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FRONT COVER

Five in a row!

Our national wheat harvest is forecast to come in at somewhere around 25 million tonnes. This is an unprecedented five seasons in a row of wheat production greater than 20 mt.

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 are not too many countries on the planet where the time taken to harvest the nation's most valuable annual crop can span around five months. Much of the winter wheat crop in Central Queensland has been in the bin since late September while some wheat paddocks in the Western Districts of Victoria – or in the water-logged South Coastal region of Western Australia – won't have headers in them until well into the New Year.

We typically have a winter grain season and harvest drawn out over an awful lot of time and space which makes Australian crop production forecasting a challenging exercise. Throw in some late growing season rainfall and October frosts – like we've had this year – and you might as well start reading your tea leaves to come up with an accurate estimate.

But being the planet's seventh biggest wheat producer and in the top three or four in terms of exports, the rest of the world tends to take a lot of interest in the condition of our wheat crop. The US Department of Agriculture currently forecasts Australian production somewhere between 23.5 to 25.5 million tonnes while the very large international commodity merchandisers, Louis Dreyfus, are more optimistic with production estimated at around 28 mt. Our local industry analysts, *Profarmer Grain* Australia, currently forecasts a 24 to 25 mt wheat crop.

The clear message is that we have another big crop on our hands and the fifth national wheat crop in a row above 20 mt – and we've never done that before. Five years ago, our average annual national wheat production for the previous five-year period was 18.6 mt, including two very dry seasons in 2006 and 2007. But in the past five years, average wheat production over the period has been around 25.2 mt including two of our biggest ever crops in 2010 and 2011.

The other clear message is that Australian farmers will grow plenty of wheat when the seasons are with us – and we're getting better at it. The average national wheat yield per hectare for the five-year period, 2004 through to 2008, was 1.46 tonnes. In the five years since then the five-year average has increased 26 per cent to 1.84 tonnes per hectare. Given our highly erratic climate, averages can be misleading, but the numbers suggest that better farm practices and agronomy, along with the use of modern machinery and technology, are delivering higher yields across a range of seasons. In other words, the on-farm application of research and development is delivering big dividends.

Productivity gains and the role of R&D

Can Australian grain growers keep increasing on-farm productivity to stay in the game? This is a question needing a fast answer and it is raised at a time when public support of research, development and extension is waning. In this issue, Mick Keogh from the Australian Farm Institute, reviews the current agricultural R,D&E scene in Australia and warns that we are heading for difficult times unless public and private investment in R&D is increased and our 'innovation system' improved (see article page 36).

From all at *Australian Grain*, here's hoping the harvest in your patch was a good one and that the coming festive season and New Year brings health, happiness and some welcome rain.

AUSTRALIAN GRAIN
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In this issue...

HARVEST TIMES

A CLAAS HARVEST CENTRE SPECIAL FEATURE

PUSHING THE **ENVELOPE**

THE new top-of-the-line CLAAS LEXION 780 – already recognised as the world's most productive combine harvester – boasts a host of improvements designed to push the envelope of harvesting efficiency even further.

The new model delivers even more power, thanks to its new 598 hp Mercedes-Benz engine that features Selective Catalytic Reduction (SCR) and a urea additive to meet Stage IIIb (Tier 4i) emissions standards in Europe. Against this, the rated speed has been lowered to 1900 rpm resulting in lower fuel consumption.

CLAAS has developed a completely new 'dynamic' cooling system to accommodate this increased power. The cooling package, which consists of a charge air pressure cooler, hydraulic fluid cooler, engine radiator, variable fan and 1.6 metre filter, sits horizontally behind the engine.

This arrangement has enabled all components to be significantly enlarged. A variable fan drive provides cooling on demand, achieving an average saving of 15 kW. Air is drawn into the radiator from above and then forced forwards towards the engine and sidewards and down through the new louvre system.

This creates a curtain effect that actively prevents dust from rising. It not only ensures that clean air is continuously drawn in, but also significantly reduces maintenance requirements due to the low level of soiling.

The threshing system on the LEXION 780 has also been optimised. Whereas the LEXION 770 features five separating concaves per rotor, the 780 has six concaves per rotor, which operate at up to 1250 rpm. This capacity is matched by the 12,500 litre grain tank and 8.8 metre auger capable of discharging up to 130 litres per second.

The LEXION 780 can be equipped with either the proven TERRA TRAC hydropneumatic suspension tracked undercarriage or an all-wheel drive system with differential lock.

On the latter, tractive force is transferred via a second hydrostat motor on the rear axle. The patented four-point linkage axle allows vertical and lateral movement for improved stability and load-carrying capacity on uneven ground. It also allows larger tyres to be fitted with a diameter of up to 1.65 m.

The LEXION 780 is the latest manifestation of the CLAAS POWER SYSTEMS philosophy, which ensures that all components of the drive system, such as the engine, axles and tyres, are optimally matched.

LEXION SETS **HARVESTING BENCHMARK**

TWO super-capacity CLAAS LEXION 750 combine harvesters set a new Australian benchmark last November by stripping 793.5 tonnes of wheat from 316.6 hectares in just under 10 hours.

Fitted with high-speed tracked undercarriage, Trimble GPS positioning systems and either a 12-metre VARIO variable cutterbar or MAXFLO draper front, the two machines each achieved a remarkable average yield of 44.6 tonnes per hour.

CLAAS Harvest Centre Narrabri Sales Manager, Geoff Palmer, says the figures are even more remarkable given the record was established in 'real' conditions. "These are the raw figures straight off the machine – no tinkering, no fudging or adjusting for moisture content," he says.

"Our drivers were instructed to drive to professional standards. They had to cut each block out, they had to wait for trucks as necessary and they had to clean up the short runs before moving on.

"As it was, the harvesting conditions were quite challenging, with lots of trees and short runs across three different paddocks. This meant each combine was effectively working for about nine hours."

CAPACITY **PLUS**

A FAMILY-OWNED business in WA's Great Southern region is using a single CLAAS LEXION 770 combine harvester to comfortably harvest more than 7000 hectares of winter cereals and canola each year.

R.W. Dowling & Co, conducted by Robert and Kay Dowling, Todd and Eliza Dowling and Royce and Kylie Dowling, operates a large-scale cropping, contract harvesting, lotfeeding and transport enterprise based around 'Wongee Farm' at Popanyinning.

"We probably aren't doing anything different to anyone else around here other than it's a bit bigger," says Todd Dowling, who with John Inglis, manages the cropping side of the enterprise.

"Harvesting is a major part of our business so it's important that we have the right machinery that lets us do what we have to do.

"We were initially interested in the LEXION because of its capacity and the VARIO front and its ability to direct head canola, which we think is the way of the future. We also wanted to improve our straw quality because we bale most of our straw and put it through our feedlot."

The Dowlings purchased a LEXION 750 with VARIO 1200 variable cutterbar in 2011 and then upgraded to a LEXION 770 with VARIO 1350 the following season. "We harvested about 5000 ha, including 1000 hectares of direct headed canola, in 2011 so we gave the 750 a good workout," Todd says.

"It did exactly what we expected but it still wasn't big enough for what we needed to do. We want to harvest as much grain as possible every hour with maximum fuel efficiency and without any grain loss and the 770 delivers this.

"You can only push any machine so hard but the 770 seems to operate at the top of its capacity all day long. You can continuously adjust the concave, the rotor and the drum speeds independently on the go to get the most out of the conditions."

Todd doesn't hand out endorsements easily but he is quietly happy with his decision. "We've had eight or nine North American harvesters over the years, so moving over to CLAAS was a big change for us," he says.

"I don't get carried away by claims of throughput per hour, operating speed or various bits of technology that come with the machine but the capacity of the LEXION is very impressive. All I am worried about is getting the job done properly on that particular day.

"The fact that we switched to CLAAS and then a second one says what we think about them. CLAAS is constantly innovating whereas some other machines are more or less the same as they were 15 years ago with a bigger engine."

The entire cropping program is implemented using one seeding rig, one self-propelled spraying unit and nurse tank and one harvester. "We are trying to keep our capital expenditure down by spreading it over more hectares and that's why we have bigger machines that can do more," Todd says.

JOHN INGLIS AND TODD DOWLING, 'WONGEE FARM', POPANYINNING, WA

GEOFF O'NEILL
'LANO',
EDGEROI, NSW

THE NEED FOR **SPEED**

NORTHERN NSW grain grower, Geoff O'Neill, reckons he's close to reaching harvesting nirvana with his new CLAAS LEXION 760, one of the largest capacity combine harvesters in Australia.

With its unique hybrid threshing and separation system and high-speed tracked undercarriage, it is capable of harvesting around the clock in almost all crops and conditions.

Geoff and his wife, Alex, conduct a large broadacre cropping enterprise centred around 'Lano' at Edgeroi, north of Narrabri. Each year, they plant about 3000 hectares of winter crops, including wheat, chick peas and faba beans, as well as up to 1500 ha of sorghum and cotton over summer.

The O'Neills purchased their first CLAAS combine harvester, a LEXION 580R, from CLAAS Harvest Centre in Narrabri in 2008. "We wanted to go to a 12 metre front so we needed a machine that had the capacity to do this – and it delivered," Geoff says.

"CLAAS combines can handle high moisture much better than conventional rotary combines. We might have to knock back one or two km/h as we go into the night but this is much less than with a rotary combine. We can harvest pretty much for 24 hours a day if we have to."

Although one of the smallest models in the CLAAS LEXION range, the 580R boasts the same 'hybrid' separation technology that has made CLAAS the world leader on the harvesting stage.

The unique accelerated pre-separation system separates up to 30 per cent of the grain before it even reaches the concave and ensures even material flow without blockages or surges.

The remaining material then passes through twin longitudinal rotors for optimal grain separation under all conditions. CLAAS is still the only manufacturer to offer both systems in the one machine.

Geoff opted to upgrade to a LEXION 760 with TERRA TRAC (equivalent to the current 770 model) in September last year. Again, his overriding objective was to increase capacity.

"The tracks were appealing to us in terms of reducing soil compaction but we really wanted the extra capacity," he says.

"Weather damage poses an enormous risk for us, so the ability to harvest as much as we can as quickly as possible is paramount.

"The 760 has a 280 mm wider drum and 20 per cent larger concave area than the 580 and can do an extra 30 tonnes an hour. We were able to trade in the 580R and another harvester for one machine that could do the same.

"We harvested this year's sorghum, which had 18 per cent moisture content, at an average of 80 tonnes an hour and spot rates of up to 90 tonnes an hour."

Farm manager, Mark Smith, is impressed by the comfort delivered by the tracked undercarriage. "I do most of the driving and there's no doubt TERRA TRAC is more stable and comfortable, particularly moving over rough headlands," Mark says.

He is also enthusiastic about the CLAAS Electronic Machine Optimisation System (CEMOS), which monitors the key settings that govern separation and cleaning performance and then advises the driver of the optimal settings.

"CEMOS wasn't on our list of must-haves but now we have it, we think it's great," Mark says. "We have invested in a high capacity machine so it makes sense to operate it to get the maximum out of it."

"Anyone can operate a combine harvester at 100 percent for an hour but it's extremely difficult to do it for 12 hours day.

"The beauty of CEMOS is that you can put anyone into the driver's seat and achieve the best results all the day without missing a beat."

DAMIEN PENDLEBURY
'GLENINDA',
KATAMATITE, VIC

HARD WORK **MADE EASY**

A FATHER-AND-SON team, Chris and Damien Pendlebury, is proving to be a winning combination in a north Victoria grain enterprise. Whereas Chris has a penchant for high performance machinery, 26-year-old Damien is a precision farming enthusiast and a consultant agronomist.

Chris and Janice Pendlebury plant about 950 ha of wheat, barley, canola and field peas each year on 'Gleninda', an aggregation of three properties just outside Katamatite. "Dad has always been innovative in his own way and was well down the path of high input farming before I joined him," Damien says.

"We are aiming for 4.5 t/ha in our wheat crops, 5 or 6 t/ha in our barley and 2 to 2.5 t/ha in our canola. These sorts of yields are not exceptional around here but they can't be achieved without inputs and good machinery."

Their machinery pool includes a CLAAS LEXION 750 combine harvester fitted with a VARIO 1050 variable cutterbar front purchased in 2011. They were attracted to the LEXION because of its superior capacity, improved stubble spreading and ability to direct head canola crops.

"LEXION makes harvesting so easy," Damien says. "It's probably got a lot more capacity than we need in terms of throughput, but we wanted the chopper and rotary spreader. This enables us to cut the crop lower, put more stubble through the machine and then spread it right across the paddock so we don't have to burn.

"With a 10.5 metre front and an operating speed of 10 to 15 km/hour, we can comfortably average about 45 tonnes an hour in wheat and up to 60 t/hr in barley – and not have to worry about stubble load.

"Dad has turned the spreader off at times and had it operating at spot rates of up to 70 t/hr in wheat just to see what it can do. That said and done, we don't need this sort of throughput because we are limited by what we can cart away by truck or put in a bag."

The VARIO variable cutterbar allows the distance between the knife bar and the intake auger to be adjusted by up to 300 mm 'on the move' to suit different crops and harvesting conditions. The addition of filler plates allows the cutterbar to be extended by 500 mm, permitting direct heading of canola.

"At the time, direct heading was still more of a concept so we direct headed 20 ha in the first year just to make sure," he says. "We did 360 ha last year and this year we'll direct head all of our canola.

"Direct heading is just so easy. Our old windrower has a 6.3 metre front, so we could only cover about 6 ha/hour – and then we'd spend the next two weeks worrying about rain and wind. The VARIO means we can cover at least 10 ha/hour and do the job in one pass."

The Pendleburys implement a comprehensive crop protection program to protect against weed competition, fungal disease and insect pressure. The nutrition program includes up to three in-crop applications of UAN liquid fertiliser, which contains 42 per cent nitrogen.

"UAN is probably 25 per cent more expensive in terms of dollars per unit of nitrogen but it's way ahead in terms of its ease of application," Damien says. "Unlike granular urea, rainfall is not as critical for incorporation and it allow us to use our existing spraying equipment."

Contact your nearest CLAAS Harvest Centre to arrange an on-farm demonstration or quote on a tailored harvesting solution for your business.

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LPA13471_ADV

Seed colour change hard to pick in canola 'voodoo' crop

AT A GLANCE...

Industry guidelines to determine timing of windrowing include:

- Assess pods collected from the main stem.
- 40–60 per cent of seeds have changed colour from green to red, brown or black.
- Seeds in the pods at the top of the main stem may be green but are firm when rolled between the thumb and forefinger.

HOW do you define seed colour change when preparing to windrow or direct head canola? It would seem like a simple question but a recent survey of growers and consultants found many different answers and interpretations.

The survey was conducted through the *Better Break Crops* program – funded through the Grains Research and Development Corporation and New South Wales Department of Primary Industries.

In total, 900 growers, agronomists, contractors, and researchers were surveyed from 2009 to 2012, all working in south-eastern Australia.

This sample shows 50 per cent canola seed colour change but NSW DPI's Kathi Hertel says to note the wide variation in colour in seed appearance which has contributed to industry confusion as to what actually constitutes colour change.

If windrowed too early, there is incomplete canola grain development and loss of profit.

Survey results

NSW DPI project manager Kathi Hertel says industry published guidelines recommend windrowing canola when 40-60 per cent of seed on the main stem has changed colour to optimise yield and oil content. But only 5.5 per cent of those surveyed described this timing as the optimum.

"Colour change means different things to different people," she said. "Understanding the term 'colour change' is crucial to avoid potentially significant production and economic penalties.

"Colour change is when the seed coat has changed from green, darkening to red, brown or black. Colour change is not when there are flecks or spots of brown on the green seed."

Kathi says descriptions of how crops are assessed to determine the optimum windrowing time were vague such as where to examine the plant canopy – the bottom, middle or higher canopy, the main stem or branches.

"There are high levels of frustration with the mixed messages and the logistical realities. This has created a lot of confusion, with less experienced growers and agronomists who are seeking information, discovering many viewpoints," she said.

She says some of the comments returned during the survey called canola a "voodoo crop", "the biggest mystery crop out there" and that it required "a fair bit of black magic to grow".

"Overall, the survey found there is a strong push to refine current production practices and to understand the reasons behind variable crop performance. This requires understanding the physiology of the crop during late reproductive development including seed maturation and oil and yield accumulation."

Crop physiology

Recent trial work has shown poorly-timed windrowing can cause canola yield losses and lower profitability. Where crops are windrowed too early there is incomplete grain development. Yield loss can be up to 100 kilograms per hectare per day or $50 per hectare per day under favourable spring growing conditions.

Key points include:

- Direct heading does not produce seed with higher oil content. This has been proven in research comparing direct heading with an on-time or later windrowing.
- Oil accumulation is progressive during the entire development stage of the seed. Oil increases have ceased by the time plants reach the maturity required for windrowing or direct heading.
- As the seed develops, its weight increases until it reaches about 35 to 40 per cent seed moisture content at physiological maturity. This is when the seed changes colour from green to brown then red and finally black.
- If a crop is windrowed when there is too much green seed then grain will not have reached its maximum weight and oil content, resulting in lost yield and oil.
- There is no yield or oil penalty if crops are direct headed or windrowed at the correct time, assuming there is no shattering. But if windrowing takes place earlier than industry-recommended seed colour change guidelines then there will be yield and oil losses. The size of the penalty will depend on the season and timing.

Kathi says the survey also indicated that more information was needed comparing direct heading to windrowing.

"Windrowing brings forward the canola harvest date whereas direct heading allows the crop to mature naturally," she said. "Some growers prefer this option because they can finish canola harvest and reduce the risk of weather damage to cereals. Seasonal conditions are the largest factor influencing the difference in time interval between the two methods.

"The general rule of thumb is that crops will be ready to direct head about 10–14 days after the optimum windrowing time. But the exact timing varies according to location, environment and season finishes. A hot dry season can result in a shorter interval while mild and wetter seasons lengthen the interval. In the Victorian Mallee, it has been 8–12 days while in some South Australian seasons, it has been as long as 18–21 days.

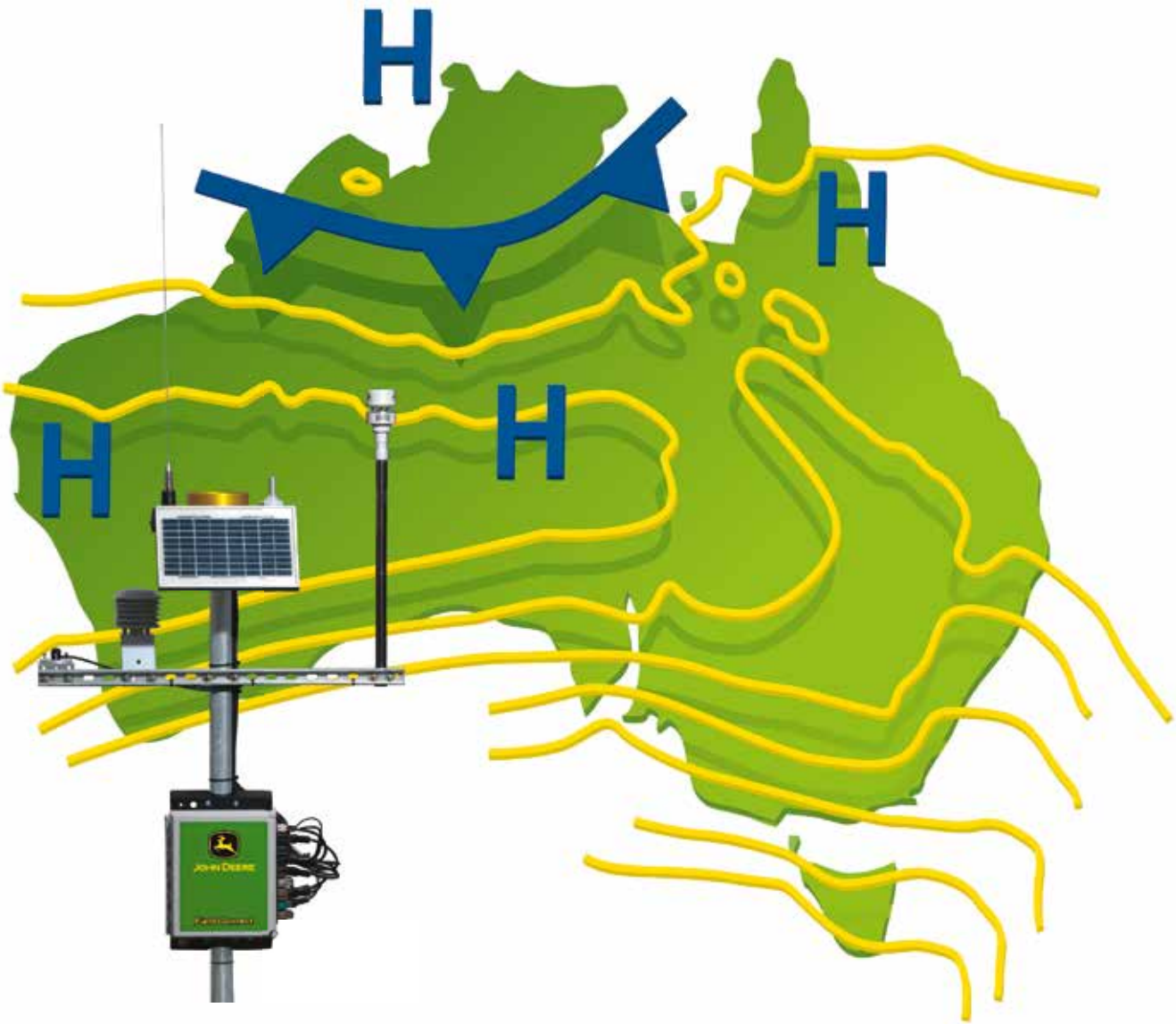
"If canola is slow to mature due to the season, delaying windrowing to 60–70 per cent seed colour change on the main stem is recommended. Under these conditions, a greater proportion of the seeds in the middle and upper canopy will continue to accumulate oil and yield, maximising overall crop performance."

Canola growth stages

Kathi says development is continuous in the life cycle of a canola plant and many growth stages overlap. "There is a clear sequence of development phases that start from leaf to stem to pod to seed," she said. "The length of each phase is influenced by the canola variety being grown and a range of environmental conditions, particularly temperature and moisture."

Factors to understand in canola growth include:

- Growth and development are controlled mainly by thermal time, called accumulated day degrees.
- Flower bud initiation occurs after the production of a pre-determined number of leaves. This differs between varieties.
- Pods produced during the first two weeks of flowering contribute to the majority of yield.
- Seed development comprises three phases:
  1. Early cotyledon stage, 0–21 days after flowering – rapid cell division occurs, rapid seed chlorophyll accumulation.
  2. Mid cotyledon stage, 21–35 days after flowering – cell expansion (seed fill) stage commences, oil and protein accumulation begins, seed chlorophyll begins to degrade.
  3. Late cotyledon stage, 35–60 days after flowering – rapid increase in oil accumulation rate over 7–21 days, seed weight peaks at around 45 days after flowering.
- Pods are the main source of photosynthesis for seed fill as leaves grow and age.
- Maximum seed weight and oil content has been reached when seed desiccation reaches 40 per cent seed moisture.
- Seed colour is directly related to seed maturation.
- A seed begins to change colour from green to brown when the seed moisture content reaches 50–55 per cent. ■



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*Fonatanelle Hybrids, 2010. John Deere Field Connect Weather station available in Australia and New Zealand early 2014.

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Managing strongly phosphine resistant rusty grain beetle

By Dr Manoj Nayak, DAFF (Qld) and Plant Biosecurity CRC[1]

THE rusty grain beetle (*Cryptolestes ferrugineus*), along with two other species of *Cryptolestes* (*C. pusillus* and *C. pusilloides*) have traditionally been looked at as minor pests of stored grain in Australia. But in recent years, there has been a significant enhancement in the pest status of the rusty grain beetle due to their development of a high level of resistance to phosphine – the key fumigant used by industry to disinfest stored grain.

The strength of this resistance is much higher than that previously reported in Australia for other stored grain pests such as the lesser grain borer (*Rhyzopertha dominica*) and psocids or booklice (*Liposcelis bostrychophila*). While the current registered dosage regimes of phosphine easily control all other established pests, they are not adequate against rusty grain beetles.

Since its first detection in 2007, there has been a steady increase in the incidence of strongly resistant populations of rusty grain beetle. This poses a serious threat to the market access of Australian grain – a market worth around $7 billion annually.

Phosphine is a unique fumigant with several positive attributes including its cheap price, ease of application, versatility and universal acceptance as a residue-free treatment.

Although several alternatives have been developed in the recent past (eg ethyl formate, ethanedinitrile, carbonyl sulfide and sulfuryl fluoride), they fail to match the attributes of phosphine. Moreover, with the imminent phase out of methyl bromide, it is expected that industry will rely on phosphine in the foreseeable future.

For these reasons, the industry focus is now on managing resistance to phosphine. So it is imperative that the current resistance problem in the rusty grain beetle be addressed.

The pathway to manage resistance involves three major stages:

Rusty grain beetle, *Cryptolestes ferrugineus* (Stephens) infesting wheat.

- Measuring the strength of resistance;
- Monitoring pest populations to identify storages where they are emerging; and,
- Developing new fumigation protocols and alternative strategies to control the resistant populations.

How strong is the resistance in the rusty grain beetle?

The Australian grain industry has witnessed the development of strong levels of resistance to phosphine in the lesser grain borer, rice weevils and psocids over the past decade. But these resistance problems are now being managed effectively through development and adoption of new fumigation protocols.

A comparison of these resistant pests with the strongly resistant rusty grain beetle in relation to one of the registered rates is mentioned here to highlight the seriousness of the current problem.

For example, at 25°C and a phosphine dose of 1 mg/L (720 ppm); we require a fumigation period of 18 days to achieve complete control of all life stages (egg, larvae, pupae and adults) of strongly resistant populations of rusty grain beetle. This is more than twice the recommended

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Manoj Nayak (left) setting up a field trial of sulfuryl fluoride at the Malu grain storage facility on Queensland's Darling Downs.

fumigation periods of eight, seven and five days for the control of strongly resistant populations of psocids, rice weevils and the lesser grain borers (Figure 1).

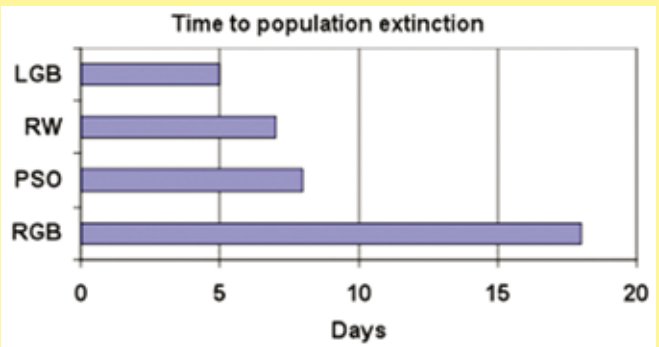
The long fumigation period – coupled with a very high concentration of phosphine required to manage the resistant rusty grain beetles – poses a number of logistical constraints. These include the maintenance of airtightness in the storage structure, the time constraint during export and the significantly increased cost of labour and resources.

Where are they a problem?

Australia's unique national phosphine resistance monitoring program (run by PBCRC through DAFF Qld, NSW Department of Primary Industries and the Western Australian Department of Agriculture) has again proved its importance with the first detection of the strong resistance in the rusty grain beetle in 2007 in a large grain handling facility in northern NSW.

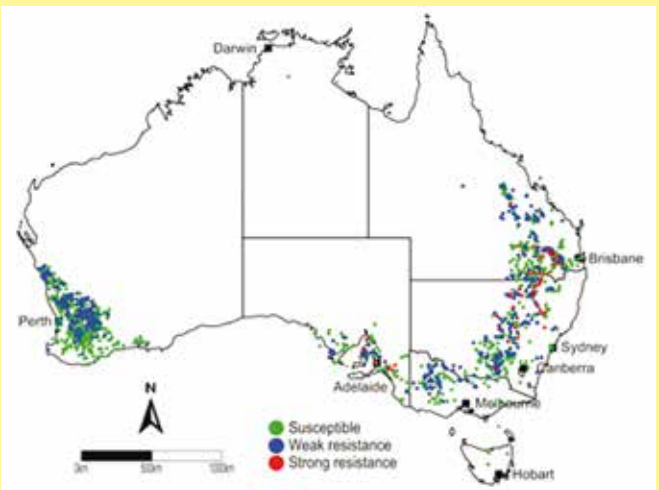
Since then, more than 100 populations of this pest have been diagnosed with strong resistance across all of the grain growing states of Australia except for Western Australia; although a

FIGURE 1: Time required for 720 ppm (1 mg/L) of phosphine at 25°C to achieve population extinction (mortality of eggs, larvae, pupae and adults) of strongly resistant populations of key stored grain pests



RGB – rusty grain beetle (*Cryptolestes ferrugineus*); PSO – psocids (*Liposcelis bostrychophila*); RW – rice weevil (*Sitophilus oryzae*); LGB – lesser grain borer (*Rhyzopertha dominica*).

FIGURE 2: Recent trend in strongly phosphine resistant populations of rusty grain beetle (*Cryptolestes ferrugineus*) in central storages in Australia



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weaker resistance is widespread in all grain growing regions (refer to map, Figure 2).

Strong resistance problems seem to be more prevalent in the bulk handling sector, which accounts for 97 per cent of the incidences compared with only two per cent on-farm.

Development of a 'quick test' for same day diagnosis of strong resistance

PBCRC research has resulted in the development of a 'quick test' being established that exposes rusty grain beetles to a high dose of phosphine and provides results within six hours of insects being delivered to laboratories for resistance diagnosis.

This test involves the exposure of adult insects to 1440 ppm (2 mg/L) of phosphine; which knocks down non-resistant insects in only 30 minutes and weak resistant insects within five hours. Any insects surviving five hours at this dose are diagnosed as strongly resistant.

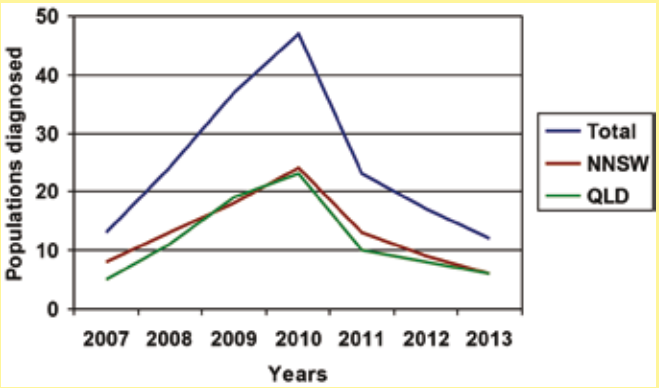
This has been a major innovation considering that the previous diagnostic test required at least a 20 hour exposure period before final diagnosis could be assessed. The new test provides same day advice to the storage operators enabling them to pursue eradication strategies faster.

Sulfuryl fluoride as an alternative to phosphine

With the failure of the currently registered rates of phosphine, PBCRC researchers are developing sulfuryl fluoride (SF) as an alternative fumigant to manage strongly phosphine resistant rusty grain beetles. Research on developing effective fumigation protocols and their validation through large-scale field trials has delivered excellent results that support the potential of SF in managing this strong resistance problem.

Key findings include:

FIGURE 3: Recent trend in incidence of strongly resistant rusty grain beetle infestations in bulk storages in Queensland and northern NSW



- The current registered rate of 1500 CT (concentration x time) of SF controls all resistant pests in Australia including the strongly resistant rusty grain beetles;
- A single fumigation with SF protects the grain in a bunker for at least three months from reinfestation; and,
- There has been a sharp decline in rusty grain beetle infestations in bulk storages after the adoption of SF by industry in 2010 (Figure 3).

The eradication plan

An action plan integrating all available strategies has been developed collaboratively under the PBCRC umbrella by grain bulk handling companies, NSWDPI and DAFF Qld aimed at eradicating infestations of resistant rusty grain beetle and preventing their spread. This plan involves the following components:

- If infestations detected at port, treat with methyl bromide;
- If infestations detected in bunkers (pad storages), treat with SF but do not use SF repeatedly on the same bulk and use this fumigant as a 'resistant breaker' only;
- If infestations detected in country depots, where permitted, use a registered; contact insecticide (eg chlorpyrifos-methyl or fenitrothion);
- Treat freshly harvested grain with a registered contact insecticide (eg chlorpyrifos-methyl or fenitrothion) to provide at least six months protection in storages with a history of reinfestation;
- Undertake an intensive hygiene program in all storages that includes detailed cleaning and structural treatments; and,
- Continue monitoring of insect populations through inspection, sampling and trapping and forward insects that survive treatments to DAFF Qld and NSWDPI for resistance testing.

To sum up

One key feature making phosphine a successful fumigant is that it can still control resistant populations if we alter its dosage regimes (concentration and exposure period). This has proven successful in managing strong resistance in the lesser grain borer and psocids over the past decade in Australia.

While developing an alternative fumigant such as SF to mitigate the current resistant problem of rusty grain beetles, we are also developing new phosphine fumigation protocols to enable industry to extend the usefulness of this important fumigant.

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Plant Biosecurity Cooperative Reseach Centre, LPO Box 5012, Bruce ACT 2617. ■

Patented new trap irresistible to insect pests

By Jan Suszkiw, Agricultural Research Service – USDA

BETTER control of red flour beetles and other costly, stored-product insect pests could be on hand, thanks to a new pitfall trap designed by Agricultural Research Service, USDA scientists.

Commercial traps now used are typically dome-shaped devices baited with pheromones or other attractants that lure the beetles into pits or onto glue strips. The new design, dubbed the 'Terrestrial Arthropod Trap' and patented in October 2012 by ARS on behalf of the US Department of Agriculture, takes this 'fatal attraction' to a new level.

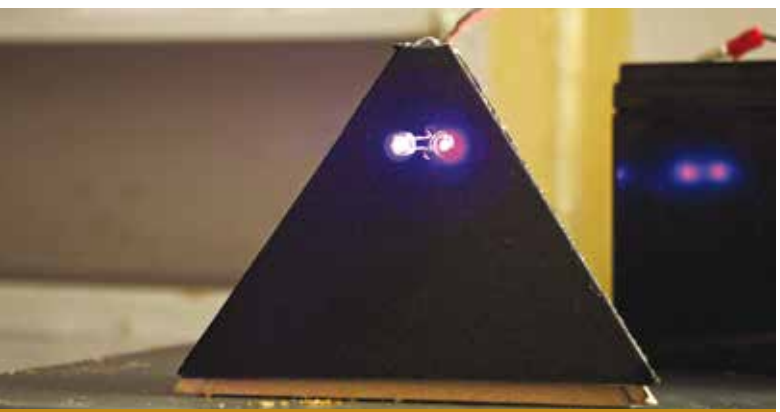
In addition to a pheromone dispenser, the pyramid-shaped trap sports three slender fins along each edge of its base to coax inquisitive beetles into crawling towards the opening of a central pit, where they can be captured, counted, and discarded.

The new trap also features light-emitting diodes (LEDs), set to wavelengths of 390 nanometers. The LEDs attract beetles from long distances, ensuring that they get a whiff of pheromone the closer they approach. This can be especially useful in well-ventilated warehouse areas, where the ubiquitous odour of food can dilute or mask the scent of pheromone emanating from a trap.

"Once the beetles are close enough for a lure to be effective, there is a further need for a trap designed specifically to appeal to the tactile and behavioral traits of the targeted pests," write the inventors in a patent description of their new trap design. Peter Teal leads the ARS Chemistry Research Unit in Gainesville, Florida. Lee Cohnstaedt is in ARS's Arthropod-Borne Animal Diseases Research Unit in Manhattan, Kansas. Adrian Duehl and Richard Arbogast were both formerly with ARS in Gainesville.

LED lights near the top of the new trap lure the pest. (PHOTO: Peter Teal)

Different wavelengths and colours of light were tested to see which best attracted insects. (PHOTO: Peter Teal)



The trap's exterior has an inner and outer layer with an opening at the bottom, where insects enter, crawl up between the layers, and fall into a trap at the top. (PHOTO: Peter Teal)

In timed laboratory trials, red flour beetles visited LED traps set to 390 nanometers 16 times versus two to five times for traps set to other wavelengths. Positioning the LEDs at the trap's top captured more beetles (55 total) than placing the diodes at the bottom (12 captured). Combining the LEDs with an attractant made the pyramid design even more effective, capturing 70 beetles versus four using a standard dome design.

The primary target

The red flour beetle, *Tribolium castaneum*, is a primary target of the team's research because it eats both raw and processed cereal grains. It commonly infests flour mills but can also be found in warehouses, storage bins, and household food pantries, causing millions of dollars in losses annually.

The pyramid trap's success in laboratory trials is a testament to the researchers' efforts to study and exploit the beetle's natural behaviors and tendencies – from identifying optimal wavelengths that cue it visually to creating a crawl space between the trap's lid and base that appeals to the furtive pest's instincts, luring it to enter and fall into the pit inside.

Small hive beetles, which can weaken honey bee colonies, were also attracted to the trap. In tests, researchers observed a 10 to 20-fold increase in captures of hive beetles compared to conventional traps used against the pest. Changes to the trap's design and to the combination of attractants and LED wavelengths can also be made to effectively target fleas, ticks, bed bugs, and mosquitoes.

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Lee Cohnstaedt is in the USDA-ARS Arthropod-Borne Animal Diseases Research Unit, Center for Grain and Animal Health Research, 1515 College Ave., Manhattan, KS 66502; Ph: +1 (785) 537-5592.

■

Doing the grain storage sums

AUSTRALIAN grain growers thinking about future investments into on-farm grain storage can weigh up the economics with the help of a new guide. The Grains Research and Development Corporation (GRDC) publication *Economics of On-Farm Grain Storage* contains all the relevant questions and equations farmers need to calculate whether grain storage is right for their farm business.

ProAdvice consultant Chris Warrick, who leads the GRDC Grain Storage Extension Project, said the guide had been well received by growers attending recent grain storage economics workshops.

He said the guide would help farmers determine if expansion of on-farm grain storage was justified for their situation, or potentially a costly mistake.

"To make a sound financial decision, we need to compare the expected returns from grain storage compared with expected returns from other farm business investments, such has more land, a chaser bin, a wider boomspray, a second truck or paying off debt," Chris said.

"*Economics of On-Farm Grain Storage* contains a step-by-step template to help farmers work out the potential financial gains such as marketing, harvest timeliness and freight savings from carting grain direct to port after harvest.

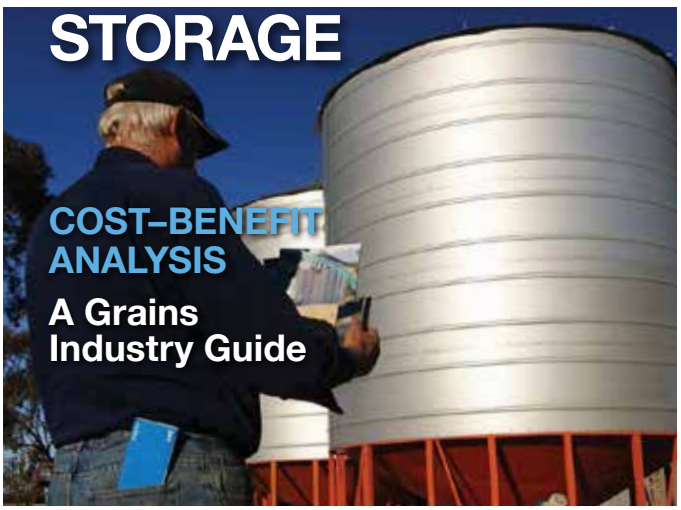
"The template also contains calculations to work out the fixed costs of on-farm storage such as the annualised capital costs of the infrastructure, site works, concrete and equipment, as well as the opportunity cost of capital.

"While it's difficult to put an exact dollar value on each of the potential benefits and costs, a calculated estimate will determine if it's worth a more thorough investigation.

"Evidently the financial implications are not the only factor to consider in deciding between investment options.

"Labour availability, knowledge and area of interest will also play a part in the success or otherwise of the storage."

***Economics of On-Farm Grain Storage* is available on the GRDC website at www.grdc.com.au/GRDC-Guide-OnFarmStorageEconomics or on the GRDC Stored Grain Information Hub www.storedgrain.com.au** ■



Insect control in stored chickpeas to maximise market returns

By Rob Taylor, GRDC Northern Region Panel Member

RECENT slides in the Australian chickpea market are likely to prompt many growers to consider storing this season's crop, placing a renewed focus on the issues of insect control and quality retention.

Insects are not generally a major problem in stored chickpeas except where storages contain residues of cereal grain already infested with rust red flour beetle, lesser grain borer or saw toothed grain beetle.

If a prior infestation exists it can quickly spread to chickpeas and create a costly problem for growers.

The simplest mitigation against insect damage in stored chickpeas is to ensure that all handling equipment and storages are cleaned thoroughly to remove any traces of old cereal grain before being used to handle chickpeas.

The Grains Research and Development Corporation (GRDC) recommends that meticulous hygiene in combination with aeration cooling should prevent insect infestations from occurring.

But if they do, the only control options are phosphine, alternative fumigant or controlled atmosphere and all of these require a gas-tight sealable storage for insect control at all stages or the life cycle. For more information growers should refer to the GRDC booklet, *Fumigating with phosphine, other fumigants and controlled atmospheres.*

Rob Taylor, GRDC Northern Panellist, Macalister, Qld.

It is important to remember that chemical sprays are not registered for pulses in any state. While there is a maximum residue limit (MRL) for dichlorvos on lentils, the product is only registered for use on cereal grains.

Storing chickpeas in aeratable, gas-tight, sealable silos is the ideal scenario to optimise quality and pest control, particularly for those growers looking to store the crop for more than three months.

Grain moisture levels are critical to quality retention during storage and research has shown that harvesting pulses at 14 per cent moisture reduces field mould, mechanical damage to the seed and splitting, while preserving seed viability. But these moisture levels can create issues with quality retention during storage unless managed appropriately.

In line with this, chickpeas stored at about 12 per cent moisture require aeration cooling – as a general rule the higher the moisture content, the lower the temperature required to maintain seed quality.

Aeration cooling basically creates desirable conditions for the grain and undesirable conditions for pests and mould, enabling low-moisture grain to be stored longer term. It also allows for short term storage of high-moisture grain (over 14 per cent) before blending or drying.

The CSIRO Stored Grains Research Laboratory has a maximum recommended storage period of three months at 20°C and 14 per cent moisture content; nine months at 20°C and 13 per cent moisture; three months at 30°C and 13 per cent moisture; at least nine months at 20°C and 12 per cent moisture; and nine months at 30°C and 12 per cent moisture.

Adhering to recommendations regarding storage of chickpeas will help preserve the quality and marketability of chickpea crops this season, giving growers a valuable competitive edge in a difficult market. ■

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Pod abortion in chickpeas: Why?

By Hugh Reardon-Smith, Landmark Pittsworth and Gordon Cumming, Pulse Australia

IN mid to late October on the eastern Darling Downs of southern Queensland, there were a number of chickpea crops at the pod forming and early pod fill stage. The lateness of these crops was due to the environmental factors through the growing season, particularly the August 21 frost and the lack of rainfall.

Most of the chickpeas were planted on the Darling Downs in late May and early June, usually double cropped into sorghum or corn stubble. Stored moisture at the beginning of the season was fairly good after above average rain for the first three months of 2013. Unfortunately rainfall was average or well below average for the rest of the growing season.

The frost on August 21 came after a period of warm days to 24°C and mild nights around 10–15°C. That night the ground temperature dropped to –7°C and the chickpea crops were hammered more than cereals, especially any crops on fallow ground with better stored moisture. The early crops at this stage were in the early stages of flowering.

This delayed the maturity of many crops with flowers aborted and leaves, branches and a few whole plants killed by the frost. This meant the frost affected areas of paddocks were podding up later than the rest of the paddock.

October weather effects

October started fairly warm but on October 7 temperatures were approaching the mid 30s and remained close to 30°C or above through to the 11th. Then on October 15 there was a touch of frost on the eastern Downs.

At this stage most crops were ripening quickly and approaching the dessication stage. But a number of crops more heavily affected by the August frost were in the early to mid pod fill stage. These crops had already had a lot of stress through the growing season, and the hot temperatures appear to have been the last straw and caused total pod abortion. It is known that temperatures of 33°C and above can cause this.

Pale aborted pods in the chickpea crop and the plant trying to flower again.

Aborted seed from both ripe and green pods.

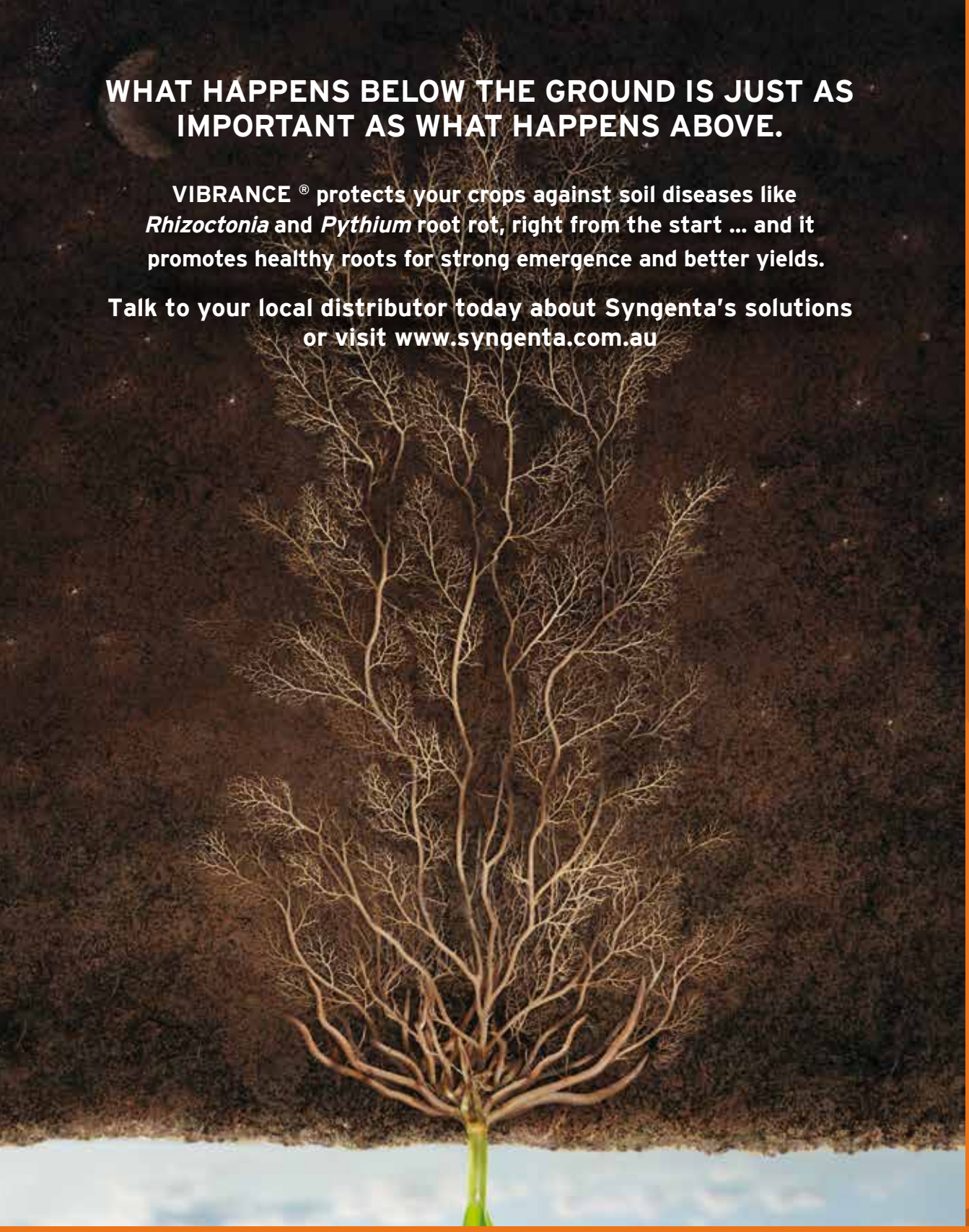
We have seen some crops with 80 per cent plus pod abortion, and some patches within crops with similar levels. The seed has formed inside the pods and started to fill and formed a full seed shape, but no moisture has gone into the seed to fill it out. All the pods on a branch are affected – from ripened pods through to green pods – so although the October 15 frost may have had some effect, we believe it is when the temperature reached 33°C that pod abortion occurred. But the chickpea plants remained green and tried to put on more flowers and pods.

What strategy from here?

We initially thought the heat issue was directly linked to planting time, with planting after June 30 especially risky. There is some truth in this but we have crops planted in mid June with patches of severe pod abortion, which were the most heavily damaged by the August frost, so we conclude it is maturity.

The reason for this season's heavy abortion of pods is a combination of all the environmental factors, and the sum of all the stress on the crop from lack of rainfall, frosts after rapid growth stages and warm weather – but it was the October heat that finally caused the damage.

It would be good to avoid July plantings of chickpeas, but earlier planting does not guarantee safety. Perhaps the best strategy is to re-assess your crop potential whenever it is delayed in maturity for whatever reason, and be aware that this problem could re-occur, especially in a winter with temperature and moisture variations causing extra stress. ■



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Cabbage, Ursus and more cabbage!

By Ian M. Johnston

Why cabbage?

Perhaps it was a mistake visiting Poland last August (2013).

Over the years Margery and I have driven around most of Eastern Europe, doing our research thing on old tractors, but never before in Poland. So why did we decide to visit Poland last August? Simple! To carry out my long neglected research into the evolution of the historically interesting indigenous Polish tractor – the Ursus.

So why might it have been a mistake to go there? *My profound dislike of cabbage!*

Permit me to explain. Back in the Dark Ages, my presence was inflicted upon a certain school in Edinburgh. In the dining hall I would line up bearing my plate and proceed past the long table, behind which stood a row of apron clad kitchen staff each with a cauldron of 'stuff' which they dolloped on to each boy's proffered plate. The 'stuff' might range from watered-down yesterday's mince, gravy with floating blobs of meat which they somewhat euphemistically referred to as stew, greasy fried herring, or if we were fortunate – good old Scottish haggis. Plus there was an assortment of over-cooked vegetables.

But always at the end of the table was the dreaded cabbage woman, noted for her mop of untidy straggly grey hair. As she leaned over her steaming pot of cabbage mush, she repeatedly scratched her head, the action of which encouraged showers of dandruff and floating hairs to descend into her nauseating brew!

Can I be blamed for harbouring a life long detestation of cabbage?

I was therefore understandably dismayed when I discovered the national dish in Poland is cabbage. It comes in many forms. There is boiled cabbage, fried cabbage, roasted cabbage, pickled cabbage, cabbage broth, green cabbage, red cabbage, blue cabbage, cabbage omelette, cabbage dumplings, cabbage stew and even (would you believe) cabbage ice cream – to mention only a few!

To confuse matters, very few of the menus in Polish restaurants include English translations. Also, apart from in the glitzy hotels, most of the waitresses and waiters (woops – I am supposed to say 'wait persons') don't understand a word of English apart from 'hello' and 'you pay now'. And frankly the Polish language is so complicated that I marvel the Poles can understand it themselves!

Not surprisingly I shed several kilos whilst in Poland.

A big surprise

We picked up the rental car in central Berlin and navigated our way south for around twenty kilometres until joining the A12 autobahn, then headed east towards the Polish border.

Driving on the brilliant German autobahns is always a pleasure. The Germans in my opinion are the world's most skilled and considerate drivers. This is evidenced on the autobahns, most of which impose no speed limits – apart from trucks. The majority of cars hurtle along at speeds ranging from 120 kph up to around 160 kph, driven with a high degree of safety and courtesy. Many are driven much faster.

As we approached Poland, I alerted Margery to the fact that we should prepare for some fairly indifferent roads compared to those in Germany. I had in mind our travels in such places as Serbia, Romania and Bulgaria. How wrong I was!

The instant we crossed into Poland we encountered the most magnificent motorway we had experienced anywhere. Better than the German autobahns, the Italian autostradas and even the interstates in the US. We were on the recently constructed E30 which carved its way through strikingly beautiful undulating forest country, in the direction of distant Warsaw. The road surface, the width of the lanes and the pristine landscaping has to be seen to be appreciated.

We were to learn that these super highways are being built all over the country. But our desire to experience at first hand

Polish cabbage dumplings sizzling in a frying pan. (Photo IMJ)

View through the car windscreen of the Polish Motorway. Note absence of heavy traffic. (Photo MJ)

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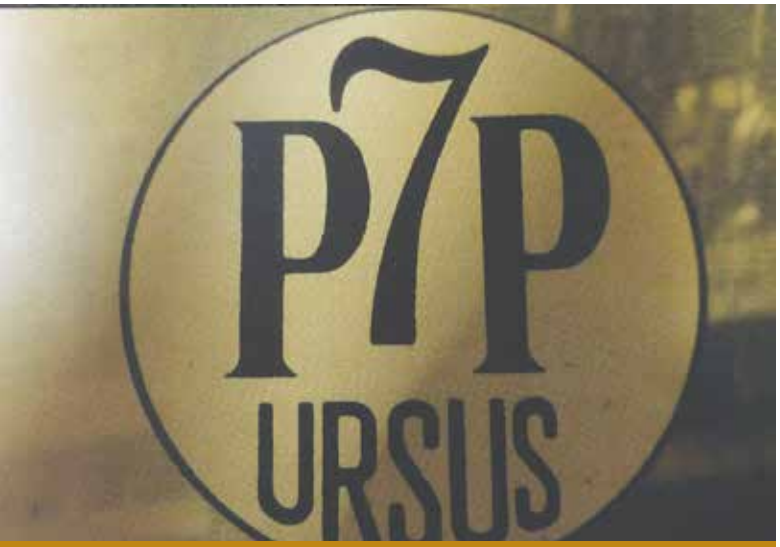


The original Ursus trademark Posag 7 Panien – see text.
(Photo IMJ Archives)

An early Ursus – a copy of the International Titan 10–20.
(Photo IMJ Archives)

the diverse farming communities, saw us also meandering along hundreds of kilometres of often pot holed or gravel roads connecting ancient villages and groups of farms. In particular we were hoping to track down some early examples of Ursus tractors.

Ursus

The origins of Ursus tractors can be traced back to 1893. In that year a group of seven Polish businessmen identified Russia as a potential market for the sale of stationary engines and ancillary equipment. Accordingly they established the Ursus factory in the Warsaw suburb of Czechowice and production commenced.

Quite remarkably and possibly without precedent, the initial capital of the company was identified as being the dowry of seven maidens who were the daughters of the seven founders! (I have confirmed the accuracy of this astonishing fact). Indeed the firm's trademark was the symbol 'P7P' which represented Posag 7 Panien i.e. The Dowry of Seven Maidens.

By 1913 a total of 6000 engines of up to 450 hp had been supplied to the Russian Tsar. In 1918 the first prototype tractor was produced. Few records remain, but it appears to have been a copy, perhaps with licensing approval, of an International Titan 10–20. By 1927 a mere one hundred of these tractors had been manufactured.

In 1930 the company, now entitled Zaklady Mechaniczne Ursus, Inc., experienced unsolvable financial problems and was acquired by The State Engineering Factory, the manufacturer of military vehicles and weapons. By 1939, under its new ownership, Ursus had produced 737 tanks, 700 military tractors, and over 1000 Ursus and Sauer cars and commercial vehicles, in addition to 2500 motor cycles and an unknown quantity of aero engines.

During World War 2 the Ursus factory was destroyed by the rampaging Nazis, along with nearly every other building in Warsaw. No other city was so utterly and needlessly gutted and ravaged during the war as Warsaw. (Man's inhumanity to man)!

In 1945 and now under the harsh Soviet regime, the Ursus factory was rebuilt from scratch. Agricultural tractors were urgently required. It was decided to manufacture copies of the German Lanz Bulldog Model P. The 45 hp single cylinder crude oil-burning two stroke engined machine was designated the Ursus LB 45 and later the C 45. Between 1947 and 1959, 60000 of these rugged and dependable tractors were produced.

The first all Polish designed Ursus was the C325 released in 1957. This was a well engineered lightweight, powered by a two cylinder upright diesel engine producing 25 hp. On June 29 1961, a C325 was submitted to The Nebraska Testing Facility

A 1947 Ursus LB45 – a replica of a Lanz Bulldog Model P.
(Photo IMJ Archives)

A 52 hp Ursus C360, encountered on a back road near Warsaw. (Photo IMJ)

A 1994 60 hp Ursus, powered by a four cylinder Polish built Perkins diesel engine, on display at an agricultural show in NSW. (Photo Des MacDonald)

in the USA. It performed admirably and returned an impressive drawbar pull of 1743 pounds at 3.89 mph. Other diesel models soon followed. Although unremarkable in design, they proved ideal for the Polish farmers at that time. They were easy to maintain and utterly reliable.

In 1969 Ursus entered into an exchange of technology alliance with the Czechoslovakian Zetor tractor manufacturer and produced the 76 hp Ursus C385, which was virtually identical to the Zetor 8011.

A momentous agreement was signed with the giant Canadian Massey Ferguson group in 1974, enabling Ursus to manufacture MF tractors and Perkins diesel engines.

Fast forward to 1990. It was around this period that Massey Ferguson Australia Ltd. commenced importing Ursus tractors for the local Australian market. The Banner Lane MF factory in Coventry, UK, could not maintain an adequate supply chain and therefore the Polish manufactured units plugged the gap. Five models were offered ranging from 38 to 119 DIN hp. But by far the biggest sellers were the 47 hp 3512/4 and the 60 hp 4512/4.

Sadly, during the 1990 decade sales of Ursus tractors declined rapidly. The company had acquired an unsurmountable amount of debt during its expansion program of the 1980s. In 1996 it was unable to meet repayment commitments of 550 million zloties and over 700 creditors were written off! In 2007 the Turkish Uzel Holdings Group, who were AGCO Massey Ferguson licensees, agreed to acquire Ursus, then failed to proceed with the arrangement. Effectively this was the demise of a once proud and great Polish tractor organisation.

Cabbages again

We spent nearly a month in Poland and warmed to the country and its people, despite their craving for cabbage and their enigmatical language. My linguistic skills could only extend to Do zobaczenia – I'll see you later – and – Dzien dobra – Good day.

Whilst most of our roaming was in rural Poland, we also spent some days in cities such as Poznan, Krakow and of course Warsaw. Although having a comprehensive historical knowledge of the horrendous victimisation the Nazis perpetrated upon the citizens of Warsaw, I was not prepared for the personal sobering psychological effect resulting from our visits to various war museums and shrines. The experience will remain with me forever.

Vast fields of cabbages thrive in the rich tilthy soils throughout the farming districts of Poland. Pictured is a cabbage crop near Plock, situated on the banks of the Vistula River. (Photo IMJ)

So it was good to escape to the countryside again. Seemingly everywhere we wandered we came across ageing Ursus tractors working merrily in the fields.

Farming activity in Poland is heterogeneous in the extreme. The old Ursus tractors were mainly employed on small meticulously maintained arable farms, with obviously high yielding crops and rich tilthy soil. In addition to the old tractors, teams of labourers were frequently observed manually hoeing weeds, which reminded me of my youth in Scotland.

But, there was no escape for me! I estimate at least 80 per cent of the crops were (you guessed it) cabbage! Now I don't actually dislike cabbages when they are growing in a field. It is when they appear on a plate in front of me that I feel decidedly queasy.

Poland can also boast thousands of hectares of broadacre farming. Magnificent crops of grain are spread across the softly undulating landscape with high tech tractors including International, John Deere, Fendt, Massey Ferguson and so on, busily doing their thing.

Our final days in Poland were spent in the south of the country in The High Tatra Mountains – no agriculture here! Then south west into the land of castles – beautiful Slovakia, the home of Zetor tractors. But that is another story for another time. ■

IAN'S MYSTERY TRACTOR QUIZ

Question: Can you identify this tractor?

Clue: It is not American and has a diesel engine.

Degree of difficulty: As easy as knowing the name of the Ukrainian Agricultural Minister!

Answer: Page 56.

Understanding signals and controlling growth in plants

By Dennis O'Brien, Agricultural Research Service – USDA

IMAGINE being able to slow down or speed up the growth rate of a crop, manipulate when it flowers, or extend its lifespan. An Agricultural Research Service scientist and his Canadian colleague have found a new signaling mechanism in plants that may allow them to do just that.

Autar Mattoo of the ARS Sustainable Agricultural Systems Laboratory in Beltsville, Maryland, Raju Datla of the Canadian Research Council, and collaborators are analysing the cellular machinery that controls the growth rate, longevity, nutrition uptake, and metabolism of experimental plants via the "TOR signaling" pathway.

Potential long-term applications of this research may include crops with early maturation and shorter growing seasons, ornamentals that last longer, and trees with more desirable growth and fruiting patterns.

ARS is using Arabidopsis as a model plant to study signaling pathways in plants. These pathways are helping them identify sensors that control nutrition and energy within the plant. (PHOTO: Keith Weller)

Key signaling pathway revealed

TOR-mediated signaling has been widely studied in yeast, animals, and humans. The TOR (target of rapamycin) pathway is a nutrition-and-energy sensor that plays a major role in mediating the signals that control growth, development, and lifespan in these diverse systems. TOR-mediated signals couple energy and nutrient availability with the protein-synthesising machinery of the cell, the ribosome.

Rapamycin, an immunosuppressant drug first discovered as an antifungal compound, shuts down the TOR pathway, thereby slowing growth and development.

Previous work showed that in yeast, mice, and humans, rapamycin functions by binding to a protein known as "FKBP12" (FK506 binding protein 12). But rapamycin doesn't bind effectively to FKBP12-related proteins in the model plant Arabidopsis or in crop plants, possibly because of differences in the protein structure.

"The question was: Could plants be engineered to respond to rapamycin, thus enabling researchers to analyse TOR pathway functions in plants?" Raju says.

To address this question, the team developed transgenic Arabidopsis plants that produced the yeast version of the FKBP12 protein and selected lines for treatment with rapamycin to monitor the plants' responses at the growth, developmental, metabolic, and gene-expression levels.

As anticipated, the plants containing the yeast FKBP12gene responded to rapamycin by growing more slowly, producing shorter roots and shoots, and living longer than their normal counterparts. For example, leaves on transgenic plants were still green and growing 70 days after seed germination, whereas nonengineered plants had completed their life cycle and senesced.

Rapamycin treatments also affected gene expression, turning off or 'down-regulating' genes associated with photosynthesis and cell growth. Consequently, rapamycin-treated transgenic plants failed to respond to increased light and displayed growth rates 10 times slower than those of nonengineered plants when lighting was intensified.

Rapamycin treatment also altered the plant's metabolism – how it processed amino acids, organic acids, polyamines, carbon, and nitrogen.

TOR linked to a critical player in plant growth

Previous research suggests that RPS6, a key component of the protein-synthesising machinery in the cell, plays an important role in plant growth. This protein is known to regulate cell size, growth, and lifespan, so the researchers wanted to investigate its

role in TOR signaling. They silenced the gene that expresses the RPS6 protein and observed effects that were similar to those of treating transgenic plants with rapamycin: smaller leaves, shorter roots, delayed flowering, and longer lifespans.

The mutant plants also showed the same response to light and nutrition deficiencies as the transgenic plants treated with rapamycin.

In other experiments, they crossed the transgenic Arabidopsis lines with lines in which the RPS6 protein gene was silenced. They found that the protein had to be functioning for rapamycin to shut down the TOR pathway and have its full effect, slowing down growth and development.

"So for TOR inhibition to manifest fully, the plant needs functioning RPS6 genes," Raju says. The results are described in a paper in the December 2012 issue of *The Plant Cell*.

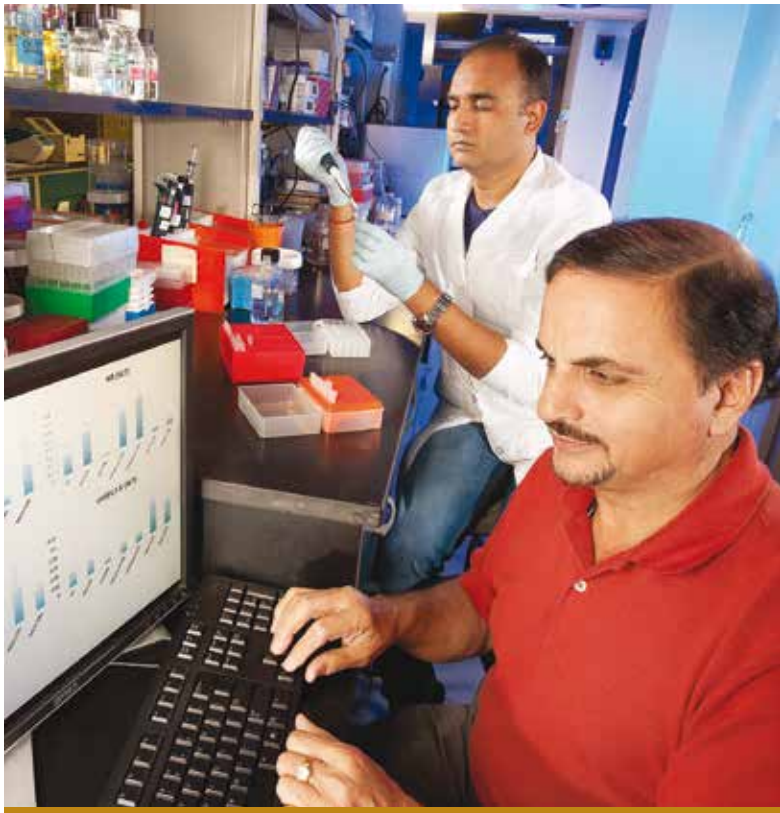
Regulatory implications

While a transgenic crop or agricultural product is likely decades away, and would require regulatory approval, the implications of the researchers' discovery are intriguing. The study focused on slowing down plant development, delaying flowering, and extending lifespan. But the researchers say the work shows that by manipulating either the TOR pathway or the gene responsible for expressing the RPS6 protein, these processes could also be accelerated.

"These results may enable researchers to develop new strategies for accelerating plant growth, causing early flowering, and extending or reducing the lifespan of an engineered crop," Autar Mattoo says.

Autar Mattoo is with the Sustainable Agricultural Systems Laboratory, 10300 Baltimore Ave., Building 001, Beltsville, MD 20705-2350; Ph: + 1 (301) 504-6622.

■



Autar Mattoo (foreground) and postdoctoral fellow Rakesh Upadhyay are studying plant genes involved in metabolic pathways related to growth and longevity. Here they are using quantitative polymerase chain reaction to analyse tomato genes. (PHOTO: Peggy Greb)

What's on the *Greenmount Travel* radar for 2014?

After a number of highly successful overseas farm study tours in 2013, everyone is asking: "Where are you going next year?"

Well, planning is at a very early stage, but at the moment – and in no particular order of importance – the destinations attracting the most interest are:

Scandinavia

One of the most beautiful and hospitable parts of the world, we have had two very successful tours through northern Germany, Denmark, Sweden and Norway – with an optional add-on to Spitsbergen in the Arctic Circle.

Africa

Southern Africa is similar to Australia in some ways – but strikingly different in many others. The scenery, animals and farming of South Africa, Zambia, Namibia and Tanzania are unique – and our operators in those countries are second to none.

BE QUICK February departure!

North America

A perennial favourite *Greenmount Travel* tour, although we seem to go to different places every time we visit the US and Canada. Well, it's a big area, but there are some things that cannot be missed, such as a visit to New York or a trip through the Canadian Rockies.

Spain/Morocco

We last ventured to Spain and Morocco in 2006 and there is a groundswell of interest in returning in 2014. From the deserts of the Sahara to Casablanca, Seville, Madrid, Barcelona – and the wonderful landscapes, food and farming in between.

China/Mongolia/Siberia

We will definitely have an Asian destination on the agenda for 2014, but the exact route has not been finalised. In recent years, we have had great tours to China and included other destinations such as Cambodia/Vietnam, Tibet and Mongolia and we have always wanted to venture into Siberia. So watch this space!

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NORTHERN FOCUS
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THE RESEARCH VIEW

Protein link to profitability for northern sorghum

AT A GLANCE...

- Sorghum growers should target protein levels of 9–10 per cent to maximise yields.
- Nitrogen management is the key to reaching target protein levels.
- Maximising grain yield through N application also maximises gross margins.

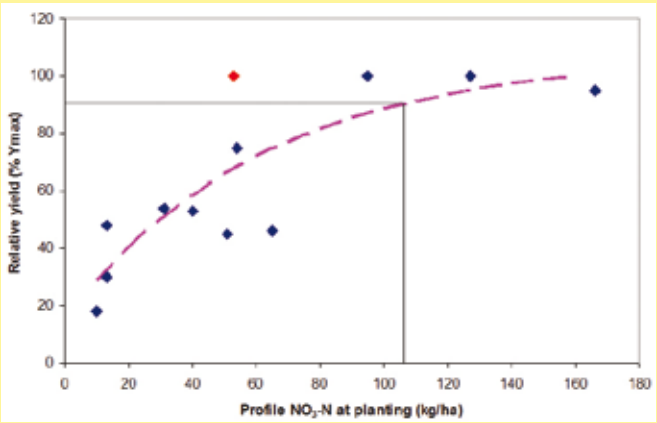
SORGHUM growers across Australia's northern cropping belt could bolster their crop yield potential and profitability through targeting grain protein levels of between nine and 10 per cent.

Attaining this target grain protein level and maximising yield is largely dependent on nitrogen (N) management which is the focus of a research project funded by the Grains Research and Development Corporation (GRDC), Queensland Alliance for Agriculture and Food Innovation (QAFFI), Department of Agriculture, Fisheries and Forestry (DAFF) and NSW Department of Primary Industries (NSW DPI).

The research is aiming to determine the agronomic and economic responses of grain sorghum to varying levels of nitrogen nutrition in the northern grains belt, with 12 sites providing data in the 2012–2013 season.

From the sites in 2012–13 a N response curve (Figure 1) was

FIGURE 1: A N response curve showing that 90 per cent relative yield is achieved when starting soil N is approximately 110 kg N per hectare



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.

developed and it was found that 90 per cent relative yield was achieved when starting soil N was approximately 110 kg N per hectare. Sites where starting soil N was less than 70 kg N per hectare were all responsive to N application. Even at sites where starting soil N exceeded 110 kg N per hectare, protein responses to N application were still observed.

One of the researchers, NSW DPI research agronomist Matthew Gardner, Tamworth, said while sorghum growers were not paid premiums or penalised for grain protein levels as with wheat or barley, they could provide a clear indication of whether a crop was over or under fertilised due to its relationship with yield.

"If growers are achieving around 9.5 to 10 per cent for protein, it's highly like that their yield will be maximised, whereas if protein levels are around 12 per cent it's a fair indication that the crop is over fertilised and at below 8 per cent they have probably lost out on some yield," Matthew said.

Nitrogen and water continue to be major limiting factors in crop yield potential, yet the greatest economic returns are achieved when grain yield is maximised, highlighting the critical relationship between yield and profitability.

Matthew said the research found that where nitrogen application resulted in yield increases, the return on N investment was $2–$5 for every $1 spent on N fertiliser.

Profits linked to N use

"At all nitrogen responsive sites, it was found that maximising grain yield through N application also maximised gross margins," he said.

"Sorghum is currently one of the most profitable crops in the higher-rainfall areas of the northern grains belt.

"Nitrogen fertiliser represents a large input cost within the gross margin for sorghum, however, the lack of protein premiums mean that luxurious N applications directly reduce profitability."

Variable yield responses to the application of N fertiliser in sorghum are not new and are normally attributed to differences in climate, soil and genotype across seasons and locations.

Part of this yield variation is associated with differences in the capability of the soil to supply N and in the efficiency of recovery of applied N fertiliser, but just as important is determining what the expected yield potential is.

According to Matthew, the N requirement is dependent on the yield expectation in a given environment as determined by climate, management and cultivar.

During 2012–2013 trial sites were established at Tamworth, Pine Ridge, Terry Hie Hie, Bullarah and Gurley with initial soil N across the sites ranging from 14–166 kg N per hectare.

Seven N rates were applied at each site, with higher rates applied at Tamworth and Pine Ridge to reflect the higher yield potential.

MR Bazley was the primary cultivar used, although 86G56 was also included in four of the N treatments.

Crop biomass was determined, crop growth stage recorded and tillers counted prior to N application, while crop biomass was also determined at anthesis and physiological maturity.

Hand samples were taken at harvest to ascertain grain yield and grain quality – protein, screenings and hectolitre weight.

Matthew said while the yield response to N application was limited to only a few sites, grain protein increases were evident across nearly all sites, even when starting soil N was up to 120 kg N per hectare.

"The lack of any protein price increments in sorghum means this equates to exporting applied N off-farm without any return on investment.

"Preliminary findings also indicate that there may be some differences between cultivars in their protein achievement at a given yield level and hence N removal in grain that requires further investigation.

"When considering timing of N application, in crop application of N prior or up to the six to eight leaf stage is highly likely to show a yield response, whereas applications after that six to eight stage are likely to generate a protein response only."

Agronomic and economic responses to N nutrition will continue to be evaluated over the following two summer seasons in the northern grains region under the More Profit from Crop Nutrition Project. ■

THE COMMERCIAL VIEW

MANAGE N TO MAXIMISE PROFIT

■ **By Peter McKenzie, Agricultural Consulting & Extension Services agronomist, Quirindi, NSW**

On-going research into the management of nitrogen (N) nutrition in sorghum crops promises to help growers maximise yields and profitability through matching N applications to yield estimations and grain protein targets.

While it's commonly accepted that yield is a key determinant of profitability in sorghum crops, it's also important to monitor grain protein levels during the growing season as an indicator of yield potential and whether in-crop nitrogen applications are required to maximise crop performance.

Widespread grain sorghum protein testing is not common commercial practice, although it is something growers should consider conducting as part of their crop management.

Grain protein can provide a valuable indication of whether a crop is over or under fertilised, allowing growers to better manage their in-crop N nutrition to attain yield targets.

The impact of varying levels of N nutrition on grain protein and therefore yield has been a key consideration in research trials across 12 sites in the northern grains region in 2012–13 (see main article).

Importantly for growers, the research suggests that crop yield and therefore profitability can be maximised by targeting a grain protein level of between nine and 10 percent through the careful management of in-crop N application.

Given that N represents a significant proportion of input costs, improved and on-going monitoring of the crop's N requirements can improve profitability through improving yield and avoiding excess application.

Where nitrogen application was appropriately matched to yield estimations and grain protein targets, the cost/benefit analysis of N investment showed a $2–$5 return for every $1 spent.

While this research is on-going, the results to date set some guidelines for maximising crop performance and give a clear indication of the value of well managed N applications to bottom line profitability.

Liverpool Plains consultant Pete McKenzie.

Plan now to control feathertop Rhodes grass

COMING into winter harvest is the time to be planning ahead for summer weed control of feathertop Rhodes grass (FTR). According to Department of Agriculture Fisheries and Forestry research scientist Michael Widderick, FTR was an all-too-familiar name to farmers in the north, but it could be effectively managed by applying an integrated weed management (IWM) approach in both fallow and in-crop phases.

"The focus needs to be on running down the weed seedbank and preventing seed set," Michael said.

Michael said the weed could not be reliably controlled with glyphosate, especially after early tillering.

"No single weed management treatment will provide 100 per cent control, so use a variety of tactics, both chemical and non chemical."

Farmers should determine the treatment type according to the density and distribution across paddocks.

"Spot treatments can be used for scattered or occasional FTR infestations. Target small, non-moisture stressed and actively growing plants to improve the chances of good control."

When using chemical control methods for FTR Michael said several residual herbicides were effective at stopping seeds germinating and plants establishing, and could therefore deplete the weed seedbank.

"Ideally residual herbicides are applied to a clean paddock and rain is received within two weeks of application so the herbicide can move into the surface soil," he said. "The double-knock tactic can be effective and there are a number of available options."

Glyphosate (Group M) could be followed between seven and 21 days later by paraquat (Group L) in a double-knock, with the addition of a grass-selective residual such as Balance to the second knock.

Another option for Queensland growers is a permit initiated by the Northern Grower Alliance (PER 12941), which allows the double-knock of a Group A herbicide followed by paraquat (Group L) but only in fallows that are to be planted to mungbeans. This permit is effective until August 2016 and is restricted to Queensland growers only.

But the practise of using Group A herbicides in fallow poses a high risk for resistance to develop so it is vital to only use them as part of a carefully considered IWM plan. For on-farm hygiene control in non-crop areas, imazapyr can be used.

"The efficacy of herbicides against FTR drops rapidly when plants are larger than the early tillering stage or are moisture-stressed, so spray young plants as soon as possible after rain for best results," Michael said.

"Always sow crops into weed-free conditions and delay sowing of summer crops in paddocks with a high density of FTR.

"As FTR germinates at or very near the soil surface, burying the seed below five cm will prevent germinations.

"Strategic soil disturbance is another option. One pass with a harrow has been shown to reduce the number of seedlings emerging by about 90 per cent compared to zero-till."

"The majority of FTR seeds lose viability after seven to 12 months, which means that although FTR is a difficult weed to manage, if seed production can be limited over one or two seasons then it can be brought under control."

IWM strategies to controlling FTR are detailed in a new fact sheet from the Grains Research and Development Corporation (GRDC), including the effectiveness of various control options such as strategic tillage, crop competition and on farm hygiene.

The GRDC's Feathertop Rhodes Grass Fact Sheet is available at www.grdc.com.au/GRDC-FS-FeathertopRhodesGrass ■

Feathertop Rhodes grass seedling. (PHOTO: Graham Charles)

Hot dry conditions exacerbate crown rot threat

RELENTLESS hot and dry winter and spring conditions stripped millions of dollars in yield from winter cereal crops across the northern region by exacerbating the effects of the fungal disease, crown rot.

Crown rot is caused by the fungus *Fusarium pseudograminearum* and is one of the most serious disease threats to winter cereal crops in Australia.

NSW Department of Primary Industries (NSW DPI) senior plant pathologist Dr Steven Simpfendorfer said the expression of crown rot was widespread this season and significantly affected yields in some areas, particularly in durum wheat crops.

"There are several factors that have exacerbated the expression of crown rot this year. Generally speaking starting soil moisture levels were significantly lower than in 2012 but an even bigger issue has been the above average temperatures and lack of rainfall during winter, particularly during the grain-fill period," Steven said.

"Previous trials have shown that with high infection, yield losses can be more than 50 per cent but importantly, even at low inoculum levels, you can still get yield losses of 25 per cent if the season runs against you.

"The conditions have been shocking this year – we've been sitting on high infection levels for a number of years but until now the effect has been somewhat buffered by soil moisture levels and milder temperatures during grain-fill.

"This year many crops simply ran short of stored moisture and plants had to expend additional energy to uptake limited moisture for grain fill from a greater depth in the soil. Increased evaporative demand with hotter temperatures during grain-fill also increased the expression of crown rot this season."

Steven said moisture stress during the grain-fill period encouraged the fungus to proliferate at the base of the tillers blocking up the vascular system and destroying some of the lower nodes prompting the development of whiteheads.

Depending on how far through grain formation the crop is this can mean no grain or impact heavily on screenings.

Growers were urged to monitor crops closely for signs of the disease so appropriate risk management strategies could be put in place to reduce the pathogen's survival and infection of the 2014 winter crop.

The Grains Research and Development Corporation (GRDC) advises growers to assess crown rot risk by checking for browning of the stem base or by taking soil and stubble samples for analysis.

The most effective way to reduce yield loss is by maintaining crown rot inoculum at low levels, particularly through a grass-free break from winter cereal cropping.

But drier in-crop conditions during break crops in both 2012 and again in 2013 is reducing the efficacy of these breaks with the crown rot fungus surviving longer in infected cereal stubble.

Other risk mitigation strategies include paddock selection based on previous crown rot infection levels, selection of appropriate cereal crop and variety to disease prevalence and susceptibility, and strategic sowing times.

The GRDC has also been supporting research to identify new germplasm for plant breeders that will allow future wheat and barley varieties to yield well under crown rot pressure.

Hot and dry conditions across the northern grains region have exacerbated the effects of fungal disease crown rot in winter cereal crops.

A balancing act

Steven said effective management of the pathogen's on-going survival and infection levels was a balancing act between inoculum levels and soil water.

"Often in management we focus on getting rid of infected stubble and therefore inoculum breakdown which is often to the detriment of soil water and this can actually make the crown rot worse," he said.

"It's important to remember that infection requires direct contact with the plant and most infection points are below the ground.

"So although cultivation can accelerate stubble breakdown, it can also distribute infected stubble throughout the soil as well as hindering water infiltration.

"The key message for growers is just to leave infected stubble alone – that's why inter-row sowing, especially in no-till systems, works so well as part of an integrated disease management program." ■

GRDC ups the ante in search for frost tolerant crops

THE Grains Research and Development Corporation (GRDC) will more than double its national investment into frost research, development and extension (RD&E) over the next five years. Its annual investment in frost RD&E will increase from about $1.2–1.3 million annually, to more than $3 million, from July, 2014.

GRDC northern regional panel chairman James Clark said the increased investment would be welcomed by grain growers everywhere from the NSW Central West right through to Central Queensland, whose crops were recently hit hard by late-season frosts.

"As frosts are often sudden and are difficult to forecast, they can be more financially and emotionally devastating than other cropping constraints such as drought as there is less opportunity to plan ahead and reduce input costs to minimise losses," James said.

"In the northern cropping region, direct losses from frost have been estimated to be $50–$100 million per annum and frost costs the national grains industry more than an estimated $360 million on average each year.

The opportunity cost of frost

"There is also data to suggest that the opportunity cost associated with frost risk management, particularly delayed sowing, may result in yield potential losses two to three fold higher than direct losses.

"We are responding to grower feedback by investing significant and ongoing funding into both genetics-based and farming systems frost research."

Frosts are most devastating in spring when cereals are at susceptible post-booting stages of development, with damage occurring to the plant reproductive structures.

Research has confirmed that in many areas the 'frost window' is ending later in the season, increasing growers' exposure to frost risk.

GRDC supported frost research in recent years has aimed to develop 'frost phenotyping' methodology allowing researchers to accurately measure and quantify the effect of frost on varieties in the field, regardless of environmental conditions.

"Progress made in developing this essential methodology means the GRDC is now able to increase its focus on other areas," he said.

"The new frost research to be supported by the GRDC will have three components:

- Genetics;
- Management; and,
- Environmental.

"A key plank of the genetics research will be the Focused Identification of Germplasm Strategy (FIGS) which will see cereal germplasm imported from all over the world and tested for its frost tolerance.

"The management component of the new frost investments will focus on farming systems, and measures to be investigated include the effects of stubble, grazing, nutrition and the use of plant growth regulators to manipulate flowering times.

"Research into environmental factors influencing frost will aim to understand landscape features that influence the severity of frost."

Primary research organisations which will lead the frost research include Queensland's Department of Agriculture, Fisheries and Forestry, the Department of Agriculture and Food WA (DAFWA), and the University of Adelaide.

The collaborative Australian National Frost Program (ANFP) will continue working on the production of frost rankings for wheat and barley varieties, investigate pre-emptive measures for growers and continue research into developing frost-tolerant varieties.

James said that the GRDC had invested more than $13.5 million into frost-specific projects since 2000.

"A further $43.3 million has been invested into projects aimed at delivering data and tools needed by growers to manage the impact of frost, such as variety specific agronomic information, online sowing time tools and improved long-range frost forecasting capacity," he said.

For information on frost damage and what steps to take when it occurs, see the GRDC's Back Pocket Guides, www.grdc.com.au/GRDC-BPG-FrostCereals and www.grdc.com.au/GRDC-BPG-FrostPulses. A GRDC Managing Frost Risk booklet is also available for download via www.grdc.com.au/GRDC-Booklet-ManagingFrostRisk or for purchase of a hard copy at $10 plus postage and handling from Ground Cover Direct, free phone 1800 11 00 44 or email ground-cover-direct@canprint.com.au ■

Frosts are most devastating in spring when cereals are at susceptible post-booting stages of development, with damage occurring to the plant reproductive structures.

Resistance: It's a numbers game

By Penny Heuston, GRDC Northern Panellist, Warren, NSW

JUST before harvest is the best time to audit your paddocks for herbicide resistance in different weed populations. Many farmers carry a misconception that herbicide resistance is a problem only affecting grain growers in Western Australia or in southern Australia – the reality is that every farmer has resistance.

Herbicide resistance is a naturally occurring phenomenon – it's simply a numbers game and how you manage these numbers will determine how quickly you develop the problem.

A growing number of cases of herbicide resistance have been identified across the northern region. Specifically in the NSW Central West, there are paddocks with ryegrass that is resistant to all types of in-crop grass herbicides.

The main problem weeds in the Central West are ryegrass and oats, while further testing is needed on several suspect radish populations.

Not all doom and gloom

But it's not all doom and gloom – if farmers act now, they can prevent herbicide resistance from developing into a major management issue.

Step one is to conduct a pre-harvest audit of your paddocks. If grasses have survived the spray, record the paddock and location, then send the seeds away for resistance testing.

GRDC northern panel member and Warren-based agronomist, Penny Heuston.

Step two is to develop an integrated weed management strategy. There are no 'new' magic bullet in-crop grass herbicides in the pipeline and the bottom line is that herbicides are not the answer to herbicide resistance. You cannot control resistance if you do not include non-chemical control measures in your weed management plan.

The key to success is getting weed numbers down early. Research in WA has shown that unless you achieve a 90 per cent weed control in year one, weed numbers won't be decreased in year two.

So look at all the available tools to achieve this: Chemicals, mechanical treatments, delayed sowing, spray topping, crop rotations, harvest management, or crop canopy management (for example, decreasing row spacings and increasing plant population to improve crop competition).

A source of weeds can be tram tracks and wheel tracks – in zero-till situations they are usually unsown and quite wide, giving weeds a lovely nutrient and moisture rich environment with no competition.

In-season it's vital to rotate chemical groups, and this can be made easier to by rotating crops. Integrate pre-emergents where you can, but don't use Group A chemicals on grass weeds in pasture situations.

It's also worth thinking about canola windrow burning. It's not as hard as many people think – the Grains Orana Alliance (GOA) has being doing some work in this space and a number of farmers successfully adopted the practice last season.

Grain growers can school up on the practice with an introductory video on the GOANSW YouTube channel at http://www.youtube.com/watch?v=vfpvscKiZd8 or read the GRDC Update Paper from Peter Newman, of the Australian Herbicide Resistance Initiative (AHRI). ■

Suntop weathers tough CQ winter

MOVE over Kennedy and Gregory – the new kid on the block, Australian Grain Technologies' (AGT) Suntop wheat variety – has shown its mettle in a tough Central Queensland cropping season.

First-time Suntop grower Tim Brosnan, 'Bettafield', Biloela says the variety performed well in a tough year in the central Highlands.

"Suntop was one of four wheat varieties we grew and it yielded 5.46 tonnes per hectare with a planting rate of 45 kg per hectare into a full moisture profile and with one watering," Tim said.

Under the same conditions Kennedy yielded 5.16 tonnes per hectare and the protein was comparable: Suntop tested 12.4 per cent and a test weight of 84 while Kennedy achieved 12.7 per cent in protein.

"That's the first time we've grown Suntop and we will grow it again," Tim said.

"It's good to have another variety in the rotation and it did well in a tough year.

"We didn't receive any in-crop rain this year."

Despite being planted within a day of each other, the Suntop matured a week later than Kennedy in a year marked by an early finish with dry, warm weather.

Tim says he's keen to see how Suntop performs on dryland fallow so he can compare it under those conditions with the widely-grown varieties, Gregory and Kennedy.

The moist conditions at planting encouraged yellow spot to develop so Suntop was faced with a disease burden early in the crop's growth but Tim says the variety recovered well.

Damien White, Regal Seed and Grain also grew Suntop this season and is looking forward to the NVT results when they are published later this year.

He says there were no disease issues and Suntop showed good straw strength and relatively good yields with limited moisture.

Damien says there is plenty of Suntop seed available for next year's planting and he expects good NVT results will prompt more growers to try the variety.

"Suntop is a welcome new variety to the stable of wheat grown in central Queensland and the 2012 NVT showed it was well-suited to our conditions," he says.

"It's a good variety that fits well into our main planting window and it matures later.

"It has been quite a while since we've had a well-rounded variety with Prime Hard classification and Suntop is a good full season, Prime Hard, high yielding variety."

Kerrie Gleeson, AGT Queensland/NSW territory manager based at Dubbo, NSW, says Suntop has out-performed other main season varieties under independent Grains Research and Development Corporation (GRDC) NVT in the northern region and is the highest yielding APH quality variety produced for northern grain growers by any organisation to date.

For more information, contact Damien White on 07 4992 113 or Kerrie Gleeson on 0427 958 259 or visit www.ausgraintech.com ■

Tim Brosnan, 'Bettafield', Biloela and Damien White, Regal Seed and Grain, Biloela agree AGT's Suntop wheat variety performed well in Central Queensland this season.

Uni and then back to the farm

GROWING up on the family farm in Nevertire, north west NSW, Diana George learned everything she could about cropping from her father, but these days she is the one doing the teaching.

The third year agriculture student loves nothing more than getting home and bringing her father up to date with the latest technological and research advancements.

"There is so much great research going on and things are changing so quickly that you really need to dedicate yourself to staying on top of it," Diana said.

Diana, who studies at the University of New England, is a member of the new breed of farmers who gain a university degree and a broad range of skills to take back to the family farm.

With an older sister shearing and a younger sister showing cattle agriculture is in her blood, but she said she had always known she wanted to grow grain.

Life after uni

That decision was confirmed at a careers day at the university in August when representatives of 10 major potential employers spoke to students about what life could hold after university.

Among them were representatives of the GRDC, who provided an insight into the broad range of research projects and initiatives going on in the grain industry.

"There is so much great research going on that directly benefits farmers. It is quite exciting to hear about it all," Diana said. "For example we use GPS (global positioning systems) on our farm but I would really like to use RTK (real time kinetic) technology."

She will finish her course next year and hopes to get a graduate position in the grains industry, before later returning to the family farm.

UNE School of Environmental and Rural Science lecturer Craig Birchall said the days when young people relied solely on their parents to learn how to farm were long gone.

"Agriculture is getting more and more complex and things change so quickly that farmers really need broad skills and knowledge these days," Craig said.

Issues such as food security and global food shortages had attracted new interest to the grain industry, from people who previously may not have considered it.

He said Diana's enthusiasm was representative of students planning to work in the grain industry these days.

"There is definitely a lot of great talent coming through and the industry looks in good hands for the future." ■

Diana George, who studies at the University of New England, wants to take her skills back to the farm.

SOUTHERN AUSTRALIA FOCUS

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

THE RESEARCH VIEW

Decision support for crop agronomy

PROVIDING a 'decision framework' to help growers and advisers diagnose limits to achieving potential grain yield – at any particular time in the paddock – is the aim of a national diagnostic agronomy project. Supported by the Grains Research and Development Corporation (GRDC) the project is being tailored for the GRDC's western, southern and northern cropping regions, and builds on a previous project led by the Department of Agriculture and Food (DAFWA) which delivered an online wheat diagnostic tool for Western Australia.

Kelly Ryan, of DAFWA, is leading WA's three-year 'MyCrop' project. She said the wheat diagnostic tool was being refined

MyCrop project leader Kelly Ryan demonstrates the MyCrop application (app) to grower Matt Jones, of Condingup, WA.

Consultants' Corner

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and expanded for pre and post-crop decisions and to cover other crops such as barley and canola.

"This project will provide a decision framework to help advisers and growers make use of observations, soil and plant tests to diagnose the limits to achieving potential grain yield at any point in the paddock," Kelly said.

She said that traditionally, identifying the most limiting constraint in a paddock had relied on field experience and the experience of the individual grower or adviser, with agronomic information often being scattered or difficult to access.

"The MyCrop project is consolidating and updating much of the information relating to crop production constraints," Kelly said.

"It is also developing an economic framework to evaluate the cost effectiveness of remediation measures, including the capability to quantify economic risk.

"Outputs being developed under MyCrop are being delivered under a web-based system, available online at www.agric.wa.gov.au/mycrop or via the recently launched MyCrop application (app)."

MyCrop can already help growers:

- Diagnose wheat constraints;
- Estimate whether they are reaching their wheat yield potential as determined by rainfall;
- Identify soil types and provide information about key soil issues.

Pre-season tools

Kelly said one of the pre-crop tools available from the MyCrop website was MySoil, designed to improve identification of soil types.

"MySoil currently summarises thousands of soils into 15 very broad soil types," she said. "These broad soil types are a starting point for yield estimates and the identification of major soil constraints that could be ameliorated to improve crop production.

"Under the current project, the functionality and utility of MySoil has been reviewed by DAFWA and industry representatives.

"Based on this review, MySoil will be improved to include more detailed soil information covering properties, limitations and management information and tools."

Another tool available on the MyCrop website and useful for pre-season cropping decisions is the Yield Constraint Calculator, which provides potential wheat yields for one or more paddocks or zones.

"Based on the modified French and Shultz (1984) equation, this tool estimates water-limited yield potential to account for soil plant available water capacity (PAWC), stored soil water at sowing and the gross amount of seasonal rainfall," Kelly said.

"It will help you identify areas in your wheat crop that aren't reaching their yield potential and areas that are.

"Linked to more than 670 weather stations, growers can graph actual wheat yields compared with potential yields as determined by rainfall.

"If the Yield Constraint Calculator shows that there is a big difference between a grower's potential and actual yields, they may want to investigate why."

In-crop tools

Kelly said that during the growing season, growers and advisers could make use of the wheat diagnostic tool.

"This comprehensive tool, available online and through the MyCrop app, combines paddock and crop symptoms in one resource," she said.

"It allows you to work through a simple process of elimination to identify in- crop wheat constraints, and provides direct access to supporting information.

"The app does not require the Internet, and can be used in the paddock and in even the most remote of locations.

"It can act as a diagnostic tool for those users unfamiliar with a plant symptom or a virtual library for more experienced users.

"Growers or advisers needing to diagnose a constraint can compare actual symptoms with hundreds of photos, which not only accelerates the diagnosis process but also the accuracy.

"The app includes more than 90 constraints including disease, pest, nutritional and soil issues.

"Canola and barley production constraints will be incorporated into the app in coming months."

The android version of the MyCrop App is available for download from Google Play and an iOS version is available from iTunes. ■

THE COMMERCIAL VIEW

DECISION SUPPORT FOR CROP AGRONOMY

■ **By David Cameron, Farmanco**

The MyCrop diagnostic tool is useful for new advisers as it helps them to identify what is going on in the field. It is also a useful reference for more experienced advisers, who can access Department of Agriculture and Food (DAFWA) information from the one source. This includes the details of researchers who can be contacted for further information.

MySoil – one of the pre-crop tools available from the MyCrop website www.agric.wa.gov.au/mycrop – helps you to identify your soil type and is a handy reference for soils across Western Australia. The description of soils and the assessment of plant available water (PAW) are useful for those working across a wide geographical area.

The PAW assessment feeds into the Yield Constraint Calculator. This is a useful benchmark for discussion about crop yields and what might be constraining them. It highlights these constraints well and across a range of seasons.

Advisers are likely to encourage growers to use these tools developed under the MyCrop project

Farmanco adviser, David Cameron.

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National rust program detects new wheat leaf rust pathotype in WA

A WHEAT leaf rust pathotype that can overcome the resistance genes Lr13, Lr17a, Lr17b and Lr26 has been identified for the first time in WA.

This finding follows investigations by Department of Agriculture and Food WA (DAFWA) staff, agronomists and growers after unusually high levels of wheat leaf rust were observed in September 2013 on the following varieties:

- Wyalkatchem (rated R to MR);
- Corack (rated R to MR);
- Mace (rated R to MR);
- Cobra (rated MR); and,
- Calingiri (rated MS).

Mace, Wyalkatchem, Corack and Emu Rock carry Lr13 and Fortune carries Lr17a, which are both now compromised.

The new pathotype showing virulence for these genes is known as 76-1,3, 5,7,9,10,12 +Lr37.

It was found on samples from Northampton, Borden, Gibson and Esperance by Professor Robert Park at the GRDC-funded Australian Cereal Rust Control Program (ACRCP), based at the University of Sydney's Plant Breeding Institute (PBI).

Robert says it is likely the newly-detected pathotype moved to WA last year from the eastern states – where it was first identified in October 2011 – and could potentially have spread right across the wheatbelt this season, aided by wet spring conditions.

This is the fourth wheat leaf rust pathotype to be found by the ACRCP in WA since 1990 and only the second to have traversed from the east coast since then.

Its discovery comes on the back of the ACRCP identifying a new pathotype (5457 P-) able to overcome leaf rust resistance in barley cultivars carrying the Rph3 gene, including the popular Bass variety.

These discoveries emphasise the importance of the GRDC's national rust detection and control initiative through the ACRCP and its close collaboration with DAFWA.

They also highlight the value of growers and grain industry staff submitting rust samples to the ACRCP for pathotype testing.

Wyalkatchem wheat at Northampton that was confirmed to be affected by the new leaf rust pathotype.
(PHOTO: Ciara Beard, DAFWA)

The ACRCP has been one of GRDC's core investments to monitor, assess and develop a rust management strategy for Australian growers and the latest findings demonstrate how quickly new pathogens can be detected.

Varieties affected by the new gene mutation

The newly-detected wheat leaf rust variant 76-1,3,5,7,9,10,12 +Lr37 will primarily affect the leaf rust response in Wyalkatchem, Emu Rock, Corack and any advanced breeding lines in WA that carry the resistance genes Lr13, Lr17a, Lr17b and Lr26.

Robert says its full impact and distribution will not be known until more extensive greenhouse seedling tests and adult plant field tests are undertaken.

Testing on Mace samples is continuing, but he says based on eastern states' experience with this pathotype, disease response in Mace is unlikely to be significantly affected.

"Mace does carry the Lr13 gene, but it seems to have a gene combination that provides its R to MR status and we don't expect this will change due to pressure from this new pathotype," he says.

Robert says Wyalkatchem may shift from R-MR to MS and Emu Rock from R to MS-S following further testing at the ACRCP.

Some varieties have other leaf rust genes that are expected to still be effective and will, therefore, have a lesser rating shift.

King Rock, Fortune and Zippy are likely to shift from R-MR to MR-MS.

Carnamah and Cobra may be vulnerable to the new pathotype, but further tests are needed to establish their responses more accurately.

On-farm implications in WA

DAFWA plant pathologist Kith Jayasena agrees it is likely the resistance ratings of several WA wheat varieties to leaf rust infection will shift to a higher susceptibility in the presence of this new pathotype – pending further testing.

He says growers in rust-prone areas, such as the South Coast, should be aware that future plantings of Wyalkatchem, Emu Rock and Corack will require careful disease management (similar to that used for existing susceptible varieties).

DAFWA recommends growers in these areas – and areas where rust was found this season – be extra vigilant about controlling wheat and barley volunteer crops in the lead-up to 2014 crop plantings, especially if there is a wet summer.

Distribution of the newly identified wheat and barley leaf rust pathotypes outside initial detection areas in WA is not yet fully understood.

Growers right across the wheatbelt are encouraged to monitor any remaining green material in late maturing wheat and barley crops for rust incidence and forward suspect samples (in paper packaging) to the ACRCP for analysis.

Early detection, awareness and monitoring of distribution will allow DAFWA, GRDC and the grains industry to direct research to the most needed areas.

Further information about rust, control and new pathotype mutations can be found through GRDC's The Rust Bust website: www.rustbust.com.au and the ACRCP.

Breeding efforts

Robert and his research group is now testing advanced wheat

breeding lines carrying the resistance genes Lr13, Lr17a, Lr17b and Lr26 to assess the full impact of the new pathotype and its potential future risks to WA wheat varieties.

He says screening pre-breeding wheat lines with new leaf rust pathotypes has been ongoing since the early 1970s.

Research to incorporate new sources of leaf rust resistance into new Australian wheat cultivars is also being undertaken through the ACRCP at the PBI, University of Sydney.

This is targeting potentially more durable resistance sources that are effective at post-seedling growth stages, such as adult plant resistance.

It is vital that suspect samples are sent in paper packaging, rather than plastic, to:
Australian Cereal Rust Survey
Plant Breeding Institute
Private Bag 4011
Narellan, NSW 2567

RESEARCHER RECOGNISED FOR FIGHT AGAINST CEREAL DISEASE

A scientist whose research into cereal disease continues to benefit Australian grain growers and the broader community has been recognised as an international leader in plant pathology and genetics.

Professor Robert Park, the David and Judith Coffey Chair in Sustainable Agriculture at the University of Sydney, has won a New South Wales Science and Engineering Award.

Robert, who is also director of the Grains Research and Development Corporation-funded Australian Cereal Rust Control Program (ACRCP), was presented with the Excellence in Biological Sciences category award for his major contribution to the global effort to fight diseases that infect agricultural crops.

"I feel most fortunate to have had the opportunity to have a career working on something that is a passion and to meet and work with some remarkable people," Robert said. "To be recognised for doing so is truly humbling."

Robert joined the University of Sydney's Plant Breeding Institute in 1988 and has since worked there as a world leader in seeking genetic solutions to rust control in cereals.

For the past 24 years, Robert has conducted Australia-wide analyses of wheat, barley and oat rust pathogens. His research has made major impacts on understanding genetic variability in all cereal rust pathogens and the genetics of resistance to these diseases in their respective hosts.

Profound impact

The GRDC, which has supported Robert's work for many years, has praised him for his research efforts and achievements.

GRDC Managing Director John Harvey said Robert's research continued to have a profound impact on cereal disease awareness, prevention and management in Australian cropping systems.

"GRDC's support of Robert goes a long way in enabling our nation's grain growers to continue operating productive farming systems. Rust, particularly, is a major issue for Australian grain growers and one that we cannot afford to be complacent about.

"The University of Sydney and Robert are to be congratulated for their commitment to, and track record in, finding solutions that have reduced the impact of rust diseases. Without current control measures in place, the potential yield losses would be enormous."

John said the GRDC and the broader grains industry recognised the value of investing in disease-related research partnerships with dynamic universities and institutes and in building research capacity for the benefit of the grains industry. He said Robert's accomplishments demonstrated outstanding return on grains research, development and extension investment.

"A key factor in the University's success has been its ability to foster partnerships with Australian and overseas research bodies," he said.

Professor Robert Park receives his New South Wales Science and Engineering Award from the Governor of NSW, Professor Marie Bashir

Global reach of R&D

Professor Mark Adams, Dean of the Faculty of Agriculture and Environment at the University of Sydney, acknowledged the global nature of the research: "Professor Ronnie Coffman of Cornell University was recently awarded the World Agriculture Prize for his part in this same global program. Australian funding agencies like the GRDC are to be congratulated for their support of Australian growers and the world's population, through visionary R&D."

The GRDC-funded ACRCP, which is led by Robert, involves more than 20 scientists across research nodes at the CSIRO Plant Industry, University of Adelaide, NSW Department of Primary Industries, and the International Wheat and Maize Improvement Centre in Mexico.

The ACRCP recently announced the discovery of new wheat and barley leaf rust pathotypes, underlining the importance of the program in protecting Australian crops.

Over the past 20 years, Robert has also developed a world-leading research program on rust resistance in barley, which has discovered new sources of durable rust resistance that are now protecting barley crops both in Australia and overseas.

Wild radish research refines control options

TRIALS in Western Australia's northern agricultural region this year have provided further evidence of the importance of spraying wild radish while it is small and following up with a second spray, as part of an integrated management strategy to control the weed.

The 'Managing stacked resistant wild radish with herbicides' project was initiated by the Grains Research and Development Corporation (GRDC) Geraldton port zone Regional Cropping Solutions Network (RCSN).

Agronomist Grant Thompson, of Crop Circle Consulting, is conducting the research at Northampton, Casuarinas and Chapman Valley.

"The aim of the trials is to find alternative options to kill wild radish with stacked, or multiple herbicide resistance," he said.

"Over-reliance on valuable new herbicides such as pyrasulfotole (for example, Velocity and Precept) could lead to wild radish developing resistance to them.

"The work that we've done has shown that there are other options that can achieve effective wild radish control, particularly if we use an early timing followed by a timely second spray."

Grant said the two large-scale trials at Northampton and Casuarinas in 2013, where herbicide tolerant wild radish populations are present, tested the efficacy of 56 'two-spray' herbicide treatment combinations and the results supported those from 2012 trials in the region.

"Almost all of the treatments achieved 100 per cent weed control when herbicide was applied early – at the 1.5 to 2-leaf stage – followed by a spray four weeks later," he said.

"There were cases where some herbicides performed more quickly and impressively, but most of the treatments designed by the steering committee associated with the trials provided very sound control.

"On the other hand, unacceptable results occurred when wild radish populations received a later initial spray at the five leaf stage, despite a second herbicide spray being applied."

Grant said the 'timing of application' trial at Chapman Valley clearly showed that there would be reduced control of wild radish if growers decided to wait and use just one late spray.

"This reduced efficacy occurred even when more robust treatments, with additional tank-mixed products, were applied," he said.

Grant said the best performing trial plots would be harvested and analysed for grain quality to assess the effect of the different treatments on grain yield, quality and final grain value returns.

He stressed that chemical control methods should be used in combination with non-herbicide weed control practices.

More information about the trial results is available by contacting Grant on 0427 652 521 or grant@cropcircleconsulting.com.au
The GRDC RCSN initiative aims to help growers get the information they need, when they need it, so they can make good decisions about farming practices. Details about RCSNs are available at www.grdc.com.au/rcsn
For information on herbicide sustainability practices, visit www.weedsmart.org.au
WeedSmart is an industry-led initiative aimed at enhancing on-farm practices and promoting the long term sustainability of herbicide use in Australian agriculture. ■

Grant Thompson, of Crop Circle Consulting, at the Northampton radish trial site.

Big moisture gains from early summer weed control

PRELIMINARY results from summer weed spraying trials in Western Australia's eastern grainbelt have shown significant gains in conserved soil moisture in areas where early germinating summer weeds were controlled.

The study is an initiative of the Grains Research and Development Corporation (GRDC) Kwinana East Regional Cropping Solutions Network (RCSN) and aims to provide growers in lower rainfall zones with more detailed information about the influence of summer weeds on soil moisture, nitrogen status and disease.

Precision Agronomics Australia (PAA) operations manager Aidan Sinnott, who is coordinating the trials, said that growers understood the importance of spraying summer weeds to conserve as much moisture as they could for following crops.

"This trial will help quantify the effects of summer weed control measures and increase grower understanding about the economic consequences – particularly at the business end of the season – when they are harvesting grain crops," he said.

Wide range of locations

The trials were conducted across a wide range of locations and soil types in the eastern part of the Kwinana port zone, with a six litre per hectare glyphosate (360 g active ingredient/L) treatment used at all sites in mid-December 2012.

Aidan said that where the trial plots were sprayed, additional moisture conserved in the root zone (to a depth of 40 cm) prior to seeding in 2013 ranged from 9 mm at Doodlakine to 60 mm at Southern Cross.

"All sites had a positive moisture conservation response, but two sites were compromised by sheep grazing," he said.

"Differences in soil Electrical Conductivity (EC) relating to the variation in moisture levels were clearly visible in the results from electromagnetic surveys carried out at the beginning and end of summer.

"These results were confirmed by manual soil moisture measurements conducted by the Department of Agriculture and Food WA (DAFWA).

"Spraying out summer weeds also visibly improved early crop vigour at some sites."

Aidan said this year's seasonal conditions meant that any differences in crop yields between sprayed and unsprayed plots in the trials might not be as marked as the variation between soil moisture levels at the start of the 2013 cropping season.

DAFWA staff will harvest the trials and compare crop yields at each location.

CSBP has also been involved in the research, testing soil samples for nitrate, ammonium, pH, EC, aluminium levels and electromagnetic data.

The Kwinana East RCSN aims to continue the trials in 2014 and to install soil moisture probes at most of the sites.

The GRDC RCSN initiative aims to help growers get the information they need, when they need it, so they can make good decisions about farming practices. Details about RCSNs are available at www.grdc.com.au/rcsn

More information about summer weed control and water use efficiency is available in the GRDC Summer Fallow Spraying Fact Sheet at www.grdc.com.au/GRDC-FS-SummerFallowSpraying or the GRDC Water Use Efficiency Supplement at www.grdc.com.au/GCS103

For information on herbicide sustainability practices, visit www.weedsmart.org.au

■

The trial site at Moorine Rock during the 2013 cropping season, with the unsprayed plot in the foreground.

Harper helps wheat growers farm today for tomorrow

EAST Hyden wheat growers Craig and Catherine Mayfield farm today for tomorrow. With a 5300 hectare 2013 cropping program at 'Minyaka' – an aboriginal word meaning tomorrow – the Mayfields think sustainably for tomorrow, but select varieties that do the job today.

In other words, according to Craig, they look for long season wheats which can be dry sown early and which ultimately yield well at the business end of the season.

"This is where I see a good fit for the new InterGrain APW wheat – trialled here as IGW3170 – but officially launched recently as Harper, because it gets away well, with good early vigour.

"And on the 20 hectares of Harper we sowed this year adjacent to Yitpi, a long time favoured variety here at 'Minyaka', Harper appears to have outyielded its neighbour and, on the way through, it's offered us superior disease resistance," Craig said.

Grower groups impressed

Importantly, Harper has also been commended by six different grower groups who have visited 'Minyaka' throughout Harper's growing season.

"Harper received a lot of positive grower comments and, after all, that's what it's all about.

"A cereal breeding company such as InterGrain relies on grower endorsements, because while their breeders can get the genetics right and they put the polish on the agronomic package, it's growers like us, out in the field, who ultimately invest in the variety and then, hopefully, enjoy the reward at the business end of the season via satisfactory profit margins.

"At this early stage, it seems InterGrain's Harper will tick all the boxes," Craig said.

Comparing Harper to the adjacent Yitpi crop, he summed up Harper's advantages as:

- No stem rust on Harper, but stem rust on Yitpi.
- Harper showed slightly better resistance to Yellow Spot.
- Harper heads a little taller than Yitpi.

InterGrain Marketing Manager Ash Brooks said Harper is a new APW wheat for Western Australia and it was bred by the InterGrain wheat breeding team, headed by Robin Wilson and Chris Moore, from Yitpi and Stylet, a high yielding Spear type.

"Harper has the potential to sustain its physical grain quality with good grain size and hectolitre weights," Ash said.

"It also has similar sprouting and blackpoint tolerance to Yitpi.

"InterGrain trials show that Harper is ideal when growers need to take advantage of early to mid season sowing opportunities and it also performs well when things get tough with sharp spring finishes.

"Harper also complements other mid to shorter season wheat varieties in growers' programs, such as Mace, Wyalkatchem and Emu Rock," she said.

Harper seed is available from registered InterGrain Seedclub members or local resellers.

For further information and details on Harper and its availability, growers are invited to contact InterGrain WA Territory Manager, David Meharry, Mobile 0427 855 059 or visit the website www.intergrain.com ■

East Hyden wheat grower Craig Mayfield wants long season wheats which can be dry sown early and which ultimately yield well at the business end of the season. He expects InterGrain's new APW wheat variety, Harper, released in WA on October 31, will tick all the boxes.

Global grain scene

Wheat

USDA WASDE bearish for wheat

Profarmer Grain AUSTRALIA
www.profarmer.com.au
November 13, 2013

Early November was dominated by anticipation of the USDA WASDE report which was released November 8, and the softening tone continued as the market digested the report.

Net speculator positions turned from net bought to net sold indicating that the market is betting on prices falling.

The USDA increased both global and US ending stocks, whereas the market was expecting stocks to tighten.

This resulted in an increase in the stocks to use ratio for global wheat from 25.0 to 25.4 per cent which took some pressure off the global balance sheet.

Global production outlook

Mixed production estimates were decreased for the Black Sea and Argentina, whilst the US, EU and Canada all saw increases.

The USDA increased the Canadian wheat production estimate to 33.2 million tonnes (mt) from 31.5 mt, whilst CWB also increased their wheat production estimate to 31.39 mt vs Stats Can at 30.46 mt.

The Australian crop size remains contentious – the USDA Australian attaché has the crop at 23.5 mt, whilst the USDA official estimate came out on Friday at 25.5 mt and Louis Dreyfus have forecast a range between 27.5 mt–28.0 mt.

There were early concerns for Russian planting progress but progress is now 87 per cent complete and the recent estimates suggest that they will come in on par with the average.

Global buying continues

EU issued a further 461,000 tonnes of export licenses bringing cumulative licenses to 9.4 mt vs 5.7 mt last year.

Russia exported 8.7 mt in the first 9 months of the marketing year vs 12.7 mt in the same period last year.

Cumulative US export sales are at 69.8 per cent of the USDA forecast vs the five year average of 58.6 per cent.

Egypt purchased 60,000 tonnes from Romania during the week, Morocco purchased 55,000 tonnes of EU soft wheat and Algeria purchased 650,000 tonnes.

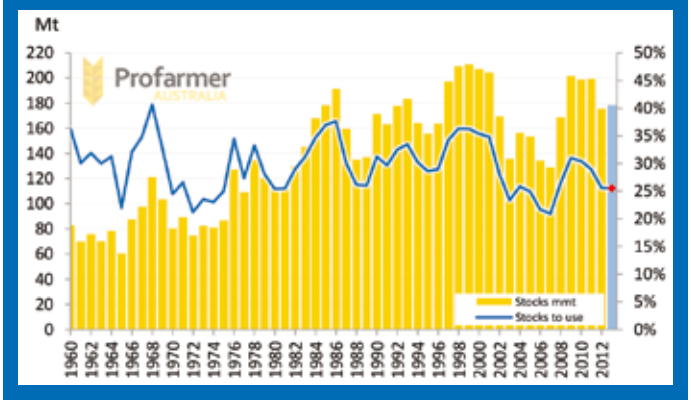
CNGOIC have Chinese wheat imports at 5 mt for 2013–14 whilst the USDA have it at 7 mt – but the trade don't tend to pay too much attention to Chinese estimates due to their tendency to mislead the market in their favour.

Coarse grains

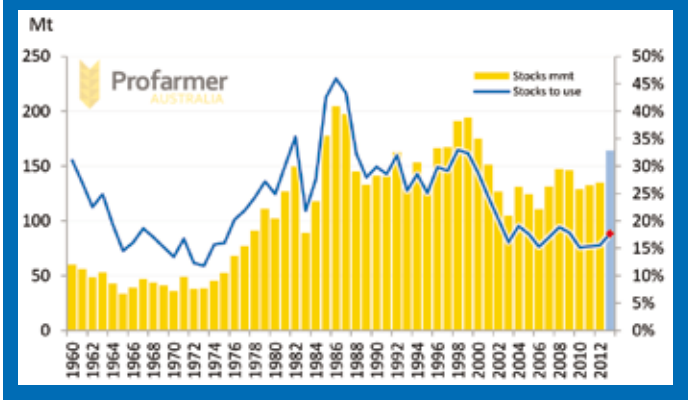
USDA WASDE neutral to bearish for corn

Corn moved higher following the USDA report as traders moved to reduce their net short position in CBOT corn, feeling that corn had been oversold and the report was not as bearish as anticipated.

World wheat stocks to use



World corn stocks to use



World wheat (mt)	2013–14			2012–13	
	Nov	Sept	Monthly +/-	Nov	Yearly +/-
Opening Stocks	**175.59**	173.85	1.74	199.37	-23.78
Production	**706.38**	708.89	-2.51	655.49	50.89
Total Use	**703.49**	706.47	-2.98	679.28	24.21
Ending Stocks	**178.48**	176.28	2.20	175.59	2.89
Stocks/Use %	**25.4%**	25.0%	0.4%	25.8%	-0.5%
Aust End Stocks	**3.77**	3.77	0.00	3.70	0.07
Arg End Stocks	**1.05**	0.70	0.35	0.59	0.46
Can End Stocks	**7.25**	6.55	0.70	5.06	2.19

World corn (mt)	2013–14			2012–13	
	Nov	Sept	Monthly +/-	Nov	Yearly +/-
Opening Stocks	**134.86**	122.59	12.27	132.46	2.40
Production	**962.83**	956.67	6.16	862.71	100.12
Total Use	**933.36**	927.84	5.52	860.30	73.06
Ending Stocks	**164.33**	151.42	12.91	134.90	29.43
Stocks/Use %	**17.6%**	16.3%	1.3%	15.7%	1.9%
US End Stocks	**47.94**	47.11	0.83	20.92	27.02
Brazil End StOcks	**11.81**	14.31	-2.50	16.01	-4.20
Arg End Stocks	**0.91**	0.91	0.00	0.90	0.01

The market took this opportunity to close the wheat corn spread with wheat failing to follow corn's lead.

The news for corn was fundamentally bearish but just not as bearish as the market expected with US ending stocks and production estimates coming in below expectations, despite yields coming in at 160.4 bu/ac, above the market estimate of 158.8 bu/ac.

China's growing sorghum demand

The USDA WASDE reiterated the belief held by their Chinese attaché that Chinese sorghum imports would rise 1.3 mt in 2013–14 to 2.0 mt.

The USDA estimates that more than half of this year's demand will be filled by the US, but this still leaves plenty of opportunity for Australian sorghum.

Chinese import growth has been exponentially rising from 86,000 tonnes in 2011–12 to 702,000 tonnes in 2012–13 (all from Australia) to 2 mt forecast for 2013–14.

Last marketing year Australia exported 700,000 tonnes to China for production of a sorghum liquor, which drove domestic prices to record highs.

With the dry conditions holding up Australian sorghum plantings we can expect another tight sorghum balance sheet this year. ■

China's importation of 700,000 tonnes of Australian sorghum drove local prices to record highs.

Domestic grain scene

Profarmer Grain AUSTRALIA

www.profarmer.com.au November 13, 2013

Wheat

To the point...

- Australian wheat prices perform very strongly vs CBOT futures.
- Delayed harvest, a lack of farmer selling and the realisation that the northern feed area will be just as tight as last year are helping support Australian prices.
- International trades appear quiet for the time being.

Australian prices tread their own path

Australian wheat values were stronger during the first week of November right across Australia despite CBOT wheat futures ending the week lower. A drop in the A$ by more than 1.5 USc helped to support, but the biggest driver of price gains was an improvement in local Australian wheat basis.

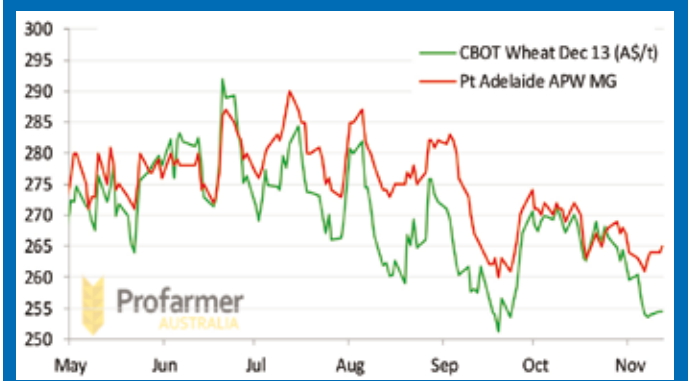
Port Kembla basis led the charge higher over the week as wet weather through that area continues to delay the harvest whilst there is a fully booked shipping stem that merchants are eager to execute.

International trades through last week indicated Australian wheat values were supported but there appears to be very little on the international trade front since then so it is difficult to know where Australian values are trading in relation to other origins (ie the competition).

Anecdotally it appears a number of the international buyers of Australian wheat do not have a short term need to keep buying as they are reasonably happy with the level of cover they have in place for the moment.

We feel the improvement in basis recently is simply due to growers not selling whilst shipping slots out of southern states are

2013–14 wheat prices



The improvement in Australian values was despite CBOT wheat futures pushing near the lows for the season in A$ terms.

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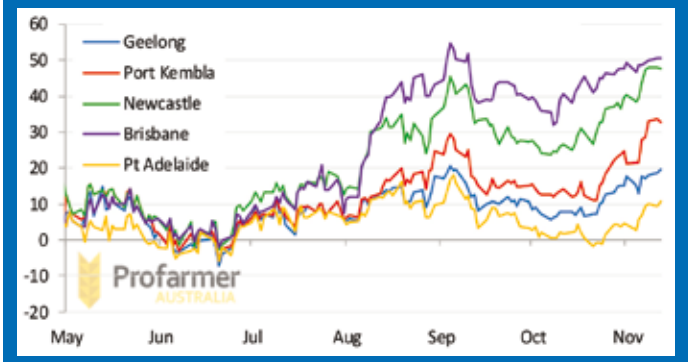
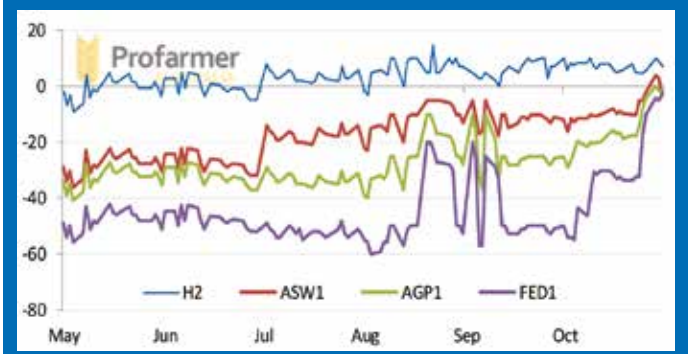
2013–14 east coast wheat basis



Wheat basis is back near season highs in all port zones except SA and WA, the export orientated states.

2013–14 wheat grade spreads from APW – Newcastle



Wheat is wheat in northern Australia as the realisation hits that grain will again be very tight this year.

reasonably full, except in WA where merchants have taken a more cautious approach after some got burnt there last year. It is a good idea to sell when others are not and buyers are bidding strongly for your grain, try to avoid selling when everyone else is selling and bidders don't feel the need to compete to attract your grain.

For growers in the northern states of eastern Australia, the realisation of just how tight things are up there is hitting home as the harvest gets into the second half. Australian Crop Forecasters have total production for southern Qld at 906 kt and northern NSW at 1.346 vs 1.3 million tonnes and 1.548 mt respectively last year – and that was a tight year.

The continued dryness up there is now putting pressure on the sorghum crop getting planted. It was hoped by feeders that the sorghum crop may provide some relief from the very tight situation in the northern feed area. The longer the dryness continues, the more nervous buyers are about securing adequate supply for their year. Especially given the increase in use of Australian sorghum by the Chinese last year.

So wheat is becoming wheat in the north Australian port zones evidenced by the premiums and discounts to higher or lower grades of wheat to APW closing up (refer chart).

In the export orientated states of SA and WA the higher protein spreads have been slowly grinding higher. We expect there will be more volatility in this premium over the harvest period as merchants look to accumulate grades to fill ships at the correct quality. But unless something disastrous happens to the Australian season, we expect at some stage after harvest this premium will close up again.

Barley

To the point...

- Malt buyers are trying to engage with growers. Premiums are being offered for preferred varieties and sites.
- We suggest harvest is the time to sell malt.
- Feed barley is becoming harder to paint a bullish picture.

Malt barley

Recently we gave the heads-up that we are starting to see some appetite in malt barley. The malsters are trying to engage with the grower as they look to start covering their yearly requirement.

Port Kembla has led the charge higher in malt prices this past week given the reasonable domestic demand levels in that area and the recent heavy rains received by many growers on the cusp of barley harvest.

Eastern Australia prices on the whole have followed the lead of WA prices that has seen steep moves higher in WA Baudin prices in recent weeks.

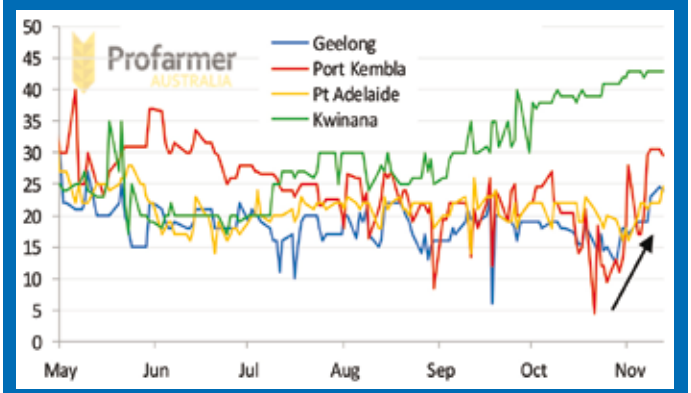
Despite this improvement in some malt prices, malsters are being selective of variety and preferred sites as to what and where they buy. For example, Baudin is the preferred variety in most port zones with premiums being paid for this variety. This implies that malt buyers and traders are not overly concerned that there will not be enough malt to meet their requirements as yet. When malt buyers do get concerned over total malt supply, you generally see the less preferred malt variety prices such as Buloke, Commander and Gairdner move more in line with Baudin values as merchants look to cover requirements.

Given premiums are being paid for certain varieties and at certain preferred sites, it is worth doing your homework and possibly carting to preferred sites to deliver your malt. Also be prudent on checking domestic delivered markets which can sometimes offer a premium for delivery direct to malster storage if your harvest logistics can handle it.

Feed barley

It is getting harder and harder to make a bullish feed grain story. Goldman Sachs recently revised down their expected CBOT corn price estimates to 400 USc/bu for the three and six month

2013–14 malt-feed spread



Malt premiums over feed barley have been improving in the export orientated port zones (ie not Qld/Newcastle) although more so for specific varieties and at preferred sites and delivery zones.

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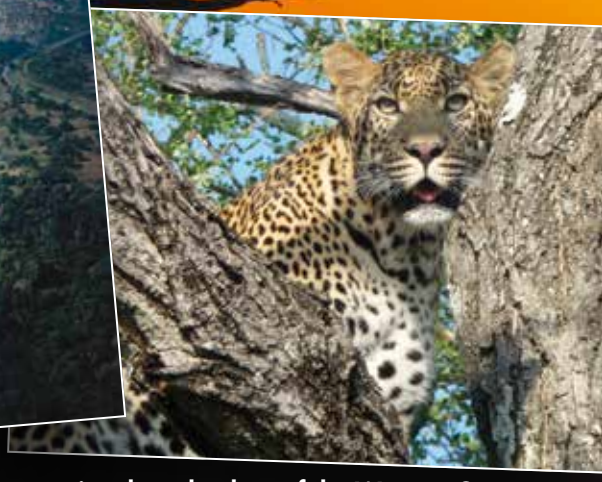

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outlooks (currently trading at 432 USc/bu in Dec13 and 444 USc/bu in Mar13.

This week has seen a bounce in CBOT corn values on the back of a USDA report which was still bearish, but less bearish than the market expected. So it prompted fund managers to buy back some of their record net short position to reduce some of their risk.

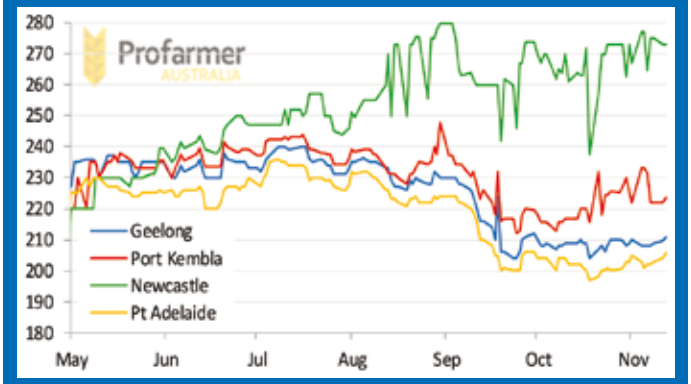
But please note, speculators still hold a massive short position in corn which makes money out of corn prices falling. They continue to bet on corn values falling.

In addition to the international scenario, Australia is looking to have a massive exportable surplus out of the southern states. Currently Australian Crop Forecasters is estimating Vic production up 400 kt from last year, SA production is up 460 kt, and WA production is up over 600 kt year-on-year.

There is a large crop that needs to be moved onto the international market. Obviously the tight feed markets in northern Australia are a completely different scenario.

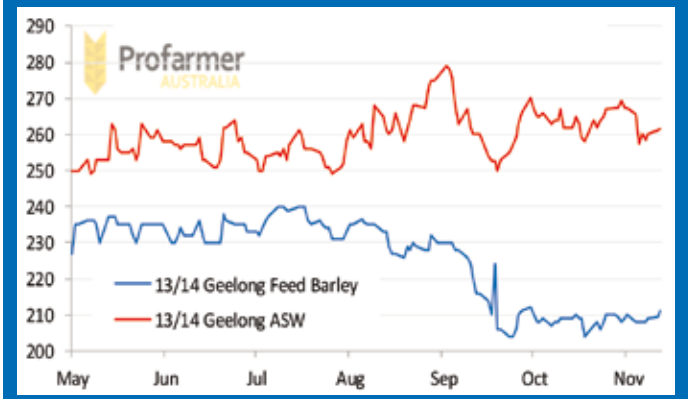
The only major supporting factor for feed grains is the current discount to wheat values which is seeing a move by feeders away from wheat towards feed grains such as corn and feed barley.

2013–14 east coast feed barley



Feed barley values in the south have seen a little uptick recently, but will be dictated by export values and it is getting harder to paint a bullish picture.

2013–14 ASW vs F1 Geelong



The discount of feed barley to wheat remains a supportive factor to feed barley. But will wheat fall rather than barley rise?

Canola

To the point...

- Some support in international values on tighter supply and continued demand for oilseeds.
- The Australian canola balance sheet looks as though it will be extremely tight again this year.

International

International oilseed values continued lower at the end of last week leading into the USDA report. The trade was expecting larger yields from the US soybean crop as harvest reports continued to report better than expected yields. But it was not expecting the cut in harvested acres projected by the USDA. This left ending stocks at historically tight levels which saw the trade push values higher Friday night and this has continued during this week.

US soybean stocks remaining tight this year is a positive for Australian canola values. But a big crop in Canada continues to weigh on the market and it was reported that growers there have been more active sellers on this recent rally. Bunge upped their Canadian canola production estimate to 17.43 mt during the week, as compared to Stat Can at 15.96 mt.

Australian canola supply and demand		
	'000 tonnes	Comments
Carry-in Stocks	200	Note this is predominately in WA
2013–14 Production	3400	Production is down 330 kt in southern NSW & 275 kt in Vic year-on-year
Domestic Use	860	As per ACF
Expected Exports	2500	3.9 mt in 13/14 of which China bought 670 kt; 2.5 mt in 12/13
Carry-out Stocks	**240**	

Below is a summary of what we see impacting Australian canola values:

Bullish factors

- US soybean stock-to-use remains very tight as the harvest there finishes up.
- Chinese buying of US soybeans continues at a strong pace.
- The potential for the Chinese to buy a significant portion of the Australian canola.
- A poor finish in the Goulburn Valley in Victoria and south eastern NSW in terms of frost, dryness when grain was filling, and now wet conditions delaying the harvest, has knocked a dent in production prospects. This is on top of acres being lost through parts of the mallee due to a very dry start to the year.
- Total Australian crop expected to come in 700 kt less than last year (according to ACF).
- Very tight carry-in stocks in Australia leading into this harvest.
- It looks as though very tight carry-out stocks in Australia at the end of next year.

Bearish factors

- A record large Canadian crop – which seems to keep getting bigger – will continue to compete with Australian values.
- There is an expectation that South America will produce a very large soybean crop. Harvest of this crop occurs in Mar-Apr next year. Plantings in Brazil are nearing completion and Argentina is still in the crux of planting under improved conditions due to recent rains. A number of estimates have Brazilian production to exceed US production. But there is some way to go here.
- Whilst the Australian crop is smaller than last year's record production, it is still large at 3.4 mt, so there may be a surplus if the Chinese do not buy in reasonable quantities.
- EU imports from Australia are expected to be less than last year given their larger crop.

Australian crop

Locally as the harvest rolls on, reports out of the Goulburn Valley in Victoria and south eastern NSW is of very disappointing canola yield results. This is likely to see another tight carry-out situation leading into next year's harvest depending on where exports come in.

The Australian canola supply and demand table is some back of the envelope numbers on how we see the situation this year.

Note we would suggest we are using conservative export numbers, although we are seeing the large Canadian crop providing relief to Australian demand from importers, and if the South American soybean crop comes in, we will see some relief there on the export front.

But now Australian canola has access to China! If they come, the export numbers used in our table could well be understated. So it is likely we will again have a very tight stock situation.

Pulses

To the point...

- Australian pulses and legumes start to trade

Australian markets

Although sales remained generally limited, some new crop legumes and pulses are starting to move into the market as prices have improved and some growers want to clear storage space for other commodities.

The lupin market on the Eyre Peninsula has improved recently as it tries to close the discount to WA lupin values.

Generally speaking, the chickpea market remains uninspiring. Although the rains have disrupted the Indian Karif harvest and delayed Rabi planting, it is not a game changer and the Rabi crop will benefit with good moisture ahead of planting.

The faba bean market is also lacklustre as it struggles to compete against good quality supply of UK and French Beans into Egypt.

Notably, Nipper lentil prices have had a very good run this past week as buyers try to engage the grower.

Field peas are also pushing higher as buyer appetite improves although the market remains burdened by Canadian and French supply.

International pulses

International lentil markets finished the week firmer as a number of exporters require short covering and new demand emerged.

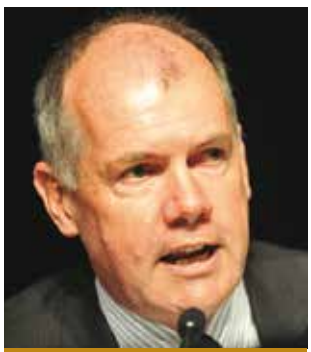
The USDA estimates were basically inline with expectations. Available supply of lentils is down about 82,000 tonnes, but demand is expected to decline also, so possibly there is little change to ending stocks.

Reports from Argentina indicate this year's crop will not meet domestic requirements and they will need to be a net importer again. The crop was expected to total around 19,000 tonnes but rainy weather conditions in the growing area is expected to hurt both yields and quality. Concern is also being expressed about Argentina's pea and chickpea crops. ■

Australian agricultural R,D&E systems under scrutiny

By Mick Keogh, Australian Farm Institute

AUSTRALIA'S agricultural research, development and extension (R,D&E) system (also referred to as the 'agricultural innovation system') has served the agricultural sector pretty well in the past, but questions are now emerging about its capacity to continually improve the productivity, profitability and competitiveness of Australian agriculture.



Mick Keogh.

The system is coming under stress as governments reduce funding for agricultural research leading to staff reductions and research centre closures, and university agriculture faculties are failing to attract students or capture research grant funding.

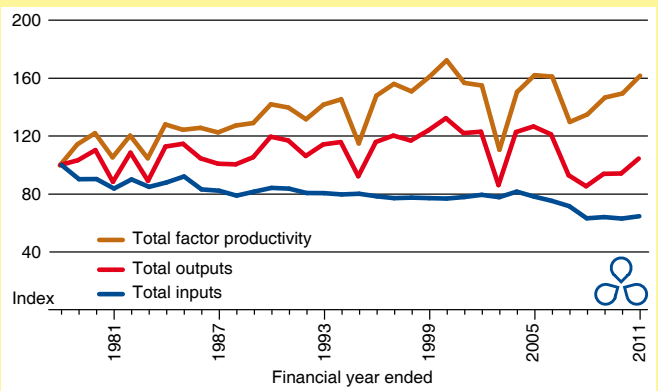
The private sector is becoming increasingly important in delivering technology and information, but will this be enough to compensate for the big losses that are occurring in the public sector? These issues were discussed at a conference held earlier this year by the Australian Farm Institute, and some of the critical issues raised are considered in the following article.

Agricultural productivity growth is crucial

The slowing of productivity growth rates in Australia's agriculture sector is an issue that is attracting increasing attention. High productivity growth rates provide businesses in the sector with the best opportunity to be more profitable – all other things being equal – and hence productivity performance is critical to longer-term agriculture sector growth.

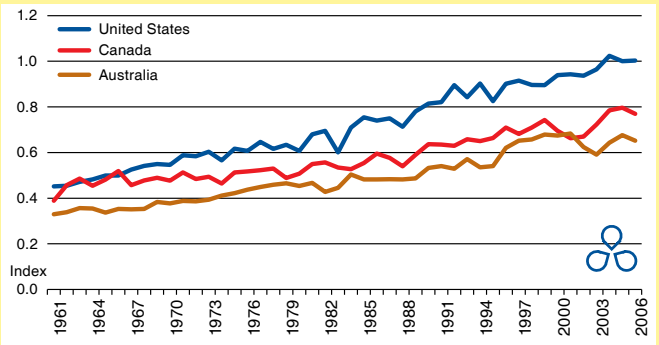
Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) analysis has identified that up until the mid-1990s, Australian agricultural productivity growth was quite high and averaged more than two per cent per annum for an extended period (Figure 1). But since that time, productivity growth in broadacre agriculture has been quite low, and by some calculations has been negative.

FIGURE 1: Total Factor Productivity (TFP) for Australian broadacre agriculture



Sources: ABARES (2013)

FIGURE 2: Total Factor Productivity (TFP) trends for Australia, US and Canada.



Sources: ABARES (2013)
*Index: United States of America agricultural TFP in 2005 normalised to one.

The extended drought that occurred across most of southern Australia from 2002–09 has been identified as a potential reason why agricultural productivity growth rates have apparently slowed over the past decade, but subsequent ABARES' analysis correcting for rainfall anomalies, did not cancel out the apparent decline in productivity growth.

This trend is not unique to Australia, and many developed nations are also experiencing a slowdown in agricultural productivity. But the worrying issue for Australia is that lower rates of agricultural productivity growth appear more pronounced than in other nations. Figure 2 provides a comparison of agricultural productivity growth rates in Australia, the US and Canada since 1961.

It highlights that while Australia has had comparable productivity growth rates up until about 1997, performance since that time is cause for concern.

It is easy to dismiss concerns about productivity performance as something that is only of interest to economists and policy-makers, but it is useful to remember that every one per cent productivity gain is worth A$500 million per year to the Australian agriculture sector – or A$4200 per year to the average farm.

Change is needed

The key findings from the analyses and data referred to above is that the Australian agricultural innovation system is no longer producing the benefits that it has in the past, and that change is needed if the desire of industry and government is to encourage the sector to grow and take advantage of accelerating global food demand.

Many immediately point to the static and declining levels of public investment in agricultural R,D&E since the 1970s as the most likely cause of current productivity trends (Figure 3). Other factors that might be contributing include that Australia has reached the limit of its available good land and water resources, or that the sector is yet to fully recover from the extended drought that commenced in 2002.

Irrespective of the importance of these factors, they simply make it even more important that action is taken to try and address declining agricultural productivity growth rates.

Government funding declining in real terms

Of all the different factors potentially contributing to a decline in agricultural productivity growth rates, the decline in real funding of agricultural R,D&E by governments is most commonly identified as the major concern. But the odds of a big boost to R,D&E funding at the Australian or state government level are not high during these fiscally prudent times.

Additionally, if the Australian Government did put more money on the table, state governments are highly likely to cut their funding in response, and transfer more of the funding burden to industry.

Of the groups that provide funding and resources to agricultural R,D&E, the amount that state and territory governments contribute, and how that has changed over time, is a matter of some uncertainty. The Productivity Commission attempted to provide an estimate of state government agricultural R&D expenditure in its error-ridden 2011 report on rural research and development.

That report suggested that total state and territory expenditure was about A$416 million in 2008–09, but sloppy analysis and a decision to use its own definition of what constitutes R&D expenditure meant that the estimate was seriously flawed.

A source of data that appears more reliable is the information that is collated annually by the Australian and state governments as part of the nation's report to the Organisation for Economic Cooperation and Development (OECD) on subsidies and public funding provided to the Australian agricultural sector.

The data is compiled by the Australian Government based on information provided by the respective state agriculture departments, and separates expenditure on agricultural R&D from related agricultural extension.

Figures 4 and 5 show that the states and territories invested just under A$200 million in agricultural R&D in 2011, and just under A$100 million in related agricultural extension activities in the same year, highlighting the major weaknesses in the Productivity Commission's A$416 million estimate.

What is also obvious from this data is that the commitment to agricultural R&D investment by state and territory governments in Australia has deteriorated significantly over the past decade, particularly when considered in real terms and from the perspective of research intensity.

The investment intensity in R&D by the states has halved over the past decade, falling from 0.9 per cent of gross volume of agricultural production (GVAP) in 2001 to around 0.4 per cent in 2011.

These figures highlight the fundamental problem in any efforts that are made to lift agricultural productivity in Australia by increasing agricultural R&D investment from government sources.

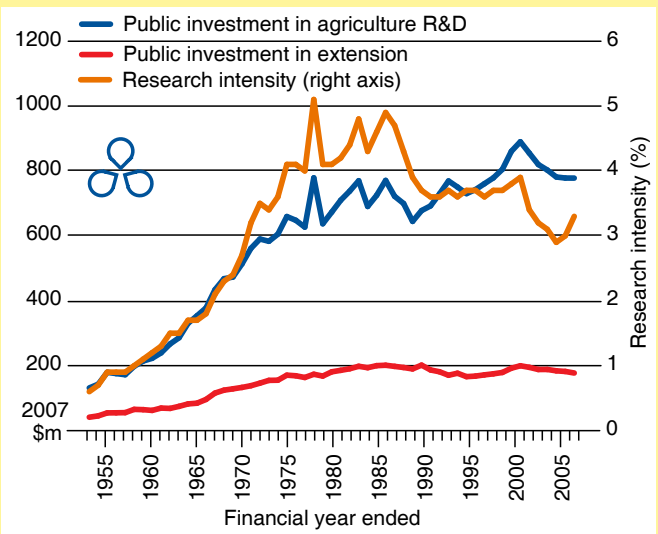
There is little point in the Australian Government committing to an increase in agricultural R&D investment, if it simply results in the states deciding they can further shirk their responsibilities.

A binding funding agreement between the Australian Government and the state and territory governments will obviously need to be an essential component of any future efforts to boost agricultural R,D&E investment, and improve agricultural productivity in Australia.

Universities are becoming the weak link in agricultural R,D&E

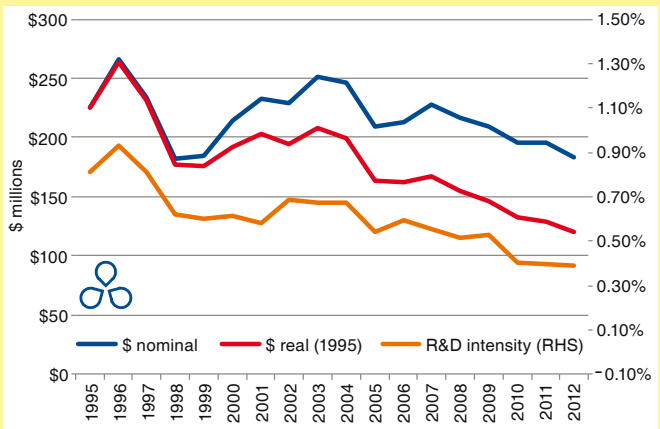
The research engine of the agricultural innovation system in Australia includes the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the state Departments of Primary

FIGURE 3: Total public investment in agricultural R,D&E



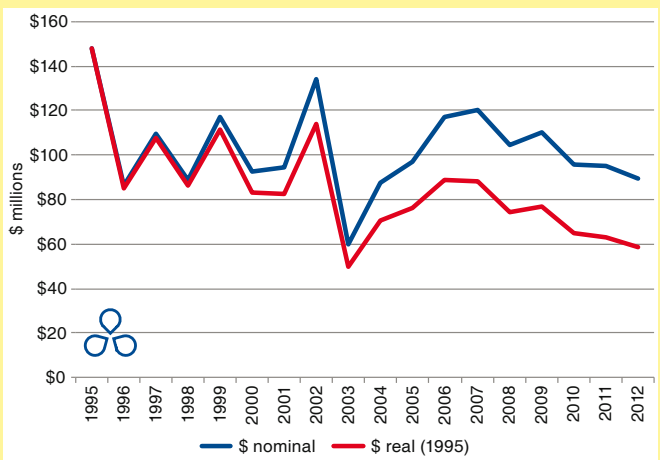
Sources: ABARES (2011)

FIGURE 4: State government agricultural R&D investment



Sources: OECD (2012)

FIGURE 5: State government agricultural extension investment



Sources: OECD (2012)

Industries (DPI), universities, and researchers employed in the private sector. But in many ways the universities play the most crucial role both as centres of research, and also as the training ground for future researchers.

Evidence that has emerged over recent years suggests that Australian universities are becoming the weak link in the Australian agricultural innovation system, and without significant change, the situation appears likely to get worse.

Data compiled by the Australian Council of Deans of Agriculture shows that annual enrolments in university agriculture courses have declined rapidly in Australia over the past decade, which raises some questions about the viability of university agricultural faculties as teaching and research institutions.

Contrast an agricultural course with a commerce course that attracts hundreds of student enrolments, many of them from overseas and paying relatively high fees, and requires no more than a lecture hall and a few tutorial rooms, and you begin to understand why Deans and Vice Chancellors are reluctant to give extra resources to agriculture faculties.

Research activities of Australian universities are assessed by the Australian Government under the Excellence in Research Australia (ERA) arrangements which are used as part of the assessment process for future research funding. One of the main criteria used to assess research outputs is the number of publications produced, with international publications receiving higher scores.

This creates an incentive to focus on research that has the potential for international publications, rather than research into issues that are a real problem for Australian farmers.

A further challenge for university agricultural researchers is that the performance assessment 'system' within universities generally discourages researchers from spending time interacting with farmers and the wider agriculture industry.

Agricultural faculties are expensive to run in Australian universities and often 'lose-out' to those faculties attracting more student fees.

The end result is that university researchers are increasingly remote from the sector they are aiming to service.

Will the private sector pick up the slack in agricultural R,D&E?

In nations such as the US the private sector is becoming a more important source of funding for agricultural R,D&E. What this means for the future of agricultural R,D&E investment in a nation such as Australia is not yet clear, but it certainly means that a change in thinking and policy is required.

Based on the best available estimates, the total public sector investment in agricultural R,D&E in Australia annually is approximately A$1.2 billion, and around half that investment is by the Australian Government with the other half split roughly between the state governments and farmer levy contributions.

The level of private sector investment in agricultural R,D&E in Australia is a lot less certain, with a survey completed by the Australian Farm Institute in 2011 estimating that the total annual investment could be between A$100 million and A$200 million.

This means that private sector investment levels in Australia are between 10 and 20 per cent of public investment levels, markedly different to the 50:50 public/private split estimated for the US.

The Productivity Commission somewhat naively assumed that if Australia scaled down public sector investment in agricultural R,D&E, the private sector would pick up the slack. But that simplistic conclusion ignores the reality that Australian agriculture is not like agriculture in the northern hemisphere, and that the total market for farm inputs in Australia is relatively small.

It also ignores that Australian agricultural products are exported globally, and that any innovative farm inputs or systems used in Australia must be acceptable internationally.

Given that the minimum cost of registering most new chemical products globally is in excess of US$250 million, it does not make sense for a global agricultural technology company to invest in R,D&E to develop products uniquely for Australian use.

This creates a very real risk that, were Australia to downscale public R,D&E investment, critical R,D&E areas that Australian agriculture needs to invest in would simply be ignored, and Australian agricultural productivity and profitability would further stagnate.

An alternative option that appears more promising is for public sector agricultural R,D&E organisations in Australia to use more of their resources to leverage co-investment from global-scale private sector agricultural R,D&E corporations.

To many this might seem like 'selling out to the multinationals' or 'supping with the devil', but it is something that seems much more common internationally than is the case in Australia.

Public sector R,D&E organisations in North America and Europe appear to regularly work cooperatively with private sector organisations, to the mutual benefit of both.

Getting the research mix right

One of the biggest challenges in managing an R&D portfolio lies in achieving an appropriate mix of projects that range from basic research right through to market-ready products and systems. Whether the Australian agricultural R,D&E system has that balance right is an open question, but the indicators suggest that there has been a drift towards short-term applied research activities, and a drift away from long-term basic research activities. While this may deliver some immediate results, it creates the risk that Australian agricultural innovations will dry up over the longer term.

The fact that Australian agricultural R,D&E is a set of activities that are carried out semi-autonomously by a range of different

government, industry and private-sector organisations makes it very difficult to obtain a comprehensive overall picture of the complete Australian agricultural R,D&E portfolio.

This situation is somewhat different in the US, where the key role of the US Government makes it possible to better coordinate and report on R&D activities.

In Australia, the nature of the agricultural R,D&E portfolio and how it is changing over time can only be surmised, but it is fair to say that there is less funding of basic research, and more funding of applied research and experimental development.

This assumption arises from the fact that both Australian and state governments have been reducing funding in real terms, and progressively increasing pressure on their research bodies to secure more of their funding from external sources.

The CSIRO, for example, is rumoured to require its research divisions to obtain up to 40 per cent of their funding from external sources, and universities and state agricultural agencies have made a habit of moving research staff onto projects funded from external sources when budget cuts are imposed. The end result is that the Rural RDCs have become more important sources of external funding for government research agencies, as have private-sector companies.

Both these funders are likely to place a greater emphasis on short-term projects that deliver commercial benefits.

For a relatively small nation such as Australia, there is some sense in having an agricultural R,D&E portfolio that is weighted less towards basic research and more towards applied research, because there is the opportunity to take advantage of the results of basic research being carried out internationally. But completely abandoning the basic research end of the spectrum in Australia brings the risk that some of the fundamental areas of high-priority interest to Australian agriculture will not be addressed.

An additional challenge for the Australian agricultural R,D&E system is the lack of clarity about which agencies or organisations are the natural 'home' for the more basic agricultural research activities. Basic research of necessity involves access to expensive equipment, well-resourced laboratories and highly-qualified support staff, all of which should be available at universities with major agricultural faculties.

Improving the performance of the Australian agricultural innovation system

Based on the principal that 'what gets measured gets managed' a very basic first step in overcoming some of the apparent weaknesses in the Australian agricultural innovation system is developing a better reporting system, so that funding levels and research activities are more transparent.

The USDA's Current Research Information System (CRIS) is an example of an efficient system that provides a clear picture of what a national agricultural R,D&E portfolio actually looks like.

In Australia, some major changes are also needed in the performance assessment 'system' for university agricultural research. A revamp of the 'Excellence in Research Australia' system is needed to put much greater emphasis on industry impacts. University researchers should also have much stronger incentives to spend time engaging with industry, and have available longer-term, larger-scale projects that provide better opportunities for career advancement and more secure tenure.

The steady erosion in public sector funding levels clearly needs to be addressed. The recent announcement of extra funding by the Australian Government is greatly welcomed, but the government should insist that the state and territory governments sign up to a binding long-term inter-governmental funding agreement before a single cent of that money gets to researchers employed by state governments.

Finally, it is obvious that the role of the private sector will become more important in the future, as a source of research and development funding, and also as the main provider of extension services. A major challenge will be making sure that there is good interaction between public and private R,D&E organisations, and that contractual arrangements have low transaction costs and avoid unnecessary bureaucracy. Making this happen will be a major challenge due to the different entrenched cultures that exist, but this is a situation where Rural RDCs could play an important facilitation role.

Australian agriculture has a lot of work to do

Ultimately, the land and water resources available for Australian agriculture are limited, and most future increases in agricultural output to meet growing world demand will need to be generated through productivity growth. The main way to achieve consistent increases in productivity growth rates is to invest in agricultural R,D&E, and at the same time to take steps to ensure that the agricultural innovation system is performing at an optimum level.

Australian agriculture has a lot of work to do to improve the performance of its innovation system, and it is of concern that at this stage there is no obvious leader driving the necessary changes. ■

Farming in Foreign Fields...

South-East Europe is speeding up

Aided by excellent geographic poistioning, InterAGRO is developing into a leading European farming group

LEADING agricultural economists from the World Bank estimate that South-East Europe is already one of the top arable farming regions on the planet. Excellent chernozem soils and an ideal climate – especially for the cultivation of maize and soybeans – provide outstanding natural conditions for state-of-the-art agriculture on the Danubian Plain.

On top of this, the Danube provides an optimum transport link in the region, especially over the Black Sea and onto the world market as well as closer to home into Austria and Germany.

High value creation potential

So it is hardly surprising that agricultural economists forecast maximum value creation potentials for the area over the next few years on the basis of existing natural resources and the known reserves.

The only downsides – on the one hand, the frequent summer dryness and on the other, the persistent political instability in many countries.

Alongside Hungary and Serbia, Romania is also one of the top locations in the Black Sea region. A total of 9 million hectares of arable land are available here. In addition to largely excellent soils and sufficient precipitation, there are also adequate fallow areas available for further operational growth.

Furthermore this EU country increasingly offers legal certainty and has a land inventory.

And it's here where InterAGRO has its field of operations and is now one of the largest Romanian agricultural groups.

Since 1985 the company has developed rapidly.

Alongside pure agriculture the company now also devotes itself to food processing – for example dairy and milling products – through to energy and fertiliser production and to tourism.

The agricultural group for which director Sorin Dogaru is responsible includes a total of two business divisions:

- The cultivation of cash crops, including grain, maize and soybeans; and,
- Grain storage and marketing with more than 800,000 tonnes of preparation and storage capacity.

Technical and innovative progress

In all, InterAGRO works more than 50,000 hectares of productive agricultural land. If you add contracting work and machine use, more than 75,000 hectares spread over 11 sites are worked every year.

From smallholder subsistence agriculture in a communist country, Sorin Dogaru has developed his operations in the past 15 years to become one of Europe's leading arable farming groups.

His recipe for success is that he relies not only on personal initiative, but also on technical and innovative progress. Here Sorin relies first and foremost on intensive plant nutrition, careful seed selection and excellent pest control.

He has also always invested in state-of-the-art tillage and harvesting technologies with the aim of a rapid reduction in working costs.

Sorin Dogaru, head of InterGrow.

Fast progress

Thanks to increased efficiencies, the company has, on average, doubled its yields over the past decade. In the case of maize this means nine tonnes per hectare; wheat just under seven tonnes; and, with canola the company is heading for an average of aroundfour tonnes per hectare.

In the past few years nearly all operations and crop rotations have been converted to state-of-the-art processes. The key machines here are Case IH Magnum and Quadtrac tractors, with power seeding and soil cultivation equipment at working widths of 12 or 18 metres.

"The decision to switch to wider working widths has enabled us to reduce mechanisation to less than one horsepower per hectare," says Sorin.

Non-plough tillage is standard at InterAGRO, as is the use throughout of GPS systems, not only for tracking and data logging on the field, but also for the permanent monitoring of the entire machine fleet.

"Using telematic systems we have been able to mobilise further reserves and, for example, conduct machine comparisons in real time."

The InterAGRO fleet now includes 11 Quadtrac and 32 Magnum tractors. The machines are used on 12 or 18 metre wide combinations for direct seeding and soil cultivation.

In all, there are more than 500 tractors in the fleet and 135 combine harvesters – mainly Case IH Axial Flows.

Clear prospects

Having concentrated on leading edge mechanisation over the past few years, Sorin is now looking to optimise nutrition management on the farms. Wherever possible, use is made of liquid fertilisers consisting of urea and ammonium nitrate.

In addition to the present low cost of the liquid fertilisers, the the easier logistics are a big factor favouring their use. Storage tanks of rubberised plastic – and with capacities of up to 100,000 litres – make for low storage costs as well as the opportunity to purchase liquid fertilisers early in the season if the price is right.

Where to from here?

"Our goal is, of course, to operate our own integrated processing," says Sorin. "That is why we are also expanding our processing activities in the area of flour and oil mills, tobacco processing as well as dairies and large-scale bakeries. This is what we will be focusing on in the coming years."

Sorin also sees further potential in bundled marketing from the region.

"It would certainly be helpful for us if there were a central marketing facility – such as a Black Sea Exchange – through which all farms operating on the Danubian Plain could market their products." ■

Yields have basically doubled in recent years due in part to intensive plant nutrition and state-of-the-art machinery.

InterGrow has more than 800,000 tonnes of grain preparation and storage capacity.

AGRITECHNICA Innovations Hannover Germany, 2013:

Pointing the innovative way ahead

AGRITECHNICA is one of the world's largest exhibitions – of any kind – and is held every two years in Hannover, Germany. Organised by the DLG (German Agricultural Society), products and innovations for the entire agricultural sector are showcased over five days. The leading technologies and new developments shown make AGRITECHNICA a unique information platform.

More than 2700 exhibitors from 50 plus countries attract in excess of 400,000 visitors – including almost 100,000 from abroad. Highlights of AGRITECHNICA include the Innovation Awards. These are judged by a neutral Commission of Experts assigned by DLG.

The following is a brief overview of three award winning innovations in 2013 from among the 393 submissions.

CLAAS Online Simulator

The CLAAS Online Simulator for operating combine harvesters and tractors allows the complete working behavior of a machine – under a wide variety of conditions – to be mapped dynamically on a PC interface. Operators can gain valuable training and experience with complex machines without leaving the office and without the risk of expensive machine damage.

With the aid of evaluated telemetric and process data, virtual control devices and operating elements, the software largely represents real operating conditions and procedures. New drivers can be familiarised with the machine and experienced operators can refresh and improve their knowledge and productivity through regular training.

Considerable savings in cost and time can be achieved.

The CLAAS Online Simulator allows high quality and 'safe' training on the operation of complex and expensive machinery without leaving the office.

New Horsch boom control to minimise drift

The development of the new Horsch Leeb boom control allows for constant and exact sprayer boom height over the crop even when the main sprayer chasis is 'pitching and yawing' over variable terrain. Precise adaptation of the boom to the field contour is made possible by, in effect, 'de-coupling' the boom from the chassis. This minimises wind and thermal current effects with the associated benefits of increased spraying efficiency (more spray on the target) and reduced spray drift.

The boom is mounted almost friction-free (using ball bearings) close to the centre of gravity. There are no springs or suspension

The CLAAS online simulator allows high quality and 'safe' training on the operation of complex and expensive machinery without leaving the office. (PHOTO: DLG)

With this singulating module adaptation from Horsch, a conventional airseeder can place seeds with similar accuracy as vacuum planters. (PHOTO: DLG)

systems or links to the main chassis. So as centrifugal forces occur as the sprayer turns or comes to an abrupt halt, the height along the boom remains essentially constant.

To achieve this, a control has been developed that allows forces to be introduced selectively into the boom via two hydraulic cylinders which very rapidly adjust the boom to the ground contour.

This innovation from Horsch has the boom mounted on a single oscillation point – and with the help of very fast and clever control software – the boom is effectively de-coupled from movements of the main chassis. (PHOTO: DLG)

Horsch precision drill meter for singulating grain

This innovative precision metering singulating module is adaptable to airseeders to create the placement accuracy and low seeding rates of vacuum-style planters. With this singulating module, a precision seeding rate of 240 seeds per square metre on 15 cm rows and travelling at 12 km per hour is possible.

No modifications to the standard seeding machine are needed until you get to the coulter. With the singulating module mounted at the coulter, each seed row possesses a dosing unit for thinning the seed flow from the distributor head. In this dosing unit the unsorted, volumetrically dosed seed flow is prepared and passed and ultimately thinned, to the down-tube.

The desired and orderly seed flow is then obtained at the outlet of the dosing unit. ■

Michael Horsch (left), Horsch Machines co-owner, meets up with Muddy River Agricultural's Steve Robertson (National Marketing Manager) and Peter Jack (Managing Director) at AGRITECHNICA this year. Muddy River Agricultural is the agent for Horsch Machines in Australia.

Solubility the key to pre-emergent options

CHOOSING and applying the right pre-emergent herbicide can be difficult, particularly if herbicide resistance is becoming a challenge in a no-till system.

Dr Chris Preston, University of Adelaide (UA) associate professor weed management says the choice is simplified when the chemistry of the available products is understood.

"Most growers are aware of the need to incorporate trifluralin into the soil within 24 hours of application and that this chemical does adhere to stubble, which can render it ineffective if insufficient chemical reaches the soil," he says.

Another major concern is the increasing populations of weeds that are resistant to trifluralin.

"Because of these two problems we've done a lot of work with industry to bring new products to the market," he says.

Knowing how the new products work

"Boxer Gold and Sakura are now available and it is important to understand the differences between how these new products work and how trifluralin works."

The main difference between Boxer Gold and Sakura and trifluralin is their respective levels of solubility.

Chris says trifluralin has no water solubility to speak of, which means that it won't move from where it is applied unless there is soil movement or exceptionally heavy rain.

Wheat is not very tolerant of trifluralin but this herbicide can still be used safely in a wheat crop provided adequate chemical-to-soil contact is achieved and the chemical is not applied to soil that will come in contact with the emerging wheat seedlings.

This means planting at the correct depth and making sure that trifluralin-treated soil does not end up above the wheat seed.

Generally disc seeders displace too little soil from the seed row to make trifluralin a safe option for use.

The amount of stubble also needs to be considered because trifluralin will stick to stubble and be rendered ineffective. Chris says using higher rates and bigger droplets can help get the chemical through heavier stubble and onto the soil but if stubble is matted on the ground the trifluralin will not get through to the soil and will not work.

Two new pre-emergent herbicides are available, offering growers an alternative to trifluralin. Here, Sakura has been applied at sowing using knife-points and has demonstrated good crop safety and weed control.

But if trifluralin-resistant ryegrass is present a grower will need to look at other pre-emergent herbicide options.

"Where ryegrass populations are not big or overly resistant, we've found that a mixture of trifluralin and Avadex can achieve a reasonable level of weed control, particularly in areas where wireweed is a problem," he says. "But, if the population is large or there is significant resistance to trifluralin then this strategy will not work. This has been demonstrated repeatedly in our trial work."

This is where the new products, Boxer Gold and Sakura, have their place but the different chemistry needs to be understood. Chris says that these new products are more soluble in water than trifluralin – Boxer Gold more so than Sakura.

Understanding Boxer Gold chemistry

"One of the difficulties with the new chemistry is the management of the herbicide down the seed row," says Chris. "Boxer Gold only needs about 5–10 mm of rain to wash it in and activate it, giving really good early weed control. But too much rain after application can wash the herbicide into the seed row and cause crop damage. We have found that wheat is more susceptible to damage than barley."

He says knife-point application of Boxer Gold works better than using a disc seeder to apply the herbicide.

"This chemical degrades fairly quickly in Australian soils, generally within a few weeks, so in longer season areas or in years with rainfall through late winter and into early spring it is likely that later flushes of ryegrass will escape," says Chris.

"The location of the crop and the level of competition needs to be considered as we have seen situations where Boxer Gold has fallen away very badly at the end of the season, but it does provide very good early control."

Understanding Sakura chemistry

The other new product on the market, Sakura, is also water soluble, requiring about 10–15 mm to activate it in the soil. Chris says this characteristics means problems can arise if the soil is dry on the surface but there is moist soil underneath.

"What can happen is a small amount of rain might fall that is sufficient to germinate the weeds but not enough to activate the herbicide and the weeds can grow through it," he explains. "Sakura is also harder to get through a heavy stubble than Boxer Gold."

The advantage with Sakura lies in its residual action that will continue to control ryegrass late in the season. Chris says sometimes, if there is a dry start to the season after early rain, there is an escape of early ryegrass but these plants become stunted as the season progresses because Sakura is still present and working on the weeds' roots.

Registrations and rotations need to be carefully considered as Sakura is only registered for use in wheat and triticale crops (not durum) and may affect following crops such as oats and durum.

Chris says another important finding of the Grains Research and Development (GRDC) supported research work was that, as with trifluralin, adding Avadex to Boxer Gold and Sakura often gives better control than using these herbicides on their own.

"We have seen this added efficacy consistently with Avadex." ■

Windrow burning – a good place to start

AHRI
AUSTRALIAN HERBICIDE RESISTANCE INITIATIVE

THE best option to maximise the weed seed bank is to harvest high and spread all of the weed seeds evenly over the paddock. This will give you something to spray next year. If you, like most others, feel that this is a bad idea, it may be time to start narrow windrow burning.

And narrow windrow burning is a good place to start to see if this harvest weed seed control caper is all it is cracked up to be.

The first step is to spend some time familiarising yourself with a beer can. The internationally accepted harvest height when trying to capture weed seeds is the height of an Australian beer can. The next step is to work out how to modify your harvester to make narrow windrows. It's easier than you think!

The art of making narrow windrows

Narrow windrow burning is widely adopted in Western Australia and is now set to be used by many interstate growers as the battle with herbicide resistant weeds grows. Many years of research has demonstrated that we can capture at least 60 to 70 per cent of wild radish and annual ryegrass seeds at harvest.

These can then be concentrated into a narrow windrow. When these windrows are burnt in the right conditions in the following autumn, 99 to 100 per cent of the seeds are destroyed.

This edition of AHRI insight will focus on how to make narrow windrows. We will follow up with information about how to burn them in autumn.

Step 1. Harvest low

This is where the beer can comes in. An Australian beer can is 13 cm high. Harvest height of 10 to 20 cm (4 to 8 inches) is essential for two reasons;

- To minimise the risk of fire escapes during burning; and,
- To maximise the number of weed seeds that enter the front of the harvester.

Step 2. Harvest low

Remember the beer can!

Step 3. Harvest low

We think you get the picture.

First, familiarise yourself with an Australian beer can.

Step 4. Make a narrow windrow chute

Narrow windrows (500 to 600 mm wide) are ideal as they burn hotter for longer killing the weed seeds. They also minimise the area of the paddock that is burnt leaving enough residue in the paddock to minimise erosion risk.

Following are some images of various windrow chutes for different harvesters. The Andrew Messina designed chute has proven to be the most popular design. CAD drawings of this chute are available to help growers to construct their own (see the AHRI website).

Step 5. Crop choice

Don't bite off more than you can chew (no pun intended). For growers that are new to windrow burning it is best to start small. Ideally start with a small area of non-cereal in the first year of windrow burning.

The Andrew Messina designed chute under construction.

Case 2388 fitted with the popular Andrew Messina designed chute.

- Canola is a great place to start as the windrows burn hot with little risk of the fire escaping to burn the entire paddock. Our research has shown that canola windrows burn the hottest of all crop types (at up to 700°C).
- Lupin and other pulse crops are also a good place to start as the risk of fire escape is also lower.
- Wheat – ideally aim for wheat that is 2.0 tonnes per hectare yield or less. It is possible to successfully windrow as high as a 2.5 tonnes per hectare wheat crop, however, the risk of fire escape is much greater. If it is your first year of windrow burning it may be best to try only a small area of low yielding wheat.
- Barley – don't even think about it! Barley is very leafy and almost impossible to burn narrow windrows without burning the whole paddock. Windrow barley at your own risk.

Step 6. Don't stop!

The chute on the harvester does restrict the flow of residue out of the back of the harvester. Stopping dead in the crop during harvest can lead to large blockages that takes a lot of blood, sweat and swearing to clear.

If you must stop, either pull out of the crop or go straight into reverse to allow residue to clear.

Step 7. Harvest pattern

The first thing to do is to harvest two or three boundary laps around the paddock. They will be the first windrows burnt in autumn forming a fire break.

Up and back harvest is ideal but not essential. Up and back harvest makes life easy at burning time as it is easy to pick the right wind direction to burn a particular paddock.

Growers who seed and harvest around the paddock can successfully make and burn windrows, but they may take a little more attention to detail at burning time to get the wind direction right given the range of directions that the windrows are aligned to the wind.

Step 8. Avoid grazing

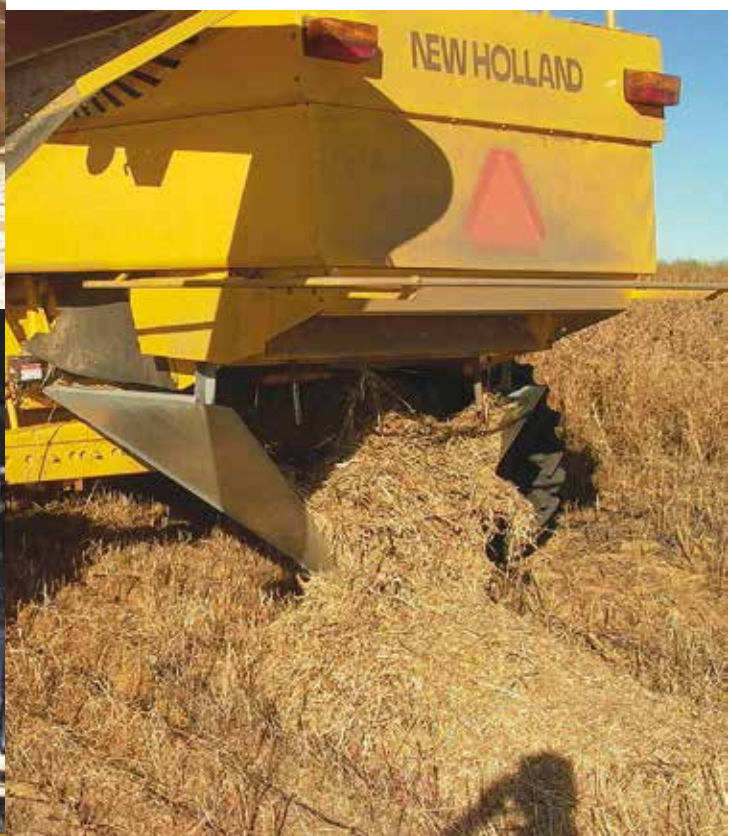
Grazing the paddock after harvest and before the burning of windrows can cause problems. Livestock can reduce the biomass of the windrow as well as spreading them out and making many small fire breaks. Ideally paddocks where narrow windrows have been made should not be grazed, however, a very light graze with sheep can remove some of the leafy material from wheat stubble making it easier to contain the fire to the windrow during burning.

But generally speaking, it is best to delay grazing windrowed paddocks until after burning.

Harvest weed seed control is our number one non-herbicide tool and narrow windrow burning is a great introduction to removing weed seeds at harvest. The majority of growers who have used this practice are now convinced that harvest weed seed control will remain as an integral part of their farming system. Some will persist with windrow burning and others will move to other forms of harvest weed seed control, like the chaff cart or Harrington Seed Destructor.

Narrow windrow burning is ideally suited to the lower rainfall areas in Australia where crop yields are lower, however, it has a role to play for growers in higher rainfall areas, particularly for canola and pulse crops where the risk of fire escapes are lower.

AHRIinsight is a regular email service providing up to date research information and news from AHRI. To find out more about AHRI or to subscribe to AHRIinsight, go to: www.ahri.uwa.edu.au/subscribe ■



These are examples of homemade windrow chutes adorning many different headers.

Pythium: An important consideration in modern farming

Lyndon May, Syngenta Seed Care and Application Specialist

WE find some grain growers still consider high rainfall or cold, waterlogged soils as the necessary backdrop for Pythium root rot. However, if we look back to the '02, '05 and '06 seasons, there were high incidences of Pythium in periods of severe drought.

While dry conditions were not previously considered conducive to the disease, it is seasons such as these that have helped turn industry opinion around.

What galvanised that opinion for us was when Pythium was successfully suppressed during drought conditions with Dividend – a Syngenta seed treatment containing metalaxyl-M.

We observed increased grain yields in paddocks treated with metalaxyl-M compared to non-treated paddocks. What we have seen since is increased industry recognition of the widespread incidence and economic importance of Pythium in southern Australia – in all season types.

Pythium often invades the crop first, feeding on young, germinating seedlings and stripping the fine rootlets and root hairs. This weakens the plant and makes it more vulnerable to attacks from other pathogens.

Seedlings that survive will have damaged root systems, resulting in reduced uptake of moisture, nutrients and lower plant vigour – effectively reducing the crop's potential.

As its effects have been investigated, Pythium is now recognised as a primary pathogen that readily forms root rot complexes with other diseases as well – including Rhizoctonia, take-all and Fusarium – and can increase their severity.

When developing seed treatments, these disease relationships have become very important considerations.

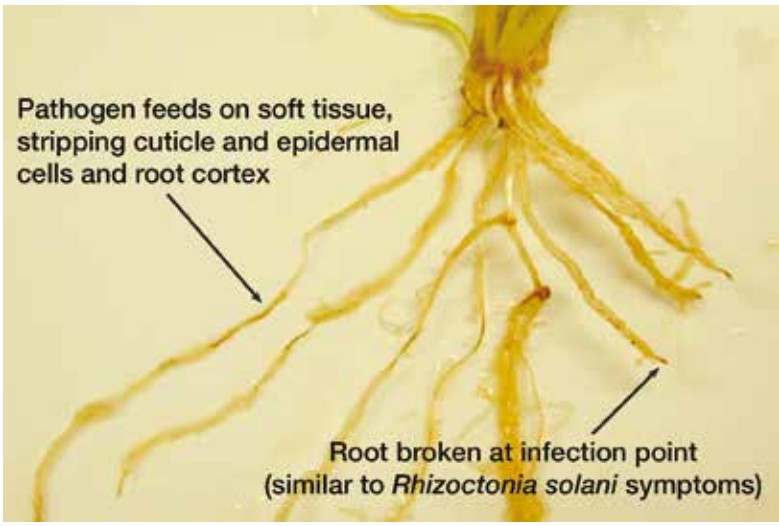
A combination of actives

What we've since brought to market is a product called Vibrance, which contains sedaxane and difenoconazole. Both have direct activity on Rhizoctonia and are combined with metalaxyl-M to provide additonal protection for Pythium root rot. This combination of actives aims to broaden the spectrum of protection by targeting both disease areas.

Vibrance can be used in wheat, barley, oats and triticale. It also controls loose smut, bunts, flag smut and seed borne net blotch. It works by moving into the soil surrounding the seed to provide a protective barrier for both the seed and developing root system against pathogens.

As a further consideration for growers, modern farming practices have been shown to increase the incidence and severity of Pythium, and as such, it is particularly important for farmers to get on top of the disease. Minimum tillage and trash and stubble retention are both shown to increase its incidence. Acidic soils, low soil nutrition (particularly phosphate), cold and wet soils, waterlogged soils and cereals sown on cereal stubble will also increase the occurrence of Pythium.

Taking into account environmental variability as well as the influence of modern farming practices, Pythium and associated root rot diseases should be a front-of-mind consideration for grain growers. ■



Adviser workshops

WHAT excites you most about working with farmers and new technology? A participant in a recent *Knowledge To Action* workshop answered this question by saying: "I am excited by innovations that can make a real difference to agriculture." It is a similar response from most who work with farmers as trusted advisers.

In contrast, the question: What is the most frustrating part of your job? – usually produces a response about slow or limited uptake of new practices, despite having convincing data.

In other words, too often, great knowledge is not converted to action on the farm.

The C-Qual *Knowledge To Action* workshops show how to blend existing agronomic excellence with communication and relationship skills that will inspire confidence and trust. The workshops are specifically designed to provide advisers with practical tools and techniques that will motivate farmers to adopt new ways of doing things.

The next workshop is scheduled for Perth, February 26 & 27, 2014, then northern Victoria in April. Details and online registration can be found at www.c-qual.com.au.

Register now so you don't miss the opportunity to learn more about how your clients make decisions and how you can influence those decisions more effectively.

After attending a recent Adelaide workshop, a commercial consultant, commented: "Fantastic workshop. It has challenged my thinking – highly recommended."

***Knowledge To Action* workshops are conducted by C-Qual Agritelligence Pty and supported by GRDC.** ■

District Reports…

November–December 2013

Western region

GIWA winter crop overview

On November 9, the Grain Industry Association of WA (GIWA) forecast total winter crop production for the state at 14.4 million tonnes – more than 500,000 tonnes higher than the October forecast.

The major positive for the production estimate was – other than localised frosts from Nyabing to east of Newdegate – the lack of weather shocks during October that could have adversely affected grain development. Consequently, the WA grain crop has finished in ideal conditions, enhanced by mostly mild temperatures.

Protein levels in cereals will be lower than average due to the high yields in most regions. Reports to date also have barley at the low end of the protein content range for malting grade. Canola quality is above average in all regions.

The quality of early deliveries of wheat into the Esperance port are also low, mostly making ASW grade. By contrast, wheat protein levels in the Geraldton Port is at least average to above average, reflecting the drier season in the northern wheatbelt.

Harvest is moving along quickly in the Geraldton Port zone and substantial tonnages have also been delivered into Esperance. By November 9, only canola and barley had been harvested in the Kwinana port zone, while at that date, the harvest had barely started in the Albany region.

It is expected that grain receivals will increase quickly now that most crops are ready for harvest. The current weather pattern appears stable, and the industry is looking forward to fine warm weather for the harvest period.

Kwinana zone

Early harvest results have shown canola to be a highly profitable crop in the Kwinana port zone this season. Districts which might historically average one tonne per hectare are delivering closer to two tonnes this year.

Early harvested Calingiri wheat at Merredin has yielded 2.7 tonnes per hectare with 10.5 per cent protein. But due to the mild and at times damp October, some black point has occured. April sown barley east of Merredin has yielded 3.4 tonnes per hectare. East of Bruce Rock and Narembeen, barley is yielding 3.0 to 4.6 tonnes per hectare. Screenings are good but protein is low at about 9.4 per cent.

Canola in the Avon Valley has averaged around 1.6 tonnes. Sclerotinia has hit the western districts hard and fertiliser applications may have been inadequate to capture the extra yield potential.

In the southern Midlands region, canola has suffered up to 50 per cent yield loss to Sclerotinia in the Badgingarra district, where crops with a previous 2.4 tonnes per hectare potential are yielding just over a tonne. Typical yields are 1.3 to 1.6 tonnes per hectare. The Moora district has only 5 to 15 per cent loss to Sclerotinia, and yields are better at around 1.7 to 2.3 tonnes per hectare. In the drier district of Wubin, canola has delivered 1.4 tonnes per hectare – well above expectations.

Barley is also yielding spectacularly at 5 to 5.5 tonnes per hectare. Protein is between 9 and 10 per cent. The Miling and Dalwallinu districts have reported high screenings in barley.

Albany zone

By November 9, harvest had not commenced in the southern half of the Albany Port zone. But canola had been harvested from Nyabing east with yields of 1.8 and up to 2.2 tonnes per hectare and 48 to 51 per cent oil.

As an indication of cereal potential, oaten hay has delivered 16 tonnes per hectare in one paddock at Katanning.

Unfortunately there is a lot of ryegrass in all crops and croptopping is happening where possible. Cereal yields are expected to come in at around 4 to 5 tonnes per hectare.

In the north and north east of the Albany zone, only canola and some barley has been harvested so far, mostly east of Lake Grace. Crusher canola is reported to be lodging and poor yielding compared to Stingray and Cobbler, while also lower for oil content.

Common yields for canola crops are around 1.6 tonnes per hectare with some reports of up to two tonnes. Oil contents are about 46 per cent and higher.

Barley crops are in very good condition. 'Poor' crops will yield 2.5 tonnes, while most will average 3 to 4 tonnes per hectare. One paddock south of Newdegate reportedly delivered 6 tonnes per hectare. Grain size and colour is good – but with low protein – and most is making Feed grade.

A significant frost event on October 14 (minus 4°) affected Nyabing, Lake Grace and South Newdegate. The effects are patchy and confined to low lying areas. Damage was reported to be at about 25 per cent of cereal heads and is causing screenings. Later maturing crops have suffered most including grazed crops.

Esperance zone

The Esperance Port zone harvest is progressing very well. Canola is almost finished throughout the region and barley is

WA PRODUCTION ESTIMATES BY PORT ZONE (TONNES)

Port zone	Wheat	Barley	Canola	Oats	Lupins	Field pea	State total
Kwinana	4,737,000	896,000	526,000	291,000	91,000	13,000	6,554,000
Albany	1,748,000	853,000	547,000	232,000	18,000	7,000	3,405,000
Esperance	1,292,000	743,000	357,000	4,000	18,000	35,000	2,449,00
Geraldton	1,514,000	47,000	174,000	6,000	250,000	1,700	1,992,700
Totals	**9,291,000**	**2,539,000**	**1,604,000**	**533,000**	**377,000**	**56,700**	**14,400,700**

about 50 per cent complete. Only a small tonnage of wheat has been delivered to date.

Canola yields are a little disappointing given the ideal and long growing season. Very few reports of plus two tonnes per hectare average yields have been received. Visually, canola crops have looked to have at least two tonnes per hectare potential.

There is more damage from sclerotinia and water-logging than anticipated (or hoped for).

Barley has some screenings, up to 20 per cent, and low protein, but very high yields. Field pea has some Blackspot infection and water-logging in southern districts – both of which have restricted yields.

Wheat delivered so far has been classified as ASW due to low protein. Despite this early report, it is expected that the main wheat grade delivered this year will be APW.

Geraldton zone

Harvest is progressing quickly in the Geraldton region. Northern districts may well be finished by November 15 due to light yields.

Canola is a mixed bag of yields across the region. Variety, soil type and depth to water are all factors. Reported yields include Eradu 2.2 tonnes per hectare and Three Springs 2.7 tonnes per hectare on good deep yellow sandplain. Neighbouring paddocks on red loam have produced just 0.7 tonnes per hectare. Poor sands have only produced around one1 tonne per hectare.

Canola within five km of the coast is poorer than average, even where grown on favourable soil types.

Canola crops in the Chapman Valley and Walkaway districts looked to have 1.8 to 1.5 tonnes per hectare potential but are returning only 1.2 to 1.3 tonnes. Where there was severe stress in June – principally in loam and clay soils with limited deep water – canola hasn't recovered well. Despite this, the Geraldton zone is producing a higher tonnage of canola than average.

Lupins also suffered in tight soils in June and in some cases didn't recover well. Where the stress wasn't as severe, they are yielding about or above average but with a high level of weeds. Harvest height of lupins is shorter than normal in some paddocks, due to the dry winter, and this may affect the final yields.

Wheat is showing good quality but variable yield – 86 kg per hl and 14 per cent protein at Pindar, but only 0.5 tonnes per hectare. Wheat sown in deep soil and fallowed paddocks from last year, is producing above average yields despite the dry conditions. For example, wheat at Morawa has produced up to 3.2 tonnes per hectare.

Generally, the districts of Binnu, Northampton, Yuna and north Mullewa are returning very low yields.

Some staining and black point is turning up in Calingiri wheat

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	25yr Annual Average (mm)	2013	25yr Annual Average (mm)	2013 to date
Emerald Qld	537	428	239	178	110	136	64	34	114	121
Toowoomba Qld	646	990	261	657	135	205	81	94	170	91
Roma Qld	577	289	232	144	132	107	73	12	134	77
Goondiwindi Qld	607	569	235	337	135	182	98	49	137	57
Narrabri NSW	631	483	221	221	124	169	124	97	160	31
Gunnedah NSW	654	466	226	254	124	83	122	142	179	44
Dubbo NSW	596	444	192	97	129	108	124	155	152	90
West Wyalong NSW	435	424	109	95	88	93	113	153	124	103
Wagga Wagga NSW	530	377	129	67	115	99	146	181	142	52
Swan Hill Vic	324	196	72	25	67	30	88	90	96	61
Bendigo Vic	515	460	109	71	106	69	165	229	138	112
Horsham Vic	364	391	80	45	72	41	127	200	108	121
Lake Bolac Vic	555	441	121	36	98	71	155	215	151	141
Murray Bridge SA	352	337	62	47	71	56	120	202	99	47
Kadina SA	331	365	53	25	74	106	113	184	89	54
Cummins SA	377	469	47	13	81	100	166	269	82	89
Esperance WA	590	762	75	50	135	301	244	275	135	151
Wagin WA	394	409	43	96	92	163	174	116	84	100
Northam WA	389	407	41	48	82	132	186	131	79	100
Mingenew WA	356	369	31	11	91	170	174	119	61	75
Moora WA	379	312	40	36	89	110	180	140	69	39
Mullewa WA	320	205	49	21	93	85	134	69	44	41

Last rainfall reading November 15, 2013.

and getting docked to GP1 grade. Neighbouring paddocks of Mace are clean. Additionally, the severe stress in June restricted the yield potential of Calingiri and pushed protein to be too high for the noodle grade.

The Grain Industry Association of WA gratefully acknowledges the assistance of DAFWA, AEGIC and numerous advisers in producing this report.
November 9, 2013

SOUTH COAST

Seasonal conditions on the South Coast over the past two months have been variable. But the spring rainfall has been good throughout September and into October providing a very soft finish.

Harvest commenced in early October. Harvest conditions have been challenging especially with high grain moisture as a result of cool weather and high humidity. In spite of this many growers are making very good progress with some at least 50 per cent and up to 75 per cent complete.

This is largely due to increased harvest capacity, grain driers, on farm blending and importantly CBH receiving high moisture grain between 12.5 and 14 per cent as part of their moisture management program.

Areas within 30 km of the coast are having one of their worst years with very large areas suffering from water-logging. But the inland Mallee areas are having one of their best ever seasons.

Canola yields are averaging between 0.5 and 2 tonnes per hectare. Low yields are from water-logged coastal areas. In general, canola yields have been disappointing – a lot of crops lost yield potential from water-logged areas particularly later in the season during flowering and grain fill.

Weed competition from late germinations of ryegrass has been problematic, sclerotinia infections have been widespread and blackleg in some varieties has caused stem cankering and consequent lodging.

Installation of a new grain drier 120 km east of Esperance in early November summed up the bleak harvest weather for farmers near the coast.

Cereal crops have been very good. Most barley crops are yielding 4 tonnes per hectare and above, with some averages close to 5 tonnes. Quality has been very good, however protein has been on the lower side in the very high yielding crops which has been a problem in maintaining malt barley standards.

Wheat is only just being harvested and early yields look very encouraging ranging from 3 to 5.8 tonnes per hectare. Once again, quality has been good, but protein levels overall could be low.

Stored soil moisture levels are very good. This in conjunction with a 30–50 mm rainfall event in late October, has seen reasonable germinations of Summer weeds and the continued growth of winter weeds. As a consequence many paddocks are being sprayed soon after the header departs.

Hopefully we can get a good run of harvest weather to get the bumper crop in the bin to fully capitalise on a very good year for the majority of the South Coast region.

Quenten Knight,
Agronomist, Precision Agronomics Australia
November 6, 2013

Southern region

SOUTH AUSTRALIA

Weather summary

Rainfall for September was average to below average across the state while October rainfall varied from below average in most of the cropping districts to average on Lower Eyre Peninsula and well above average in the Lower South East.

Maximum temperatures ranged from well above average on Upper Eyre Peninsula, Mid North and Northern Mallee, to just above average in southern areas.

Strong to gale force winds were recorded across large areas of the state during September and October.

There were several significant frost events in parts of inland districts from early to late October.

Thunderstorms in late September and early October brought heavy rain and hail to isolated areas.

Crop conditions

Harvest is now well underway in the earlier maturing districts of the state and is one to two weeks earlier than normal with peas, canola and barley the first crops to be reaped.

Wheat harvest is well advanced on the Far West Coast but has only just started in other early districts and will not start until early December in the later districts.

Yields are likely to vary from average to well above average but are now significantly lower than earlier estimates due to a range of extreme weather events during spring.

Strong to gale force winds in early to mid-October caused significant flattening of plants and head loss in ripe barley crops in several areas of the state with losses of 30 to 50 per cent reported in some paddocks.

Grain loss from wind damage was also reported in ripe wheat crops on Upper Eyre Peninsula.

Wind also knocked canola crops down and caused significant grain shattering in crops planned to be direct headed.

Bean crops in the Mid and Lower North were damaged by the strong winds, with stems being kinked half way down the stem reducing grain fill of the upper pods.

Frost in early October damaged some early sown pea crops. And then a relatively widespread frost in mid-October caused severe damage to wheat, barley, pulse and canola crops. The worst affected areas were the Upper and Mid North, and Southern Mallee.

Some frosted wheat crops in the Upper and Mid North were cut for hay, but crops in other districts were generally too far advanced to cut.

Disease and pest levels

Leaf diseases have generally been at relatively low levels with preventative fungicides ensuring stripe rust levels were controlled in susceptible wheat varieties.

Preventative fungicide applications to pulse crops also kept disease levels relatively low and the warm dry spring reduced the build-up of diseases.

Snail levels were high in parts of the Upper Eyre Peninsula but relatively low in most other areas of the state as a result of good snail management.

Native budworm numbers were generally higher than normal in most areas of the state with some pulse crops requiring two insecticide applications and more canola sprayed than normal.

Crown rot and take-all levels have been higher than normal in some districts.

Hay and pastures

Yields of export oaten hay crops have generally been above average, although quality (digestibility) has been low and most growers are only achieving poorer quality grades with significant price penalties.

Pastures have adequate to good levels of feed in most areas, although the dry finish in the Mallee and cold wet conditions in the Lower South East have reduced pasture growth.

Livestock are in good condition in most areas of the state, although cows and young stock in the Lower South East are in poorer condition.

There has been an increased area of pasture hay cut in many districts to replenish on-farm fodder reserves with reports of high yields of good quality hay in most areas.

PIRSA Rural Solutions
November 1, 2013

VICTORIAN MALLEE

Harvest has just begun at time of writing this report. While it's too early to say, I'd expect yields to be below average, but may meet expectation from moisture given the dry year. Summer was the driest in my generations' memory with no summer weed spraying required. To the end of October the Central Mallee received around 230 mm of rain with 180 mm falling in the growing season. A rainfall event in September was crucial to the outcome.

Many legume crops have yielded well to date at around one tonne per hectare for peas. Frost and hot conditions in spring are the biggest threat for legumes. Cool springs equate to optimal pod filling and this spring has been fair. Some late sown crops suffered some frost damage. The irony is that we see early sown crops as risky and the frost came later this year making the early sown ones safe. It just proves that some risks can be managed while others cannot. Regardless, there is still some losses caused by frost, but I sense other areas will be reporting about more late occurring frosts causing extensive damage.

Just as the barley ripened, the Clearfield variety Scope weakened in the straw causing cankering and heads fell to the ground. Some farmers even chose to windrow as it just started to happen once it was ripe.

Some canola has been harvested prior to November yielding around one tonne per hectare.

Many barley crops are contaminated with wheat and vice versa, particularly Clearfield stubbles which had to go back to Clearfield crops because of the residue. There will be a significant amount of grain delivered as feed.

No matter where you are, I'm sure Mother Nature expressed herself in one form or another this cropping season. Never far from our mind is the looming threat of frost or hail and to a lesser extent fire, but wind caused havoc this year.

Early October saw winds reach 100 km per hour damaging sheds and silos and blowing hay windrows around. For most of October the wind blew and when the canola was windrowed it struck again making a mess. That's two years in a row so when it comes to canola harvest management, the jury is still out.

More will be revealed in the harvest report.

Simon Severin
Dodgshun Medlin Agricultural Management, Swan Hill
November 1, 2013

MURRAY VALLEY RICE REPORT

This current rice season, most Murray Valley growers have sown a reduced area and at a later date than last season. The area is down due to water issues (low carryover from last season, high price of temporary water, high water use last season etc) but the reason for sowing later is not clear.

Some growers waited to see what the water market would

Aerially sowing rice at Deniliquin this season – on close inspection, you can see the rice seed falling from the aircraft.

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do – others deliberately delayed sowing until the second half of October due to changes in recommended sowing times for Reiziq. There was also a lot of winter crop being watered in early October which may have delayed rice ground preparation.

The relatively cool weather has not been conducive to quick establishment so crops have been slow to emerge from the water. Average temperatures during October were low, mostly due to below average minimums (that is, cold nights) and the wind was constant.

Ducks and water-hens have not been a major problem. Some individual growers did have problems, especially those that sowed early near harbourage areas, such as creeks, water storages or drains. There were reports of growers deliberately emptying storages so as to reduce their attractiveness to ducks.

A major concern for growers at present is the price of temporary water. It is currently trading around $70 per megalitre, and this in a year when the Murray Valley is on 100 per cent allocation for general security water. This will make purchasing water very expensive for any grower who has over-planted and needs more water to finish crops. They will be hoping that the price eases considerably towards the end of the season.

November is the time when post-emergent, foliar broadleaf and sedge weed herbicides should be applied. The Rice Crop Protection Working Group has been encouraging the general use of MCPA and/or Basagran as a second mode of action herbicide to minimise the risk of developing herbicide resistance.

But other broadleaf summer crops have become more common in the district so growers are very wary of herbicide drift. This is likely to prevent the widespread use of MCPA, especially in the eastern Murray Valley.

John Fowler
Senior Land Services Officer (Mixed Farming)
Murray CMA
November 6, 2013

An Opus rice crop at Deniliquin, 28 days after being aerially sown. The bay has greened up, but due to relatively cool conditions after sowing, the crop was growing quite slowly.

WESTERN MURRAY VALLEY

Winter crops

What happened to spring? October simply just didn't happen! The WMV received only 12 mm of rainfall in October with no rainfall event greater than 3 mm. Total growing season rainfall From April – October will average 200 mm. With no summer

Andy Gleeson, from Gleeson brothers at Wakool, inspects the wind damage as rice seedlings float to the edge of the paddocks.

Even with a cold and windy October planting, rice seems to be establishing well. Andy Gleeson inspects for bloodworm 14 days post sowing.

This rice field was sown 14 days ago and is establishing well.

rainfall or stored moisture available, winter cropping yields will now be limited by moisture.

Frost has had a slight effect on some late maturing canola, however yield reports so far have been positive. Visually, barley and wheat seems unaffected with more moisture stressed crops than frost damaged ones.

Harvest has been underway since early November with irrigated and dryland canola both windrowed and ready to go. Yields have been highly variable with most dryland crops yielding 0.7 –1.2 tonnes per hectare with oils having a massive range of 36–44 per cent (some frost effected crops which matured later). The standout dryland canola variety to date has been Stingray TT. Irrigated canola has been pleasing with most pre-watered (100 mm) + 1 spring irrigation (70–100 mm) crops yielding 2.3–2.7 tonnes per hectare with oils averaging 44 per cent. The standout variety has been Crusher TT with some Gem TT oils reaching 47 per cent.

It is worth noting with weed control issues aside, Hyola 50 has so far had the highest yield recorded this year at 2.8 tonnes per hectare. Triazine Tolerant canola still is the major canola system grown for herbicide resistant weed management and weed spectrums such as wild radish, Pattersons curse, mustard and amnsinkia.

John Hibma from Mathoura inspects a paddock of Aston Italian ryegrass which is ready to bale.

This photo of emerging corn was taken near Mathoura in early November. The corn was sown in mid-October into a pre-watered field.

Dryland barley harvest has just commenced with most crops going malt and yields ranging from 2.0–2.5 tonnes per hectare.

Summer crops

Murray Irrigation Limited is currently on 100 per cent allocation. But temporary water is trading at $76 per megalitre and this is making growers crunch numbers closely to determine the risk of growing a summer crop or selling the water they had set aside for summer.

The majority of the rice plantings have been done with overall area down 10–15 per cent on last year. This is mainly due to the temporary water market being higher than anticipated and the announcement from Sun Rice for growers to budget on $260 per tonne opposed to $300. This fall in commodity price and increase in water value has dropped our gross margin return from approximately $800–$1000 per hectare down to $350–$450 per hectare. Growers and advisers are all hoping the price indication is very conservative and water values decline.

Rice establishment has been quite good so far with less duck pressure than last year. Bloodworms have rarely required a second treatment and slime is confined to high organic matter soils or late weed control blocks. Aquatic snails are causing significant issues on rice on rice paddocks, with many growers required to treat crops with copper sulphate (an additional $75 per hectare not usually required).

Corn plantings have increased with good starting prices ($260 per tonne). With good water allocations and high return its exciting to see confidence come back to summer cropping with corn. Corn is currently the highest grossing summer crop we have and only uses 8 ML per hectare (opposed to rice or lucerne using 12–14 ML per hectare)

No soybeans or grain sorghum has been planted due to less than ideal results last year and the poor outlook for commodity prices.

Hay cutting has commenced and even though it hasn't rained for five weeks, with that, it will probably rain. There has been an

A build up of green slime in some fields along the Murray Valley is causing some issues for emerging rice seedlings.

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increase in "hay freezing" cereal crops with resistant ryegrass and irrigators sowing higher quality pastures with ryegrass and clover. With an increase in hay cut and frosted crop to the east and north, hay prices are unfortunately dropping. As usual, growers with quality such as lucerne, vetch, clover or ryegrass are holding value whilst the cereal market drops dramatically.

Good luck and fingers crossed for a dry harvest. Let's hope the above average spring prediction doesn't all come in November!

Laurence Pearce
Agronomist, IK Caldwell, Deniliquin NSW
November 11, 2013

Northern region

WESTERN QUEENSLAND

There was a small winter crop harvest in western Queensland this season in response to a reduced planted area and lack of rain – in some cases crops were grazed.

Wheat generally had good protein but low yields.

There was a similar scenario with chickpeas – below average yields but surprisingly good quality considering the season we have had.

Growers are desperately holding out for decent rainfall to enable a summer crop to be planted. There is considerable interest in mungbeans and sorghum at currently attractive prices. All we need is rain!

Kirsty Wilde
Account Manager Agronomy–Landmark
November 6, 2013

DARLING DOWNS

Winter crop

It has been a very tough finish to the winter season with above average temperatures and well below average rain for the last three months of the season. The result is that yields have depended mostly on how much stored moisture was available.

The Eastern Downs yields for wheat have ranged from 1.2 tonnes per hectare to 4.5 tonnes, with screenings on average between 2 and 7 per cent and protein generally between 11 and 14 per cent. Wheat has suffered from crown rot again this winter, and some mouse damage, and there was early season stripe rust and yellow leaf spot.

Harvest under way near Aubigny just west of Toowoomba. Cereal yields and quality have been erratic on the Darling Downs this season.

Barley has been the best performing crop yielding up to 5 tonnes per hectare and having stronger prices than usual. It also grew away from early net blotch.

The rotational crops have not fared as well. Canola was the first harvested with yields around one tonne per hectare, but chickpeas have suffered the worst from lack of moisture. With so many paddocks double cropped, setbacks from the frosts and pod abortion from the heat, yields are showing the result of all these combined stresses. Results so far have yields between 0.8 tonnes and 2.1 tonnes per hectare, with most crops around 1.25 tonnes. With the feed equivalent prices for chickpeas, breaking even is a challenge this winter.

We do have a little linseed grown and it is producing about 0.75 tonnes per hectare.

Overall, the cereals have yielded well for the conditions, making an average return thanks to strong prices.

The chickpeas have been the major casualty with low yields from all the stresses and the lowest prices for many years.

The only benefit of the dry weather is good conditions for harvesting.

Summer outlook

Irrigated cotton and corn have been planted but have been hard to water up, with cotton crops in particular needing

some replanting. Corn is growing well and had a reasonable establishment. There are a few dryland sorghum crops with patchy emergence which are persisting with lower than ideal populations.

There has been no general rain to plant on, just storms, and so the majority of the summer crop is waiting to be planted. The dryland cotton grower's planting window is rapidly closing, but corn, sorghum, millets, mungbeans and soybeans will all be planted through to mid January.

Hugh Reardon-Smith
Agronomist, Landmark Pittsworth
November 5, 2013

CENTRAL QUEENSLAND

The weather

Rainfall: Dry conditions continued into October across CQ grain growing districts with well below average rainfall in all areas. Orion, 22 mm (long term monthly average 45 mm) and Springsure 13 mm (47 mm) recorded highest rainfall on the Central Highlands, Jambin 25 mm (55 mm) and Biloela 21 mm (53 mm) were best for the Callide and Moura 18 mm (60 mm) and Theodore 14 mm (64 mm) best for the Dawson.

Useful storm rain has fallen in a limited area, Emerald (96 mm) to Springsure (63 mm) during the first week of November but most districts are still desperate for rain.

Cropping and pasture overview

Summer crop: Most paddocks cropped to sorghum and mungbeans last summer and fallowed through winter in readiness for a summer crop have some soil moisture below 60

Unloading the header CQ-style. Harvest underway at Peter Mifsud's property 'Wandina' near Kilcummin.

cm. These paddocks will require at least 100–200 mm of rain before having sufficient soil water to plant. Farmers who plan to rotate paddocks planted to wheat and chickpea this winter into a 2013–14 summer crop will require more then 200–300 mm before being wet enough to plant to summer crop.

At this stage, how much and when rain falls will dictate what area is planted to sorghum and price and rainfall (how much and when) will dictate how much mungbean is planted.

Current price suggest more sorghum and less mungbeans will be planted and probably not until after Christmas.

Winter crop: The 2013 winter crop harvest is complete. Yields from early planted crops were much higher than yields from later planted crops. This supports the science which says the gains from planting wheat early will, overtime, far outweigh gains from avoiding frost by planting late. Frost did cause severe but patchy damage in some paddocks to both wheat and chickpea but in the end it was difficult to apportion yield reduction caused by frost or a dry finish.

With a decline in chickpea price (CQ $470 per tonne) the common marketing strategy for farmers this season has been to sell wheat and stored chickpeas on-farm.

Wheat planting (around 200,000 hectares) extended from mid April to early July. Most farmers were pleasantly surprised at yields given some crops received no in-crop rain. Early planted yields ranged from 2.5 to 3.5 tonnes per hectare but crops that were either double cropped, late planted or weedy yielded from 0.7 to 1.7 tonnes per hectare.

Low protein (8.5–10.5 per cent) was common. Explanations include: Farmers are applying insufficient N; farm practice has improved leading to better use of rainfall and increased yield with less water; a run of good seasons; and, high yielding crops have depleted N reserves and a decline in soil fertility (there is less N to mineralise for the next crop).

Chickpea planting (80,000 hectares) extended from early May to late June. Ascochyta blight (AB) was detected in some early crops and preventative sprays were used by some growers but many did nothing. Dry weather prevented AB from becoming a major issue this season. Chickpea yields range from 1.4 to 2 tonnes per hectare. Fires in headers harvesting chickpea were a serious issue especially during extremes of high temperatures and low humidity.

Livestock and pastures: With no effective rain since May most grass paddocks in CQ are either grazed short or very short although east of the Gregory Highway is generally much better then west of the highway. Hopefully storm rains will continue and cover a much wider area. If not, a green pick could prove fatal to drought affected cattle.

Water: Stock water shortages continues as a major issue and pulling bogged cattle from dams a heartbreaking job.

Financial issues: Cash flow, the cost of feeding stock and major downgrading of farm values when re-valued for increased overdrafts, are major concerns for farm managers.

Maurie Conway
Central Queensland Grower Solutions, Sustainable Farming Systems
Department of Agriculture, Fisheries & Forestry
Emerald, Queensland
November 6, 2013

ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

The tractor is a 1957 48 hp French Sift. This fine example was photographed at the Temora Rural Museum.

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