available to them, irrespective of what we might think should happen.

To set the context, here are some predictions about the environment within which extension will operate.

Agriculture will continue to change in response to technology, markets and climate. Cutbacks we have seen in funding for public-sector agricultural extension will not be reversed and may continue. The dismantling of extension infrastructure and capacity in the public sector has gone too far for it to be reversed without major new public investments, and we don't foresee those occurring.

Private sector capacity in extension will continue to grow – including extension provided by purchasers of agricultural products (eg dairy, horticulture, sugar), input suppliers (eg fertiliser, feeds) and farm management specialists.

There will be continuing increases in the average size of farms, and in the number of corporate farms, with resulting growth in the vertical integration of information services (= 'extension') into farm businesses.

There will continue to be growth in the use of advanced information and communication technologies in agriculture, providing information to farmers in novel ways.

Falling numbers of graduates from agricultural programs could create a serious challenge to extension services (public and private) to obtain employees with the required knowledge and skills.

Continued public investment?

In this context, is there a need for ongoing public investment in agricultural extension? We believe that there is. Public-sector agricultural extension can continue to play important roles that address various market failures.

One key role is to foster two-way information flows between researchers and farmers. Information flow from farmers to researchers is needed to ensure that the research conducted will be beneficial to farmers and likely to be adopted by them. Some researchers already have sufficiently strong relationships with their farmer audience not to need this sort of help from extension agents, but many others don't. The traditional role of extension agents in promoting uptake of beneficial new research results (technologies, systems and practices) should continue.

We do not share the negative view of technology transfer that seems to exist among some theorists of extension. We believe that technology transfer and approaches such as participatory research and farmer-to-farmer learning are not mutually exclusive. Indeed, these latter approaches, as part of a broad portfolio of extension methods, can make valuable contributions to the success of technology transfer in appropriate circumstances.

Farmer groups and organisations such as the Grower Group Alliance (www.gga.org.au) have key roles to play in this process.

Given that public budgets for extension are unlikely to grow, and may shrink further, it will be crucial for public extension services to take a more business-like approach to prioritising their activities than they have commonly done in the past.

Extension efforts should be focused on issues for which there would be substantial benefits to farmers from changing their practices, especially if those new practices would also generate benefits for the broader community (eg environmental benefits).

Extension would not focus on practices that farmers already have good knowledge about and have decided not to adopt, because non-adoption is a clear signal that the practices do not generate large enough private benefits.

The heterogeneity of farms and farmers should be recognised when looking at reasons for non-adoption. This more sophisticated approach to planning extension effort will require greater collection and analysis of information.

Face to face still critical

As important as social media and other modern communication methods will be, public extension should not rely on them exclusively, but should maintain a level of face-to-face communication. Farming is already socially isolating for some farmers, and with declining farmer numbers this may become a more widespread issue. It is likely that farmers will always put a high value on personal contact in extension.

Finally, we note that, in the past 20 years, public sector extension has been prominent in supporting natural resource management (NRM) policy for agriculture. It has been the go-to policy response of most government NRM programs.

Unfortunately, these programs have often funded extension efforts without asking fundamental questions, such as: are the practices we wish to promote actually adoptable by farmers?

A more thoughtful, selective and evidence-based use of extension is needed in this policy context.

The future of Ag extension?

Mike Stephens, National President, Ag Institute Australia

THERE are five important questions to be answered as a subset to broader questions about the future of agricultural extension in Australia:

- What information results and systems need extending?
- How will the extension be delivered?
- How will it be funded?
- Who will the audience be?
- Who will drive extension?

Mike Stephens.

But first some history

The extension concept was developed by the Land Grant Universities in the United States. Those universities were charged with the triple responsibilities of researching, teaching students and 'extending' that knowledge to the broader farming community.

The term 'extension' only started to gain currency in Australia in the late 1960s. Before then district officers who specialised in sheep and wool, cropping, dairy and other subjects worked at local research stations and district offices.

Much of their work was underpinned by government policies of land clearing, water conservation and increased food and fibre production. In the 1960s district officers gradually morphed into extension officers. Extension services started to come under pressure as the market economy flourished from the 1980s. This was followed by a mantra of privatisation.

Australia needs to keep both the challenge and opportunities of the 'Asian Century' and global population in perspective. Ruthven (2012) asserts that if Australia increased its agricultural production fivefold it would feed three per cent of the Asian population.

In addition, the 'extension market' needs to be segmented because 39 per cent of Australia's total farm income is earned by 2601 businesses (Findlay 2012).

What information needs extending?

If Australia is going to accept the challenge of providing more food from less land with higher input costs and diminishing resources, its primary producers will need better education, more research and more effective extension. That research will need to be directed towards better land and water utilisation, more productive animals, greater labour efficiency and business resilience or agility.

A major change will be moving away from the traditional top-down activity, with information cascading from the top to a system where information will flow back up the decision-making pipeline from the bottom. That is, the farming community will push information back up the decision-making pipeline from the bottom. This is already happening.

How will extension be carried out?

Traditional dissemination methods such as print media, radio, television, field days, farm walks, newsletters, meetings, conferences, will be complemented by an increased emphasis on electronic forms of communication such as websites, social media, emails and text messages, online videos, e-newsletters and spontaneous digital extension alerts. Self-directed farmer groups will also play a major role.

How will it be funded?

Unquestionably, in future, the major funding will come from a user pays system. There will be exceptions, for example the Federal Government Climate Change Adaptation Program is underpinned by an outreach program which will continue to be funded by government.

Who will the audience be and who will drive it?

The 'market' has a number of different audiences. These include the 3000-odd very large farm businesses, the productive and profitable middle, the unprofitable and the peri urban, lifestyle or hobby farmer group. Each group has different needs and will utilise extension services in different ways.

The prime drivers of extension will continue to be the federal and state governments and their relevant institutions, including the R&D corporations. But the future growth of extension will be market driven and fuelled by entrepreneurial spirit.

The new models

My guess is there will be three extension models.

- The very large businesses will initiate their own extension.
- Other profitable businesses (including lifestyle and larger hobby farmers) will retain outside consultants on a fee for service basis. These businesses will be served by multi-disciplinary consulting businesses which have a range of specialists and generalists covering all technical, human and business aspects of farm business management.
- The vast majority of producers will still look to R&D corporations to provide content for a bulk extension service. Resources currently wasted on 'flag waving' will be re-deployed and more general technical advice may be provided through self directed farmer groups, possibly partly funded by the relevant R&D bodies.

It is unclear how extension personnel will be trained and whether they will require accreditation. There is a place for accreditation schemes such as *AgCredited* as an industry wide quality assurance program.

It is difficult to imagine any major government funding for an extension service unless, as with the current Federal Government Climate Change Adaptation Program, there is a public good outcome required.

ABOUT THE AUTHORS

Mike Stephens is national President of Ag Institute Australia and also a consultant with Mike Stephens and Associates. **Mike thanks and acknowledges the influence of Trevor Johnston and Robert Patterson in the preparation of this article.**

David Pannell is Winthrop Professor in Agricultural and Resource Economics at the University of Western Australia, Director of the Centre for Environmental Economics and Policy, an ARC Federation Fellow and a Fellow of the Academy of Social Sciences in Australia. David's research has won awards in the US, Australia, Canada and the UK.

Sally Marsh is Assistant Professor with the School of Agricultural and Resource Economics at the University of Western Australia, but is now largely retired. Her research interests include extension policy, theory and practice; policy review and analysis; and capacity building for regional NRM. ■

The Australian Farm Institute has been established to conduct research into public policy issues impacting on the Australian farm sector, and to promote policy solutions that maximise the economic and social wellbeing of farmers. To do this, the Institute contracts leading academics and consultants (both within Australia and internationally) to carry out research projects on specific farm policy issues, promoting the outcomes of this research to policy-makers.

see: http://www.farminstitute.org.au

Farming in Foreign Fields...

Did you increase your production by 1.75 per cent last year?

Global agricultural production must increase each year to keep pace with demand, yet regional production potential varies greatly.

AS North American farmers watch 200 plus -bushel corn (12 tonnes per hectare) flow into the combine, or stand in a lush irrigated vegetable field in California, or send out a truckload of market- weight pigs, it's easy for them to assume that agriculture everywhere is similar to North America's – highly productive, efficient and progressive.

As Australian farmers are only too aware, it's not. Agricultural competence varies greatly throughout the world. North America's drought-constrained 2012 crops introduced new realities into the global food situation: As productive as US and Canadian growers are, unforeseen situations can dent their food production, yet the global demand for food continues to grow.

To meet this demand, producers everywhere must increase their output.

Global Harvest Initiative (GHI) is a private sector policy group that proposes public policies designed to enhance global food and nutrition security through increases in agricultural productivity while conserving natural resources.

What gains farmers need to make

Beginning in 2010, GHI has produced an annual Global Agricultural Productivity Report (GAP Report) to analyse the rate of global and regional agricultural productivity growth, and compares it to the rate required to meet estimated demand growth.

In 2010, GHI calculated that the global agricultural total factor productivity (TFP) must grow by an average annual rate of at least 1.75 per cent to double agricultural output by 2050.

That's the year global population is expected to reach 9 billion, compared to about 7 billion today.

The GHI defines TFP as the ratio of agricultural outputs (gross crop and livestock output) per inputs (land, labour, livestock, fertiliser and machinery) used.

GHI's recently released 2012 report identified that overall global TFP is rising at an annual rate of 1.84 per cent. But significant regional differences exist.

For example, Sub-Saharan African food production is projected

POLICIES TO ACCELERATE PRODUCTIVITY

The 2012 GHI GAP Report offers these public policy recommendations for all parties interested in sustaining and accelerating agricultural productivity.

- Increase levels of public and private sector investment in agriculture;
- Improve agricultural research funding, structure and collaboration;
- Embrace science- and information-based technologies; and,
- Remove barriers to global and regional trade.

to meet just 13 per cent of that region's food demands in 2050. Conversely, Latin America and the Caribbean, according to GHI estimates, will have food production significantly outpacing that region's demand.

According to the report's authors, "Achieving necessary food production by 2050 requires improving the productivity of farmers in every major region, and across all scales of agriculture, from the small holder to the commercial exporter."

In this scenario, getting more production from currently cultivated areas is critical.

Report highlights need and capability imbalance

A report on *The State of the World's Land and Water Resources for Food and Agriculture* from the Food and Agricultural Organization (FAO) of the United Nations summarised that "the distribution of land and water resources does not favour those countries that need to produce more in the future".

The average availability of cultivated land per capita in low-income countries is less than half that of high-income countries, and the suitability of cultivated land for cropping is generally lower. Some countries with rapidly growing demand for food are also those that face high levels of land or water scarcity.

Developed countries face relatively low growth in food demand. They are also the most productive, with the lowest use of inputs per unit of output.

The GHI Report concludes: "If investment in science and technology is sufficiently robust to allow productivity to grow at historical rates, then developed nations as a whole should be able to meet their demand for food and biofuel, maintain land and water for conservation, urbanisation and recreation, and maintain their historic agricultural export levels."

For North American and other developed country producers, the challenge is clear – continually increase crop and livestock production while sustaining valuable soil and water resources to help meet the growing global demand for food.

For more information: www.globalharvestinitiative.org/
Source: CaseIH *Canadian Farming*, Spring 2013

FOOD DEMAND VERSUS AGRICULTURAL OUTPUT

Projected per cent of the region's food demand met by maintaining its current total factor productivity (TFP) growth rate

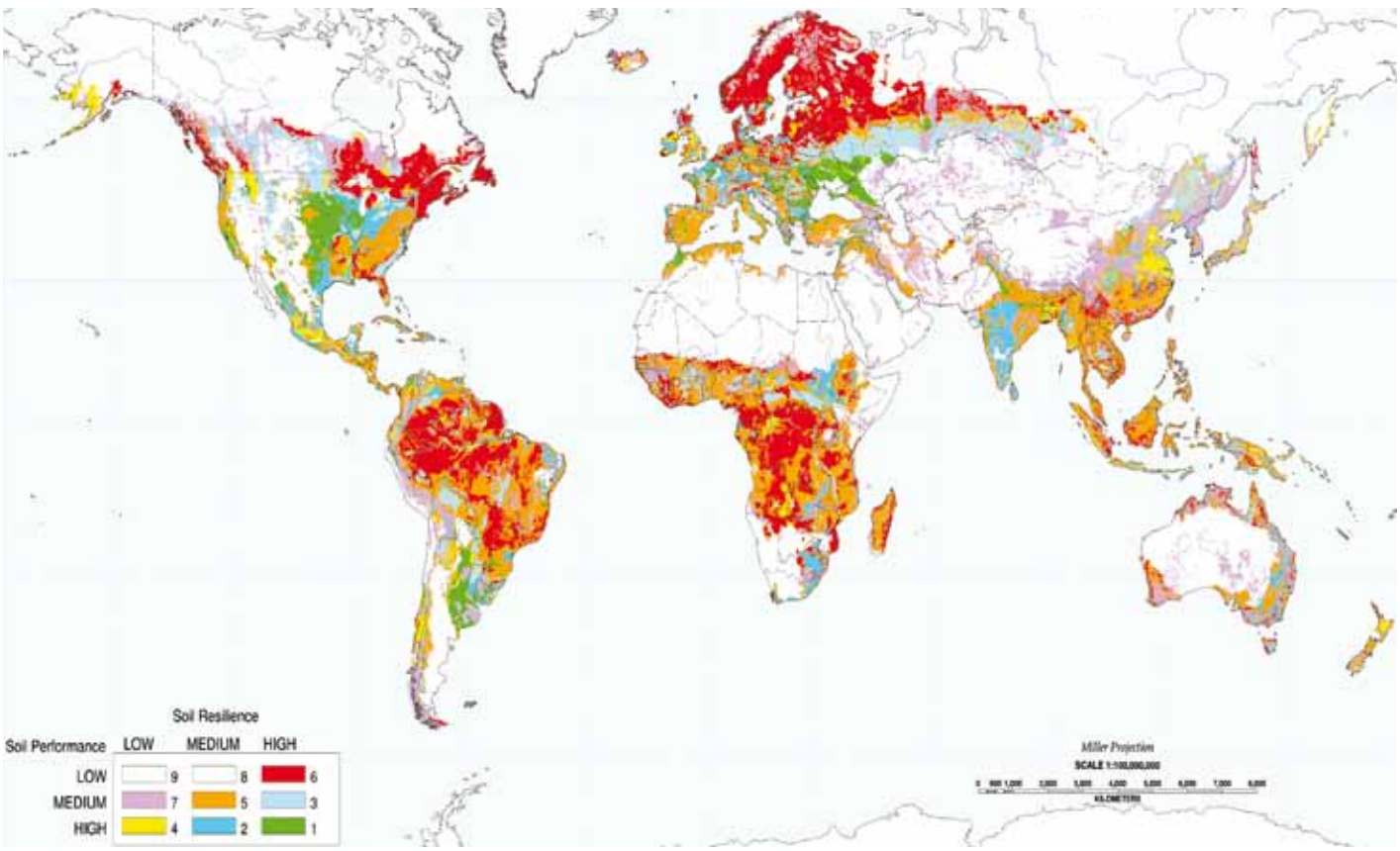
Region	Projected food production vs. demand
Sub-Saharan Africa	3%
Middle East and North Africa	83%
South and Southeast Asia	82%
East Asia	74%

- Rapid population growth will be the primary driver for Sub-Saharan Africa's food demand.
- Most of the projected growth in Asia's total food demand will result from rising incomes.
- The vast region comprised of Eastern Europe and the former Soviet Union has enormous agricultural production potential. Agricultural productivity in this region is relatively low (2.3 per cent for 2001–2009) and improvements could significantly raise output, meeting local and regional demand as well as allowing for exports.

FOOD PRODUCTION AND GLOBAL CAPABILITY

This *Global Land Quality* map defines land and its ability to support cultivated crops and it helps put the global food production challenge into perspective. Only a small percentage of the Earth has agricultural potential similar to that of the US Corn Belt.

Source: USDA Natural Resource Conservation Service



INTERNATIONAL AND LOCAL RESEARCH TO HELP REMOVE A BLIGHT ON OUR CHICKPEA INDUSTRY

In April 2012, Audrey Leo, a PhD student at the University of Melbourne, traveled to Spain on a GRDC Travel Award to attend the 3rd International Ascochyta workshop held in Cordoba. Audrey also presented a paper at the workshop for which she won a presentation award (see box article).

During the workshop, scientific discussions led to various collaborations including the exchange of genomic data with Professor Diego Rubiales's group from Cordoba University – pioneers in the research on Ascochyta rabiei – a pathogen that causes Ascochyta blight – a major disease of chickpeas in Australia.

The following is Audrey's account of the workshop as well as a brief overview of her research and the potential benefits for Australian chickpea growers.

MY research has involved examining the genetic structure of *A. rabiei* in Australia from 2009 to 2011 and studying molecular host defence mechanisms in resistant chickpea genotypes. The international ascochyta workshop and follow up scientific discussions with the Cordoba University group have direct relevance and benefits to my current research project.

In particular, my project entails identifying candidate defense-related genes that may be most suitable for strategic and sustainable development of durable genotypes in future chickpea pre-breeding programs.

The workshop provided scientific presentations which outlined the in-depth studies on existing and novel candidate genes located or mapped on the major resistant quantitative loci related to ascochyta infections.

Further scientific discussions with the Cordoba University group working on these genes, enabled me to have access to their molecular data for the purposes of subsequent gene validations in the newly developed resistant chickpea genotypes in Australia.

In addition to the defence-related work, the workshop also incorporated scientific discussions on the population structure of *A. rabiei* worldwide which enabled me to further understand the pathogen's epidemiology both in and outside of Australia.

One mating type unique to Australia

To date, Australia is the only country that has just one mating type of *A. rabiei*. This resulted in a narrow genetic diversity of the pathogen in comparison to other *A. rabiei* populations worldwide.

This narrow genetic diversity of the pathogen may have some slight potential benefit to Australia as it will mean that the pathogen may not be evolving rapidly enough to overcome resistance.

For this slow resistance build-up to continue to benefit our Australian grain industry, we will need to maintain an effective monitoring and quarantine program on imported seeds.

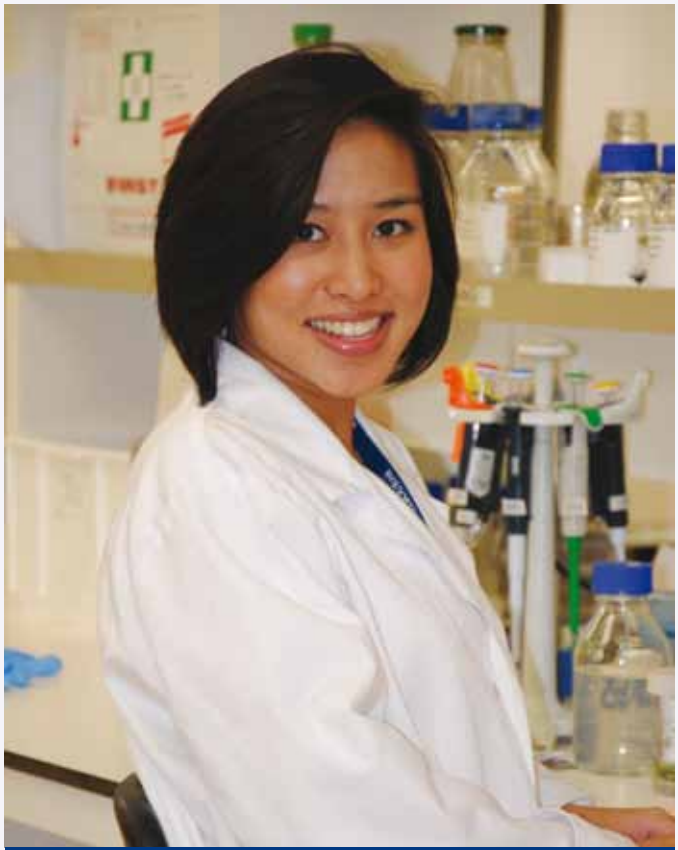
Additionally, maintaining close ties and coordinating our efforts with the international Ascochyta team is crucial to keeping our disease management strategies up to date.

The incorporation of scientific information will enable us to improve our screening techniques, field and disease management strategies, and disease resistance varieties to reduce the impact of ascochyta blight on Australian chickpea.

International collaborations

Collaborations have been formed with international research groups focused mainly on genetic enhancement of legumes towards ascochyta resistance. These alliances have been made with Okayama University in Japan (Dr Toyoda Kazuhiro's group) and Cordoba University in Spain (Dr Teresa Millan and Dr Eva Madrid's group).

Productive alliances are achieved through information exchange on molecular data and co-authorship of manuscripts submitted into peer-reviewed refereed journals. Results obtained from these, and other similar research collaborations,



Audrey Leo is researching the genetic makeup of the pathogens causing Ascochyta blight in chickpeas.

will be invaluable for increasing our knowledge of the genetic background of ascochyta resistance.

We can then apply this wider knowledge towards an improved chickpea breeding program in Australia.

Information gained from this conference and discussions with the University of Cordoba group have also been integrated within my PhD thesis.

The results have also been presented at national pulse pathology workshops as well as the Australasian Plant Pathology Conference.

The data also feeds into the newly funded GRDC Germplasm Enhancement Program – led by Dr Judith Lichtenzveig at Curtin University – on developing novel selection tools for ascochyta blight breeding for the pulse industry. ■

AWARD WINNING PRESENTATION HELPS SHED SOME GENETIC LIGHT ON A MAJOR CHICKPEA DISEASE

Audrey's paper presented at the Cordoba workshop focused on the *Genetic structure of Ascochyta rabiei in Australia and the association of fungal haplotypes to chickpea genotypes*.

Audrey studied the Australian *A. rabiei* fungus population from six major chickpea growing regions from 1999 to 2010. There were 241 isolates collected and these were tested with 20 microsatellite markers. The genetic relationships among 206 *A. rabiei* isolates – sampled from three Australian states from chickpea varieties with differing levels of resistance – were also assessed.

Overall, gene diversities among the Australian isolates were relatively low, indicating that the Australian *A. rabiei* regional populations were probably established as founder populations.

Using a PCR assay, only a single mating type (MAT1-2) was found among all the isolates examined (Figure 1).

There was also the absence of sexual recombination (that is, no interchange of chromosomal parts or genes) which suggests that the pathogen is reproducing asexually, and producing a high proportion of clones.

Spread around Australia via seed

Little genetic differentiation was detected among populations from different geographical regions indicating that the pathogen has dispersed around Australia via seed-derived inoculum.

A small number of isolates were molecularly distinct and with no detected clones based on the SSR loci assessed. These may be evidence of multiple and recent independent introductions of the pathogen into Australia (Figure 2).

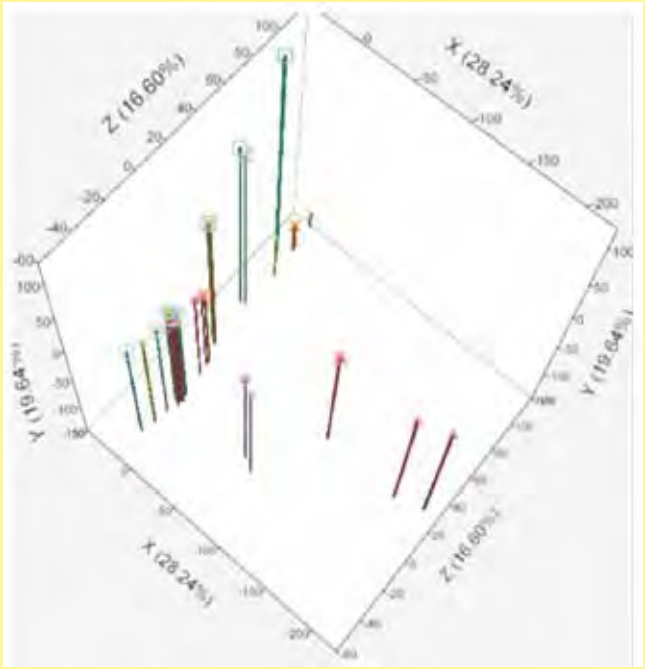
The study also found that there were no isolates uniquely associated with a particular chickpea cultivar and no evidence of selective adaptation. This constraint may have been due to the limited number of samples collected, coupled with the relatively short history of the pathogen in Australia.

Nevertheless, it is very significant that even though the isolates were mostly clonal, there were several isolates of *A. rabiei* able to cause significant disease on the most resistant Australian chickpea cultivars such as Genesis 090.

The study has emphasised that while the general fungal population structure was genetically narrow, it does contain haplotypes that are highly pathogenic and should be employed in screening of sustainable resistance within breeding programs.

FIGURE 1: The presence of mating type 2 (MAT1-2) in Australia among some of the A. rabiei samples collected in 2009, indicating asexual reproduction of the fungus in Australia

FIGURE 2: Evidence of multiple and recent independent introductions of the pathogen into Australia



Travel patterns of wind-blown soil microbes

■ By Dennis O'Brien, Agricultural Research Service – USDA

WHEN strong winds carry away soil, microbes in the soil can act like hitchhikers and go along for the ride. With help from a wind tunnel and the latest DNA technology, Agricultural Research Service scientists from the USDA, are shedding light on the travel patterns of these soilborne hitchhikers.

The work has implications worldwide for soil health and could lead to management practices that minimise the damage to soils caused by wind erosion.

Scientists have been studying wind-eroded soils since the 1930s, but few studies have focused on wind's effect on soil microbes. Microbes drive a number of critical processes, such as releasing enzymes that spur turnover of organic matter, sequestering carbon in the soil, and making nutrients available to plants.

A dust storm near Lubbock, Texas, in June 2010. When strong winds carry away soil, microbes in the soil can act like hitchhikers and go along for the ride. ARS scientists are studying the soil microbes carried in the wind and shedding light on wind erosion effects on soil quality. (Photo: Scott Van Pelt)

Soil microbes include bacteria, fungi, and protozoa. Veronica Acosta-Martinez and Terrence Gardner in the ARS Wind Erosion and Water Conservation Unit in Lubbock, Texas, focused on bacterial populations that could be classified by DNA sequencing. Gardner is a visiting scientist in Veronica's laboratory, and his position is funded by Alabama A&M University.

The researchers characterised the bacterial diversity in eroded sediments and their soil sources, focusing on the types of bacteria associated with coarse particles and fine dust particles.

They classified the bacteria found in each type of soil by phylum, class, and genus using pyrosequencing, a process that allowed them to identify up to 100 times more DNA in each sample than what they would have detected with traditional soil-sequencing methods.

The project was a collaborative effort. Scott Van Pelt, Ted Zobeck, and Matt Baddock, also in the Lubbock unit, collected airborne dust and samples from organic-rich soils susceptible to wind erosion from fields in Michigan where potatoes, beets, and onions had grown a few years earlier.

To simulate wind, they used a portable field wind tunnel that they had previously developed for other studies.

Wind tunnel results

The results, published online in the *Journal of Environmental Quality*, showed that certain types of bacteria, in the phylum Bacteroidetes, were more predominant in the fine dust while other types, in the phylum Proteobacteria, were more predominant in the coarse sediments.

As part of the study, Francisco Calderon, an ARS scientist in Akron, Colorado, used infrared spectroscopy to assess the effects of wind on the soil's carbon composition, a critical factor in soil health.

Those results showed that wind had the same effect on the soil's carbon composition as it had on the bacteria – 'fractionating' it so that certain types of soil carbon were more abundant in the dust – while other types were more common in the coarse sediments.

Veronica says the fact that Bacteroidetes were associated with fine dust may be significant, because studies have shown that they resist desiccation and have survival mechanisms that make them able to cope with extreme conditions and explore new habitats when carried long distances.

On the other hand, the fact that Proteobacteria were associated with coarse eroded sediments, which travel shorter distances, may explain how soils can retain important qualities despite damaging winds.

Proteobacteria are critical for carbon and nitrogen cycling in the soil, and the fact that they are more likely to stay close to home during dust storms is good news for soil health, Veronica says.

Veronica Acosta-Martinez is in the USDA-ARS Wind Erosion and Water Conservation Research Unit, 3810 Fourth St., Lubbock, TX 79415; Ph: +1 (806) 749-5560 ext. 5233.

■

Harvest efficiency across all crops and conditions

NEW Holland's CR Series combines not only offer unmatched efficiencies when harvesting but when it comes to ensuring profitability, provides industry-leading grain and straw quality with just 0.1 per cent grain cracking.

The CR's unique twin rotor design provides high quality straw for baling, and is the perfect choice for extensive operations where maximum throughput is required. With its spiral design propelling the crop gently backwards it's highly efficient in ensuring effective threshing and separation.

"Coming from a farming background I originally favoured conventional combines to handle large volumes of straw but after experiencing the twin rotor combine I have found not only do they handle the volume but produce a superior sample with far less grain loss," says long term New Holland dealer, Geoff Perkins.

One of Geoff's customers is Roger Newman of 'Linton Park Farms' in the Narrogin district of WA. Roger recently purchased a CR9090 from Geoff Perkins' Farm Machinery Centre after experiencing how well his current CR9070 performed during harvest.

"We operate in hilly country and the CR performs well with the twin rotors' ability to fill the whole sieve area, together with the self-leveling shoe, which avoids just one side of the sieve being loaded up," Roger said.

"I believe the twin rotor concept assists grain quality and quantity. We manage to get 24 to 25 tonnes of canola per hour with a 40 foot (12.2 m) front," said Roger.

Like many busy farmers these days, Roger and his family don't have a great deal of spare time to carefully and regularly monitor harvesting efficiency.

"While we know our grain quality is good we don't measure the physical grain loss except to say that when the sheep go over to the chaff-cart stacks in search of some good tucker, the stacks are virtually left undisturbed because there is no grain in them. We also have very little regrowth from the header throwing grain out the back," Roger said.

Comfort is important

Long days, and nights, in the paddock means operator comfort is paramount during the long hours of harvest. The ergonomic design of the CR Series combine cab ensure it not only looks good but is functional in design and offers operators all the creature comforts you'd expect from a class leading combine.

The layout and cab design were two key features that drew Roger to the CR Series. "It offers a perfect view of the entire header and I like the feel of the controls and the positive button response time."

The other drawcard to purchase another New Holland CR Combine was Roger's strong relationship with his local dealer. Geoff Perkins and his team have a very strong reputation within the Narrogin community and are well known for their level of knowledge and technical expertise.

And when it comes to making large scale purchases like a combine, customers like to know they not only have the support of their local dealer, they are working with someone who understands their business and its needs as well.

"I rely on my relationship with Geoff to help me establish the term of the lease based on the hours the machine will do each season and the trade-in value at the end," Roger says. "By financing my machine through an operating lease I am able to retain working capital for other farm improvements."

Fitted with the latest ECOBlue™ Selective Catalytic Reduction (SCR) system used to meet Tier 4A emissions standards and boasting a Cursor 13 engine, the CR9090 series combine Roger has purchased offers industry-leading technology with enough power to meet the most demanding conditions, while offering significantly reduced fuel consumption.

"The CR harvester performs well and I'm happy with its harvesting capabilities and the support we get from Geoff Perkins," says Roger. "This will be my fourth New Holland combine – the first was a CX – and I'm looking forward to taking delivery of my third CR, a new CR9090, later this year." ■

District Reports…

May–June 2013

Western region

NORTH

Rain is pouring on the roof as I write. May has been good to us in our area with the entire region receiving 25 to 80 mm for the month. Seeding is in full swing and the first growers are completing their programs now. The crop would be around 65 per cent complete with that number changing every hour.

Most paddocks have had good knockdown weed control which should make for clean crops throughout the season.

Crops have emerged well and dry sown crops have again led the charge. All crops have only emerged in the last week and are around the one leaf stage. The good start will mean that some growers will expand their cropped area.

Mouldboard ploughing is making a comeback and the growers with tough weeds and non wetting soils are now tipping soil over around the clock.

This year has had the best May rain that has been seen on many farms for a generation. Average rain from here would give us a cracker of a cropping year. The only downside so far is that other parts of the WA grain belt have missed out on the rain. Hopefully the next few days will give them some much needed moisture.

Peter Norris
Agronomy For Profit and Synergy Consulting, Geraldton
May 19, 2013

SOUTH COAST

Seasonal conditions on the South Coast for the previous two months have been ideal, with record rainfall for March and good follow up rains for April and May. The start to the 2013 season doesn't get too much better than what we have experienced to date.

The soil moisture profile is currently full, seeding commenced for some at the end of March with the majority going by mid April. At the time of writing, most growers have finished seeding. Establishment has been very good and crops have jumped out of the ground with the good soil moisture levels and higher soil temperatures.

With the early start to the season weed germinations have been very good, so growers have had the opportunity to double knock most paddocks. This has been ideal to help manage herbicide resistance. Many growers are observing low levels of ryegrass surviving glyphosate knockdowns, some of this is due to poor coverage and shading with such large and dense weed germinations. But in many cases glyphosate resistance is the cause.

The demand for paraquat has been massive, which has caused supply issues, especially towards the end of the seeding program.

The only downside to an otherwise great start was the need for some canola re-seeding due to seed burst. Some growers received 40–50 mm in one rainfall event on top of soil already at field capacity the day after seeding. This, coupled with the ability to seed a large amount of hectares over a 24 hour period, resulted in some re-seeding up to 400 hectares of their canola programs – an expensive exercise where hybrid seed was sown!

Currently some of the early sown canola crops are being sprayed with post emergent herbicides and some post emergent nitrogen is being applied.

The 2013 season has started well and shows some great promise – let's hope it continues.

The accompanying chart shows the current soil moisture levels in the Northern Mallee, from an 80 cm soil moisture probe located 70 km north of Esperance. These are the best stored soil moisture levels that we have seen for a long time.

Quenten Knight
Agronomist, Precision Agronomics Australia
May 19, 2013

Southern region

SOUTH AUSTRALIA

Rainfall across the agricultural areas of South Australia remained below average for the first half of April but a series of cold frontal systems in the last two weeks of the month increased totals for much of the far west, the Eyre and Yorke Peninsulas, the Mount Lofty and Flinders Ranges and parts of the Murray Valley.

Monthly rainfall totals typically ranged between 10 to 30 mm, with higher values in the 40 to 60 mm range about coastal and elevated locations.

The wettest days occurred between the April 21 and 24 and on then again on the 29th of the month.

Good rainfall continued during May with monthly totals of between 25 and 50 mm for most cropping districts. The Mid North and Southeast generally enjoyed 50 mm plus monthly totals.

All districts have had good winter crop planting rains.

Based on Bureau of Meteorology reports
May 24

VICTORIAN MALLEE

At the third week of May, sowing is at 80–90 per cent completion. Since the introduction of no-till and dry sowing, most would plan to have the crop sown by May 20 – but this season has been an exception.

The only rainfall in November and December was in the form of showers and January and February weren't much more generous. Consequently, there has been very little summer spraying done and soil moisture is depleted. The implication at sowing, has been the lack of germination of volunteer seeds from last years crop. Volunteer cereals and canola in newly emerging cereal crops can be competitive and penalising. Contamination can be another consequence at harvest.

There were just no significant rainfall events prior to sowing to provide a knockdown opportunity. Legumes and canola will require early grass herbicides to take the pressure off and preserve moisture. Farmers were forced to re think their sowing plan and prioritise the safest crops such as the legume stubbles first.

In recent years, there hasn't been as much fallow in the district, but some have elected to leave a paddock out to preserve moisture and nutrients for next year whilst commencing a grass break this year.

Recropping intervals from residual herbicides have also impacted the sowing plan. We have only received 70 mm of rain from the end of October to mid May and this has been in low rainfall events which have dried out quickly.

As there has been little moisture at depth or at the surface, growers have elected not to sow too deep. This only brings up clods, wastes fuel, and wears out machinery. It can affect the efficacy of pre emergent chemicals. Sowing seems to have been quicker as many have had to speed up on dry soil to achieve enough soil throw to cover herbicides. Dry soil doesn't throw as far as wet soil.

A general rain of around 7 mm fell on May 12 and this has been enough to germinate sown crops on lighter soil types. Follow up rain will be the key to bring up the heavier soil types. For now, crops are surviving well on limited moisture as water is harvested into the press wheel furrow.

Growers are holding off on crop nutrition plans in the crop, but are actively spraying out volunteers where the opportunity presents itself.

Simon Severin
Dodgshun Medlin Agricultural Management, Swan Hill
May 15, 2013

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)	2013 rainfall to date (mm)	Summer		Autumn		Winter		Spring	
			25yr Annual Average (mm)	2012–13	25yr Annual Average (mm)	2013 to date	25yr Annual Average (mm)	2012	25yr Annual Average (mm)	2012
Emerald Qld	537	208	239	178	110	71	66	100	120	62
Toowoomba Qld	646	792	261	657	135	192	86	138	176	132
Roma Qld	577	200	232	144	132	107	75	91	139	61
Goondiwindi Qld	607	463	235	337	135	182	101	67	141	46
Narrabri NSW	631	356	221	221	124	169	132	147	163	26
Gunnedah NSW	654	261	226	254	124	64	128	123	184	58
Dubbo NSW	596	199	192	97	129	108	129	96	157	79
West Wyalong NSW	435	168	109	95	88	92	118	100	127	73
Wagga Wagga NSW	530	133	129	67	115	88	154	112	146	97
Swan Hill Vic	324	36	72	25	67	21	94	71	98	53
Bendigo Vic	515	105	109	71	106	55	176	160	142	57
Horsham Vic	364	70	80	45	72	40	133	133	110	58
Lake Bolac Vic	549	85	121	36	98	71	160	155	154	112
Murray Bridge SA	352	87	62	47	71	56	124	169	102	49
Kadina SA	331	125	53	25	74	105	117	134	91	29
Cummins SA	377	111	47	13	81	101	173	176	83	48
Esperance WA	590	278	75	50	135	243	254	264	140	138
Wagin WA	394	182	43	96	92	153	180	105	86	92
Northam WA	389	146	41	48	82	122	195	143	81	101
Mingenew WA	356	168	31	8	91	164	181	147	63	77
Moora WA	379	120	40	36	89	98	187	175	71	115
Mullewa WA	320	74	49	21	93	64	138	118	46	54

Last rainfall reading May 27, 2013.

District Reports…

May–June 2013

Northern region

CENTRAL WEST

The Simpson Desert has moved to the east – well that's what is seems like in the western part of this region. There has been only one decent rainfall event since July last year so we face no sub-soil moisture and a late start to sowing.

The district generally received 0–5 mm on May 14, but there were good falls of up to an inch (25 mm) around Gulargambone and areas to the east. This 'pocket' had a great summer compared to the bulk of the region.

Eyes are peeled for the rain forecast to come this week and this has resulted in a number of scenarios. Some sowing rigs are parked, some are flat out and some growers are hedging their bets and putting the odd paddock in.

The consequences of this dry start are little to no canola for the region, little to no lupins and a rush to secure shorter season wheat seed plus a renewed interest in barley.

Chickpeas will replace some of the lupin and canola areas and fieldpeas will be grown by the fieldpea growers!

The lack of canola this year is a real loss to our system – a system where herbicide resistance has had a real blow out and the use of alternative chemical groups, together with other cultural practices, is a must.

Fertiliser is still a concern with soil tests showing horribly low starting N levels. With the lack of stored moisture, growers are understandably reluctant to invest big in nitrogen at sowing and will aim to top-dress if the season goes with them.

The good side of the dry? Cotton picking is finished after a dream run and the yields have been terrific.

Penny Heuston, Warren
Delta Agribusiness
May 21, 2013

DARLING DOWNS

Summer crop

Most of the summer crops are now harvested, and the yields have been surprisingly good for the season we have had. The sorghum responded very well in terms of yield, although the quality of the early crops was compromised by significant rain just before harvest. The yields have generally been above 5.0 tonnes per hectare with the best crops around 7.0 tonnes, and in the end, most grain was Sorghum 1 quality. Some late crops however will have some yield reductions from ergot.

The improved prices for sorghum have helped make this a profitable summer crop this season.

Of the legume crops, soybeans have yielded strongly despite needing another rain to maximise grain fill. Dryland crops have yielded up to 3.0 tonnes per hectare and semi irrigated above 3.0 tonnes.

The mungbeans have struggled to exceed 1.5 tonnes per hectare, despite growing a better architecture than in previous seasons, with only a few crops approaching 2.0 tonnes per hectare and others around 1.0 tonne.

All legumes needed some insect control, mostly for heliothis and loopers this summer, and the early mungs did suffer some yield and quality downgrades from harvest rain.

Cotton has had an exceptional season with dryland crops averaging 7.0 bales per hectare and yielding up to 10 bales per

Soybeans have performed well with dryland crops up to 3.0 tonnes per hectare.

hectare, whilst irrigated crops are averaging 10.0 bales per hectare.

Early crop quality is good and turnout has been 40 per cent or above. The new varieties Sicot 74 and 75 have been the best performers.

Winter crop outlook

The Downs planting window is starting to open, but many growers need more rain to join the moisture up before they can start. There has only been a minor planting of chickpeas and barley to date.

The chickpea area is projected to be as strong as last season, which is up 30 per cent on the five year average, aided by the planned double crop planting to utilise the late season rainfalls.

There will be more barley planted than last winter, and wheat may also be up a little.

The rain so far has been patchy so growers are watching the current change hoping to receive the planting rain this week.

Hugh Reardon-Smith
Agronomist, Landmark Pittsworth
May 21, 2013

MARANOA

Light and isolated showers across the region haven't been enough to prompt sowing our planned winter crop area – which most estimates suggest will only be around 30 per cent of 'normal'.

Deep planting of chickpea – and in some cases wheat – has begun. But many growers are hesitant to plant where at least 100 mm of rainfall is required to bolster very dry subsoils.

The summer crop has almost all been harvested with virtually no weather delays.

Kirsty Wild
Account Manager Agronomy, Landmark Roma
May 21 , 2013

SOUTH BURNETT

Key issues

- Peanut harvest is underway.
- Many unplanted paddocks.
- Many late crops at risk of frosts.
- The rain stopped around mid April and allowed harvest to start.

Peanut yields and quality are extremely variable. The wet weather contributed to some very high yields of over 5.0 tonnes per hectare in parts of paddocks while at the other end of the same paddock, the crop will not be harvested. Waterlogged areas never recovered.

Peanut leaf disease, particularly net blotch, levels were extremely high and paddocks that did not receive a good fungicide program had significant leaf loss and subsequent yield and quality reduction. It was also the worst year for the soil borne disease Sclerotinia minor since the 1990s. Fungicide programs could not halt the spread of the disease.

Overall, considering the drought prior to the floods, plus the prolonged wet weather resulting in high disease levels, the peanuts have performed quite well. Some peanut growers will rate the season as very ordinary, while others will come out of it quite well. Some results due to management, others due to luck as to which end of the spectrum they were on.

About 30 per cent of the total corn area was planted in February. Really late! Hoping for a very late frost year.

Bean crops have also been variable. Some navy bean crops will produce a viable crop despite spending a month in soup. Others have died or been ploughed out. Soybeans, where they were not physically flooded, will yield quite well. In some crops harvesting height will be an issue, more so with 791 compared to Bunya.

Mungbean crops are variable as well, depending on planting time and soil type.

Insect pressure has been quite low. Heliothis and green vege bug numbers have the lowest for years. Soybean loopers and bean pod borers have been sprayed.

Only a small amount of winter crop has been planted.

Ian Crosthwaite
BGA AgriServices, Kingaroy
May 17, 2013

CENTRAL QUEENSLAND

Weather

At the beginning of April when CQ grain farmers were starting to plan winter crop planting, north of Clermont was dry, Clermont to Emerald was mostly very wet, Emerald to Rolleston was variable but generally OK to wet and the Dawson and Callide were still recovering from major rainfall and flooding events in January.

Following extensive frost damage to the 2012 winter crop, most growers have been more conservative in deciding a starting date for planting this season so were less in a hurry to get started. Also, rather then a major planting rain and then fine weather to get the whole district planting, this season has been characterised by frequent scattered small showers of rain.

This has made winter crop planting a stop-go affair as frequently there has been enough rain to wet the topsoil so dirt sticks to the wheels and to stop trash flowing past tynes – but mostly not enough to thoroughly wet the soil profile.

Summer crop

District Reports…

May–June 2013

Sorghum: About 100,000 hectares of sorghum have been planted in CQ this summer. Sorghum crops generally look very good with above average yield expected for many crops. Fertiliser and weed management within paddocks has sorted crops into excellent and ordinary categories. Crop maturity ranges are soft dough to starting to colour. It is common in many crops for late heads to have ergot.

Mungbeans: A larger then expected area of mungbeans was planted especially in the Callide, and to a lesser extent, the Dawson and Central Highlands. I estimate a total area for CQ at about 15,000 hectares. Yield expectations are mostly above average. The majority of crops in the Callide have been harvested but harvest is still to happen on the Central Highlands.

Sunflower: A small area of sunflower was planted (about 5000 hectares). Crops yields are expected to be moderate to good.

Winter crop

I expect a very large winter crop will be planted (possibly 300,000 hectares) given a smaller area was planted to summer crop this summer and generally good to excellent soil moisture profiles leading into winter.

Wheat planting is about 40–50 per cent complete of an expected area of 180,000–200,000 hectares.

Chickpea is about 50–60 per cent completed of an expected area of 100,000–120,000 hectares.

Weeds

Feathertop Rhodes grass remains the major weed management issue for CQ farmers with residual herbicides the most effective control measure. Flaxleaf fleabane is becoming more widespread across CQ and plant numbers are especially high wherever glyphosate is used and has reduced competition.

Pastures

A very wet January and follow up rain during summer in the Dawson and Callide have resulted in the best grass pasture in many paddocks for many, many years. Paddocks around Monto are dominated by Rhodes grass, a wet season indicator. I can't remember the harder, forest country along the Banana Range (between Biloela and Banana) ever looking this good.

Most grass paddocks on the Central Highlands have recovered from chewed out and looking grim for winter during early summer to now where there is an excellent pasture cover going into winter.

Livestock and water

Low cattle prices are an ongoing and grim reality for CQ and the whole cattle market. Low cattle prices, labour shortages and recent wet weather have been some of the factors that see many properties heavily stocked leading into winter.

Flooding within many river and creek systems during summer resulted in most stock water dams east of Emerald being filled, whereas surface water for stock use is frequently in short supply on many properties west and north of Emerald.

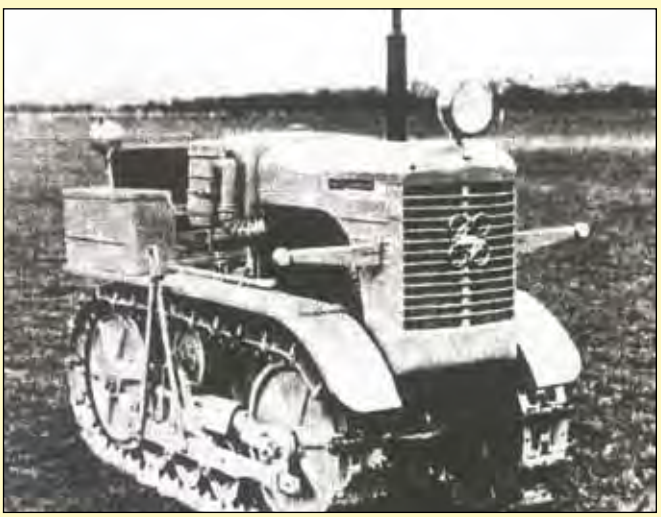
July 22–26, 2013

CQ Grower Solution 'Winter Roadshow' – theme: Feathertop Rhodes grass management. CQ farmers, mark your diaries.

Maurie Conway
Central Queensland Grower Solutions,
Sustainable Farming Systems,
DAFF, Emerald, Queensland
May 16, 2013

ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

The tractor is a 1952 Howard Platypus, developed by Australia's Clifford Howard when his Rotary Hoes group controlled Fowler of Leeds in the UK. It was built at his Basildon plant in Essex, and featured a Perkins P4 diesel of 34 bhp. (Photo IMJ archives)



ADVERTISERS' DIRECTORY