AUSTRALIAN GRAIN

November–December 2011

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

Advertising
Norm Neeld
(Group Sales Manager)
P: 07 4659 3555
F: 07 4638 4520
M: 0428 794 801

Editor
Lloyd O'Connell

Associate Editor
David Dowling

Production and Design
Mick Allan

Office Manager
Catherine O'Connell

Published by Berekua Pty. Ltd.,
40 Creek Street, Brisbane
Registered by Australia Post Publication No. PP 424022/1581. ISSN 1449–2970.

Published bi–monthly.
Grain Yearbook published in April

FRONT COVER

Full to the brim
Many forecasters are tipping this year's national winter crop to come in at around 41 million tonnes. This would be our fourth biggest ever. But late season – and grain filling – rains may just put another bag or two into grain storages across the country and challenge the 2003–04 record of 43.4 mt.

PHOTO: Peter Norris, Australian Grain district reporter, WA Northern Region

Contents

Editorial **2**
Scientists use genetics to defeat crown rot **4**
Research to bolster yellow spot resistance **6**
Breeders given tools to reduce grain defects **7**
Crop sealing products under trial **8**
More harvesting capacity and versatility with less compaction **13**
GRDC International Research Review:
Biological battle waged against snails **16**
International collaborations under way at CSU… naturally **17**
Coming to a paddock near you: Taped insect cadavers **18**
Classic Tractor Tales…
Tractors and politics of the 1940s **20**
Windows opens the door to speedy science **24**
Marketing…
Domestic grain crop outlook **25**
Domestic crop estimates **26**
Markets overshadowed by uncertainty **27**
Food security, food reality and Australian agricultural opportunity **29**
Education a key to tackling urban encroachment **33**
Farming in Foreign Fields…
Knowing the costs pays dividends **34**
Closing the phosphorus efficiency gap **36**
Peak phosphorus – a real or perceived issue? **37**
It seems 'biochars ain't biochars' **39**
District Reports **42**

Focus Sections

Southern Australia Focus

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

Consultants' Corner:
Building better soils for better crops **i**
New faba bean: A class of its own **vi**
Seed destructor set for test debut in the south this harvest **vii**
Spray expert says simple changes can increase yield **viii**

Northern Focus

Covering Northern NSW and Queensland

Consultants' Corner:
Building better soils for better crops **i**
Whole-grain flour power **v**
Innovative use of alternative flours **vi**
Grain pests: Their natural habitat and their natural enemies **vii**
Empower farmers to feed the world **viii**
CSG debate flawed **viii**

Editorial... Lloyd O'Connell

With a relatively smooth harvest to date – then again, any harvest relative to last season's would have to be at least smoother – most forecasters are tipping around a 41 million tonne national winter crop. This would put the 2011–12 crop just off the medal podium coming in at our fourth biggest ever. But recent late season grain filling rains in many regions, may just tip the current winter crop well into the medal rankings.

At 43.4 mt, 2003–04 has been our biggest winter crop. This is just 2.4 mt – or around five per cent – more than estimates for the current season. And I think we were given a strong hint that a few yield surprises might be on the cards this season when, in mid-November, the Australian Oilseeds Federation lifted national canola production estimates by 85,000 tonnes to our biggest ever delivery of 2.62 mt. If there's a similar three or four per cent 'surprise' in wheat and coarse grain production, then this season will certainly step up onto the podium and will even give the 2003–04 record a big shake.

Great yield result, pity about the price, or should that be pity about the exchange rate. While our strong Aussie dollar is helping with the price of imported inputs, it's a very sobering thought that for every one cent appreciation in the Aussie dollar compared to the US$, it means about $3 to $4 per tonne less in growers' pockets for internationally traded – and US$ priced – grain crops. Since the floating of the AUD in 1983, it was only four years ago when our dollar first broke through the 80 US cent barrier (read as $60 to $80 AUD per tonne 'lost' to AU$/US$ appreciation).

Except for a fairly tight corn and barley balance sheet, the world grain markets are currently well supplied. But with increasing consumption rates, stock levels will continue to be tight enough to support relatively good world prices – and here's the catch again – in US$.

Productivity growth

The latest research from ABARES shows that cropping farms are leading the way in agricultural sector productivity gains – in other words – how efficiently farms combine inputs to produce outputs. ABARES uses total factor productivity (TFP) as the key indicator as it compares the total market outputs produced (crops and livestock) relative to the total inputs used (the main types being land, labour, capital, materials and services). Over the past 30 years, cropping farms have averaged TFP growth of 1.9 per cent a year compared to all broadacre farms at 1.3 per cent.

These productivity gains are a big feather in the cap for grain growers in particular – and farmers generally – given that in the most recent OECD *Agricultural Policy Monitoring and Evaluation* (2011), Australia expends the lowest amount of public funding on agriculture as a percentage of GDP (0.12%) of any nation on Earth. The US, Canada, Brazil and the EU all spend more than 0.6 per cent of GDP with the OECD average at 0.85.

From all at *Australian Grain*, here's to a great Christmas and a productive, prosperous and healthy New Year.

AUSTRALIAN GRAIN

In this issue...

Genetics to defeat crown rot

Queensland scientists believe they have broken through the crown rot barrier by using genetic research to create disease-resistant wheat parent lines

See article . . . . . Page 4

Crop sealing products under trial

During the difficult 2010–11 winter crop harvest, the southern NSW based grower's group FarmLink Research tested the usefulness of various crop sealing products. The products included pre-harvest spray treatments aimed at reducing shattering losses in canola and lupins and less sprouting in cereals.

See article . . . . . Page 8

Peak phosphorus – a real or perceived issue

A reliable supply of high quality phosphorus (P) has been a cornerstone of agricultural development in Australia as well as across the globe. As most farmers know, P is an essential nutrient for plant growth that has no substitutes.

See article . . . . . Page 37

Tractors and politics of the 1940s

During the Second World War, new tractor availability came to a more-or-less full stop. Australian farmers were obliged to patch up old tractors that in normal times would have been scrapped. To add to the problem, spare parts were in a critical short supply, and worn out pneumatic tractor tyres had to be replaced with hitherto abandoned spudded steel wheels. Often horse teams, having been replaced by tractors and now enjoying their retirement in the back paddock, were once again harnessed to the plough.

See article . . . . . Page 20

Good looks, brains and a whole lot of brawn.

JOHN DEERE

The new S690 delivers on every level. The Class 9 harvester boasts 405 kW (543-hp) at rated speed and 460 kW (617-hp*) at its peak power, making it one of the most powerful combines on the market.

Big and nimble, it can easily handle 12.2 m (40-ft) platforms including the new 640FD HydraFlex™ Draper and it's also easier to find your comfort zone with 30% more interior space and familiar controls.

Expanded glass, tinted windows, and slimline cornerposts offer almost 180-degrees of visibility. The 14,100 L (400-bushel) capacity grain tank and new grain cleaning system means you'll keep moving through harvest at maximum capacity without compromise.

With JDLink™ and other extras as standard on all the S-Series Harvesters, welcome to a new era of harvesting from John Deere.

Get to know the all new S-Series Harvester at our website or visit your local John Deere dealer today.

Nothing Runs Like A Deere.™

*At 1900 RPM.

JohnDeere.com.au/new

Scientists use genetics to defeat crown rot

QUEENSLAND scientists believe they have broken through the crown rot barrier by using genetic research to create disease-resistant wheat parent lines.

Crown rot causes an estimated $79 million per annum in yield losses for Australian growers and has severely hindered the industry for more than 60 years, despite the efforts of Australian and international researchers.

Department of Economic Development, Employment and Innovation (DEEDI) scientist Dr Damian Herde said overcoming crown rot was the Holy Grail of wheat breeders and growers.

"A DEEDI team has been working with the Grains Research and Development Corporation (GRDC) for many years now to develop disease-resistant wheat lines," Damian said.

"We have developed a variety of genetically resistant wheat designed to assist breeders to produce disease-free, superior varieties.

Scientists Damian Herde and Cassandra Percy in a 'growth room' with some new pre-breeding material.

"We have sent the latest batch of 30 lines to wheat breeding groups throughout Australia.

"We are confident our lines are going to help wheat breeders defeat crown rot.

"This outcome represents years spent identifying breeding material with a desirable gene, plus several more years purifying and crossing it many times to lines with many other sets of genes.

"These parent lines with the new gene are now being crossed by commercial plant breeders.

"It will be another seven to 10 years of this crossing and selecting process before we finally see the release of a commercial crown rot resistant wheat variety, but we believe this is now a certainty.

"It is a very long process. By comparison, if this were the medical field what our team has done is similar to finding the gene that causes a disease, finding a way to shut it down and doing preliminary trials demonstrating that our process works, and then handing the process to a commercial company."

Crown rot is a soil-borne disease that is most damaging in a dry season, and results in the affected plants producing pinched seeds or no seeds at all.

Damian and his researchers have used genetic research to gain a greater understanding of why some wheat plants were resistant to crown rot and others were not.

"While the idea of genetic resistance to crown rot has been known in the scientific community for decades, the ability to capture this resistance and produce a successful disease-free variety has remained elusive," he said.

"Our research has involved using old-fashioned techniques combined with modern understanding to identify how genes are passed on by the parent plants resulting in disease-resistant plants.

"This has helped us to properly screen, cross-breed and continue to develop new wheat lines which we believe will have even greater disease resistance."

For more information call DEEDI's Business Information Centre on 13 25 23 or visit www.deedi.qld.gov.au ■

SOME CROWN ROT HISTORY…

In Australia crown rot (caused predominantly by *Fusarium pseudograminearum*) is the fifth-most damaging disease of wheat, as well as the major soilborne disease and the most costly Fusarium disease.

Yield losses in the northern cropping region (characterised by summer-dominant rainfall) can be as high as 89 per cent, while damage is not as extreme in the south (up to 9.5 per cent yield loss in Victoria).

The widespread use of minimum-tillage/conservation farming practices have resulted in situations more conducive to severe disease problems, because crown rot inoculum carries over in retained stubble.

Limited control options

The available strategies for controlling crown rot are limited, compared to many diseases. There are no effective fungicides available. Cultural practices, such as avoiding back-to-back wheat plantings, and using crop rotations with sorghum or chickpeas, can help lower the level of inoculum in paddocks prior to planting. But several years of cropping to a non-host will be required, particularly in severely crown rot infected paddocks.

Genetic disease resistance is the most efficient approach to managing crown rot. The use of resistant varieties minimises losses due to disease in the current crop, as well as reducing the level of inoculum that is carried over to the following season.

Unfortunately, at present there are no commercially available cultivars that have strong resistance to crown rot. The strongest resistance is found in the cultivar EGA Wylie, followed by Sunco, Baxter and Lang, but their resistance level is still only intermediate, and all will suffer yield loss in the presence of disease, particularly with a dry finish.

DEEDI is working with Fusarium crown rot of wheat, developing elevated levels of genetic resistance in the crop plant.

Crown rot resistance has been difficult to capture by plant breeders in the past. The work by DEEDI first investigated why this was the case, and uncovered the complex nature of the disease. This has enabled a strategic approach that optimises the strength of resistance.

To support the genetics, strong and reliable field disease testing methods, coupled with the fastest glasshouse test in the country enable DEEDI to balance between speed and accuracy in the pathology approach.

DEEDI has released three sets of resistant material to the private breeding companies over the past two years. The most recent (2011) consisted of 30 lines with improved disease resistance, covering a range of wheat germplasm sources.

The material developed by DEEDI is being screened for known disease-resistance molecular markers in collaboration with the University of Southern Queensland. Molecular markers will be a useful tool for the private breeders who do not have access to pathology testing of the DEEDI quality.

The broad usefulness of the DEEDI crown rot parents can be seen by their usage to elevate disease resistance by researchers at SARDI, the new crown rot researchers at the University of Queensland and University of Sydney, as well as by the private plant breeding companies.

Crown rot symptoms in wheat.

Research to bolster yellow spot resistance

WESTERN Australian researchers have identified new genetic material which wheat breeders can use in coming years to strengthen the resistance of new varieties against yellow spot disease.

Department of Agriculture and Food WA (DAFWA) scientists have identified the material in collaboration with researchers from The University of Adelaide and Victoria's Department of Primary Industries under a Grains Research and Development Corporation (GRDC) funded project.

Yellow spot, also known as tan spot, is a damaging foliar disease in wheat and can cause yield losses greater than 50 per cent in seasons when conditions are favourable for disease development.

In WA alone, yellow spot causes average crop losses of $140 million annually, and the cost of controlling the disease in the state is $209 million annually.

DAFWA senior plant pathologist Manisha Shankar said yellow spot had been widespread in the WA grainbelt in 2011.

She said relatively few yellow spot resistance genes had previously been identified and mapped in Australian germplasm, and only one gene – tsn1 located on the 5BL chromosome – was in general use in Australian wheat breeding programs.

"Since starting work on this pre-breeding project in 2010, our research team has found five 'chromosomal regions' – or genes other than tsn1 – which confer resistance to yellow spot," Manisha said.

"Some of these genes appear to be novel (previously not reported).

"We are now working to 'stack' two or more of these genes in combination with tsn1 to develop higher levels of resistance that can be deployed into future varieties."

Manisha said the research had also identified novel yellow spot resistant germplasm among lines imported from the International Centre for Agricultural Research in Dry Areas (ICARDA) and the International Maize and Wheat Improvement Centre (CIMMYT), through the CIMMYT-Australia-ICARDA Germplasm Evaluation (CAIGE) project.

"These ICARDA and CIMMYT lines will help us identify additional resistance genes to further enhance resistance," she said.

Delay pathogen evolving

"Also, if genes 'stacked up' in breeding lines are from diverse material, the yellow spot pathogen may take longer to evolve against them and break down the genes."

Manisha said researchers at DAFWA and Queensland's Department of Employment, Economic Development and Innovation (DEEDI) were also developing new technology which would speed up screening processes used by plant breeders to identify yellow spot resistance levels in adult plants.

"Currently, this screening is carried out in the field and takes place when the wheat plant reaches maturity," she said.

"By exposing plants to continuous light in the glasshouse, plants are reaching maturity much more quickly, and under these controlled conditions plants have produced flag leaves within four to six weeks.

"The levels of yellow spot resistance in adult plants grown under these conditions can be easily distinguished much earlier, and these methods will greatly improve the efficiency of breeding for adult plant resistance to the disease." ■

DAFWA researcher Manisha Shankar is confident the discovery of the new yellow spot resistance genes will lead to more resistant varieties in coming years..

Breeders given tools to reduce grain defects

AUSTRALIAN wheat breeders have been equipped with new tools to assist the development of varieties which, at harvest, are less likely to be downgraded in quality due to grain defects.

Research funded by the Grains Research and Development Corporation (GRDC) has produced new germplasm, screening methods and selection tools to speed up the production of varieties less susceptible to pre-harvest sprouting, late-maturity alpha-amylase (LMA) and black point (BP).

In seasons with extreme damage, sprouting and black point can cost Australian growers hundreds of millions of dollars.

LMA is a genetic defect which, like sprouting, may be triggered by environmental conditions and results in the production of alpha-amylase – an enzyme which can degrade grain starch – measured by 'falling number' tests at delivery.

But unlike sprouting, there is no physical evidence of the defect on the grain itself.

University of Adelaide 'pre-breeders', under a GRDC project, have developed new screening processes which are helping plant breeders eliminate LMA.

LMA screening is now an important step in variety classification and has greatly reduced the risk that new varieties posing a high risk would be released to growers.

"This is significant because LMA has traditionally been very difficult to screen for and get rid of," University of Adelaide Associate Professor Daryl Mares said.

He said screening for sprouting and black point had also been difficult and expensive.

"But in collaboration with local and international researchers, the projects based at the University of Adelaide have identified genetic material which influences these defects, and developed new molecular marker tools," Daryl said.

"These tools will speed up the time it takes for breeders to identify wheat lines with enhanced resistance to sprouting and black point and which have greatly reduced risk of LMA.

"This is because molecular screening can be conducted by breeders in the laboratory, free from the complicating effects of environmental factors associated with field testing."

Daryl said the results of the 'grain defects' research would significantly reduce the incidence and severity of defects at harvest in the future, as better varieties became available to growers.

"This will in turn lead to reduced risk and increased or more reliable returns for growers, and flow-on benefits for the marketing of Australian wheat," he said. ■

Sprouting and blackpoint can cost growers million of dollars in damaged grain.

Crop sealing products under trial

DURING the difficult 2010–11 winter crop harvest, the southern NSW based grower's group FarmLink Research tested the usefulness of various crop sealing products. The products included pre-harvest spray treatments aimed at reducing shattering losses in canola and lupins and less sprouting in cereals.

How the trials were done

Canola – A replicated trial of small plots was set up at Brent Alexander's, 'Milbrulong', to compare direct heading canola plus or minus Podceal (Agspec) and Desikote Max (Nufarm) to windrowed control plots. Additional treatments of Podceal and Desikote Max plus Roundup were included in the trial.

Two demonstration sights were established on the properties of Bernard and Rob Hart, Junee and Ben Beck, 'Downside'. Podceal supplied by Agspec was applied to measured sections of the crop by air. Measurements were collected on windrowing shattering losses, direct heading shattering losses, yield, harvest speed, grain quality and post harvest seed germinations.

Lupins – A strip of Podceal, supplied by Agspec, was applied four harvest strips wide on a lupin crop at David and Cathie Fox's 'Marrar' property to test shattering differences plus or minus Podceal. Information was collected on harvest shattering losses, yield and grain quality.

Wheat – A replicated trial comparing Podceal and Desikote Max was implemented at Galong to test the effect of the pod sealant products on sprouting in wet conditions. Eight replications of each treatment were compared to a control of nil application.

Replicated trial results

The yields of all treatments were not significantly different.

AT A GLANCE...

- Replicated trial data showed no significant yield improvements with the products tested.
- Grain quality improvements were not observed in any crops.
- Harvest speed was decreased with direct heading treatments by an average of 0.45 ha/ hr.
- Direct heading worked well with belt fronts – a cross auger helps.
- Growers risk shattering losses in canola if direct heading is delayed.
- Shattering losses were impacted by disease levels in 2010.

Tawriffic TT was the canola variety used in this trial. Windrowing was done by hand using a hedge cutter. The trial harvest was delayed by 10 days due to rainfall – harvest took place 20 days after windrowing. It was expected that the direct head only treatment would have been adversely effected by the harvest delay, but this did not happen.

The oil contents of the direct head only and the windrowed treatments were significantly better than the direct head + Desikote Max treatment. The addition of Roundup was undertaken to test anecdotal evidence that it may improve seed retention, yield and oil content.

Hart's demonstration information

Canola yield

Yields were adjusted for moisture to eight per cent at the time of harvest to give a realistic comparison between treatments. The direct heading plus Podceal treatment, for this site, was 212 kg per hectare greater than direct heading with no Podceal and 180 kg per hectare greater than the windrowed treatment average (Figure 1). Harvest at this site was at the first opportunity and very timely.

Shattering loss

Shattering losses were influenced by moisture levels and temperature at the time of harvest (Figures 2 and 3). The direct head minus Podceal treatment was harvested at 7.30 pm which

FIGURE 1: Moisture adjusted yield Hart's Podceal demonstration 2010

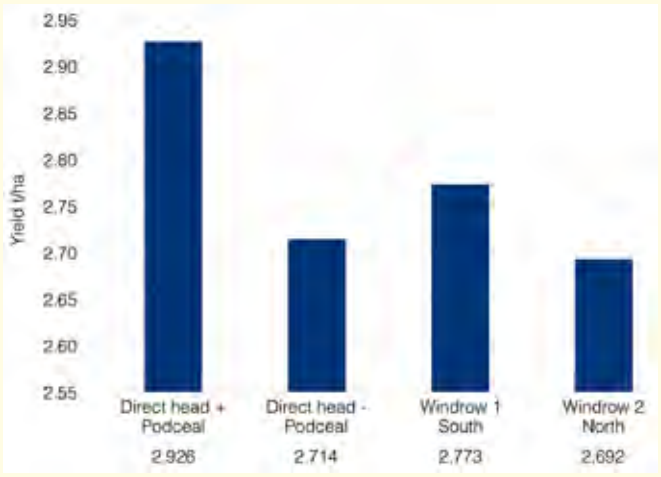


TABLE 1: Yield results replicated Podceal and Desikote trials

Treatment	Yield kg/ha	Significance	Oil %	Significance
Direct Head	2567	a	45.4	a
Direct Head + Podceal	2364	a	45.3	a b
Direct Head + Desikote Max	2273	a	44.8	b
Direct Head + Podceal + Roundup	2323	a	45.2	a b
Direct Head + Desikote Max + Roundup	2263	a	45.1	a b
Windrowed	2293	a	45.4	a
LSD (P=0.05)	392		0.526	
CV	11.08			
Significance letters that are the same are not statistically different.				

Everything You Need to Go All Out.

Extra versatility for your get-it-done attitude.

JOHN DEERE

Introducing the new 9R/9RT Series Tractors. With up to 417 kW engine power (560 hp*), up to 9,071 kg hitch-lift capacity, and up to 295 L/min hydraulic flow, they make it easy for you to go all out and get every job done faster than ever. What's more, the PowerShift Transmission with its new Efficiency Manager™ feature will help you get it all done with less diesel. Combine that with the advanced GPS and information-management technologies from John Deere, and you'll get it all done better than ever – all while riding in the spacious and comfortable CommandView™ II Cab. These are the high-horsepower tractors built for your go-all-out-and-get-it-done attitude.

The all-new 9R Series Tractors with 268-417 kW of engine power (360-560 hp*) and 9RT Series Track Tractors with 343-417 kW of engine power (460-560 hp*).

Get to know the all-new 9R/9RT Series Tractors at our website or see your local John Deere dealer today.

Nothing Runs Like A Deere.™

* Rated engine hp (ISO) per 97/68/EC.

JohnDeere.com.au/new

TABLE 2: The effect of sealant products on wheat to reduce weather damage					
Product	**Yield t/ha**	**TWT gms**	**Screen % gms**	**1000 GWT gms**	**Falling numbers**
Podceal @ 700ml/ha	7.35	76	0.702	44.71	241.5
Desikote Max @ 700ml/ha	7.51	76	0.784	45.09	249
Control – nil application	7.78	76	0.677	45.51	250.4
LSD (P=0.05)	0.574	4.05	0.134	1.26	17.64
There were no significant impacts on any of the factors tested in the wheat trial with Podceal and Desikote Max.					

FIGURE 2: Yield monitor moisture levels at harvest of Hart's Podceal demonstration 2010 – grain tested prior to harvest was on average 7.5 per cent

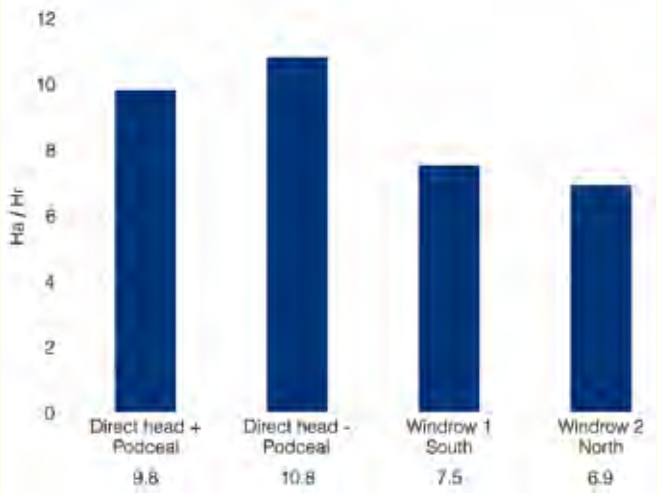


FIGURE 3: Direct heading shattering losses, Hart's Podceal demonstration 2010

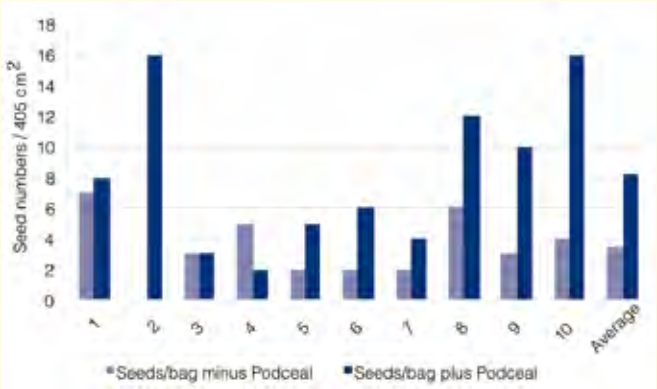


Photo 1: Stem colour post direct heading (Hart's site).

raised the moisture level by one per cent above that of the direct head plus Podceal treatment. Total shattering losses per hectare were 3.78 kg per hectare for nil Podceal and 9.1 kg per hectare for plus Podceal. This equates to a direct harvest shattering loss between 0.13 per cent and 0.3 per cent of total yield.

Harvest speed

Harvest speed was reduced by direct heading by 0.45 hectares per hour (Figure 4). Stems in direct heading treatment were still green (see Photos 1 and 2). Grain moisture when tested prior to harvest was averaging 7.7 per cent. The moisture percentage was influenced by the significant levels of diseased plants – 20 per cent – in the crop that dried down quicker than the unaffected plants.

FIGURE 4: Harvest speed ha/hour, Hart's Podceal demonstration 2010

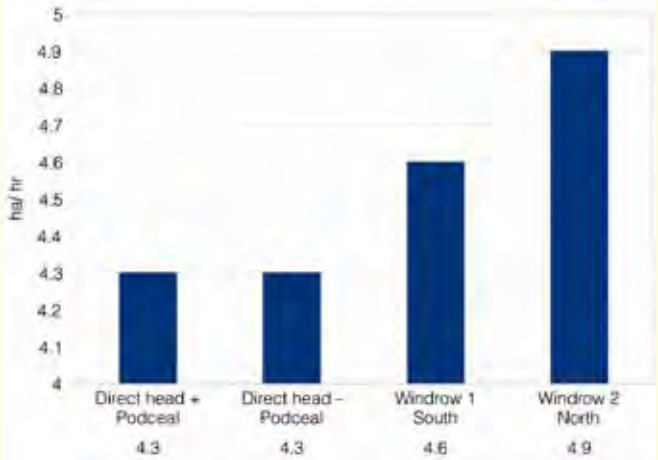


Photo 2: Header trash post direct heading (Hart's site).

Post harvest seed germinations

The average post harvest seed germinations (Figure 5) for each treatment were:

- Direct head plus Podceal – 221 plants/m^2;
- Direct head minus Podceal – 337 plants/m^2; and,
- Windrowed – 365 plants /m^2.

Post harvest seed germination was measured outside the trash trail six rows in from the outside row. Direct heading caused extra shattering on the outside of the header comb where it was cutting into the crop. Shattering was largely an effect of disease drying down plants early. Shattering within the windrow trash trail 'appeared' higher than the direct heading trash trails. (See photos 3 and 4).

FIGURE 5: Post harvest seed germination Hart's Podceal demonstration 2010

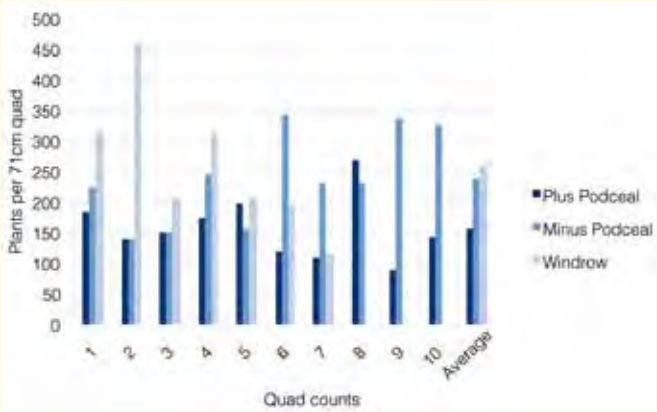
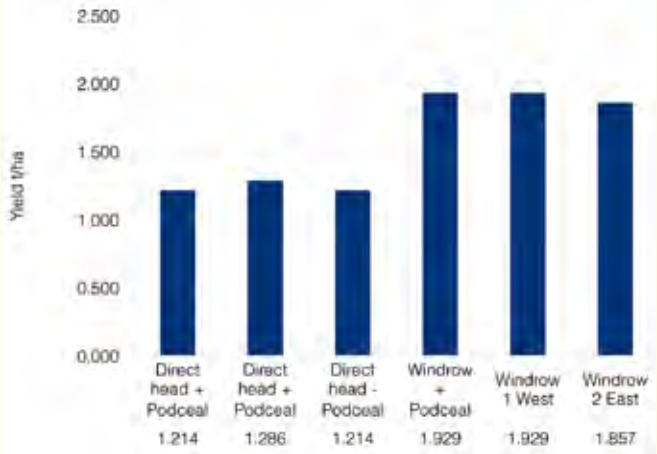


FIGURE 6: Yield result, Beck's Podceal demonstration 2010



Beck's 'Downside' demonstration results

Yield

The yields for direct heading plus Podceal, for this site, were marginally different to direct heading with no Podceal. The average yields for the plus Podceal treatment were 36 kg per hectare greater than the minus Podceal treatment.

The average yields for the windrowed treatments was 700 kg per hectare greater than the direct heading treatments. This sites harvest was delayed by several weeks due to rainfall and this had a marked effect on the direct headed treatments. A windrowed treatment that had Podceal applied prior to windrowing had a minimal effect on yield of 30 kg per hectare (Figure 6).

Harvest speed

The average harvest speed for direct heading was 4.9 hectares per hour (Figure 7). The average harvest speed for windrowed treatments was 5.6 hectares per hour an increase of 12 per cent. Direct heading speed was affected by the direction of the lean on the standing crop. This effect is similar when windrowing.

FIGURE 7: Harvest speed 'Downside' Podceal demonstration 2010

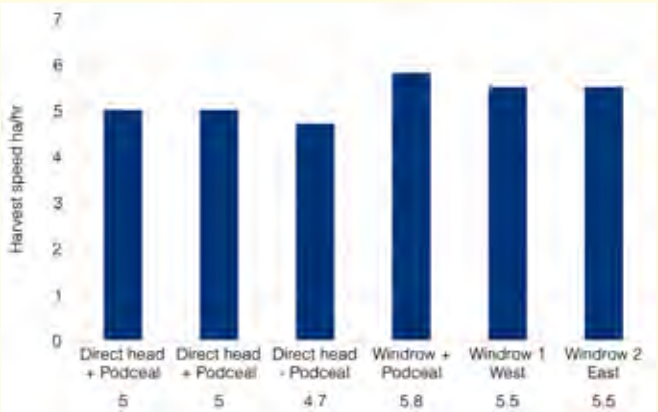


Photo 3: Post harvest germination direct heading (Beck's site).

Photo 4: Post harvest germination windrowed (Beck's site).

Shattering loss

The use of Podceal under the conditions experienced at this site reduced direct heading shattering losses by 43 per cent or 26.9 kg per hectare (Figure 8). At $500 per tonne, 26.9 kg per hectare of canola grain would increase returns by $13.45 per hectare. Post harvest emergence counts were taken but owing to severe hot weather, volunteers were severely moisture stressed and difficult to accurately count.

Lupins and Podceal demonstration

Yield

The use of Podceal on lupins at the 'Marrar' site yielded on average 159 kg per hectare less than the untreated controls (Figure 9). Yields were measured by header yield monitor using a Case setting for soybeans as there was no calibration for lupins.

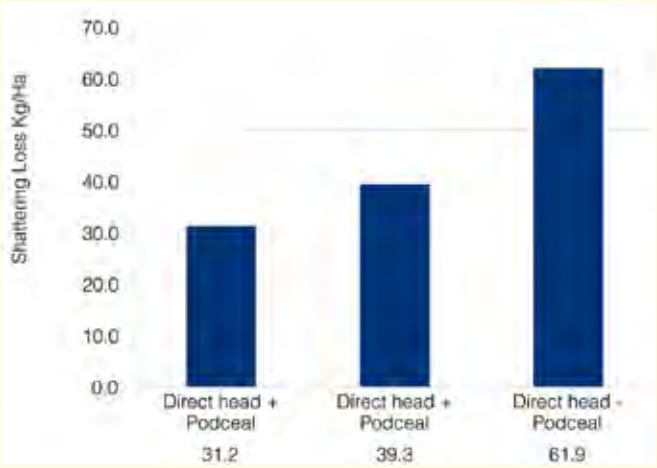
David Fox believed the actual yields were greater than estimated by the monitor. He commented that the Podceal strips sounded and felt harder to thrash and that there was more pod in the plus Podceal strip samples.

On average the minus Podceal strips were 0.172 hectares per hour faster to harvest than the treated strips (Figure 10).

FarmLink Research gratefully acknowledges the following; The input of Agspec who funded large parts of this product assessment.
Nufarm for their contribution to the replicated trial work on canola.
NSW Department of I&I, Peter Matthews and Steve Lyon for management and harvest of replicated wheat trials.
AgriTech for trial management and harvest of replicated canola trials.
Growers Rob and Bernard Hart, Ben Beck and David and Cathie Fox for their time and effort with the commercial area assessment.

Project collaborators: AgriTech, Agspec, Brent Alexander, Ben Beck, FarmLink Research, David & Cathie Fox, Hart Bros. Seeds, NSW Department I&I and Nufarm.

FIGURE 8: Harvest shattering losses 'Downside' Podceal demonstration 2010



On average, the harvest speed for windrowed crops was 0.45 hectares per hour faster than the direct headed crops with the crop sealing treatments.

TABLE 3: Comparitive costs per hectare for lupin crop sealant treatments

Costs	Product $/ha	Application $/ha*	Total $/ha
Podceal	31.68	24.00	55.68
Desikote Max	31.62	24.00	55.62
Windrowing	37.50		37.50

*Aerial application.

FIGURE 9: Lupin harvest yield Podceal demonstration 2010 at 'Marrar'

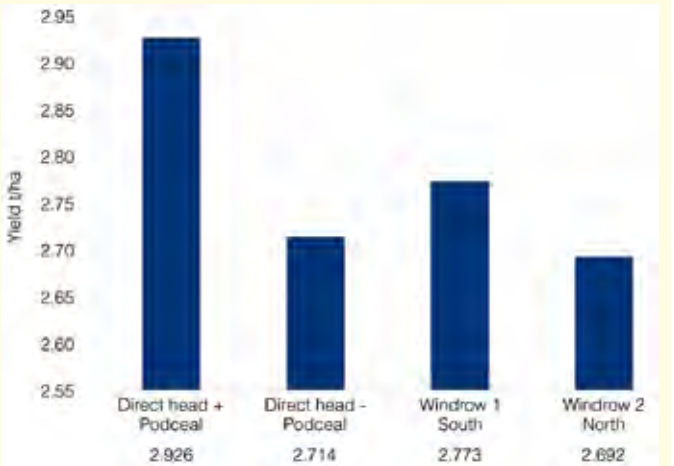
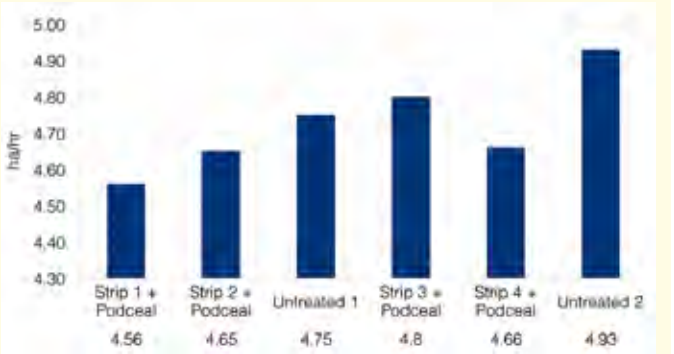


FIGURE 10: Lupin harvest speed Podceal demonstration 2010 at 'Marrar'



More harvesting capacity and versatility with less compaction

THE ability to direct head canola, improved stubble management and reduced soil compaction are three big reasons behind the purchase of Riverina grain grower, Ian Trevethan's new combine harvester.

Ian Trevethan, wife Melanie and parents, Paul and Joan, manage a diversified agribusiness enterprise that includes large-scale cropping, livestock, olive and aquaculture at 'Dunoon' near Howlong NSW.

Each year, more than 1400 hectares of dryland wheat and canola are sown across the family's three properties or under leased or shareholding arrangements.

"We have doubled our cropping area in recent years and our old Deutz Fahr just wasn't keeping up," Ian says.

"It really struggled during last year's wet harvest.

"To be fair, it was 25 years old and it was time to upgrade."

The Trevethans quickly crossed contracting and second-hand machine options off their list.

"It's not worth buying a second-hand machine at the moment because of the strong Australian dollar," Ian says.

"We decided against using contractors because we need the flexibility to get harvesting done when it suits us.

"We are very busy over summer with shearing and our fish farming operations, so we can't afford to wait for a contractor.

"Even with our own harvester, we probably lost close to $100,000 in downgrading because of delays in harvesting last year."

With the sniff of a new combine harvester sale in the air, the Trevethans found themselves at the receiving end of an offer too good to refuse.

Side by side demo

"Two local machinery dealers arranged for us to have a side-by-side demonstration of two different combines," Ian says.

Ian Trevethan and Claas Harvest Centre Wagga Wagga principal, Paul Spackman, inspecting a side-by-side windrowing versus direct heading trial on 'Dunoon'.

"To be completely fair, both machines did a great job but we felt the Claas Lexion 750 had the edge in terms of capacity and spreading crop residues.

"We wanted a machine that could handle large volumes of material without impacting harvesting efficiency.

"The fact that it was purpose-built for tracks clinched the deal."

With its hydro-pneumatic rubber-tracked undercarriage, 10.5 m extendable cutterbar and a throughput upwards of 80 tonnes an hour, the Claas Lexion 750 is one of the most advanced harvesting platforms available in Australia.

Terra Trac is the world's first factory engineered and fitted track assembly for combine harvesters.

With nearly three metres of ground contact area, the twin 630 mm tracks and 2.75 m spacing provide a stable platform when operating heavy, wide fronts, even at high speeds.

Equally important, independent trials show the tracks can slash soil compaction by up to two-thirds.

"We can see major benefits in being able to get into our crops when we want, improved stability and a reduction in soil compaction," Ian says.

"The 40 km per hour transport speed and 3.3 m transport width are also important, as we can move to the next paddock or farm quickly without an escort."

The soft touch... Ian Trevethan and Claas Harvest Centre Wagga Wagga principal, Paul Spackman, inspecting the Lexion 750's hydro-pneumatic tracked undercarriage.

New separation technology

All four models in the Lexion 700 series feature the unique 'hybrid' separation technology.

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

The remaining material then passes through twin longitudinal rotors for optimal grain separation under all conditions.

Claas is the only manufacturer to offer both systems in the one machine.

Other vital statistics include a Caterpillar C13 engine that delivers a maximum output of 466 hp (343 kW) and a 10,500 litre grain bin with 100 litres per second discharge rate.

"We've probably got twice the capacity we need but we don't want to stand still," Ian says. "We'll have the capacity if and when we expand and in the meantime, we'll do a bit of contracting when it suits us."

Canola direct heading

Completing the package is a Claas Vario 1050 multi-crop variable cutterbar that will enable direct heading of canola.

The distance between the knife bar and the intake auger can be adjusted by up to 300 mm 'on the move' to suit different crop conditions.

The manual fitting of stripper bars can widen the table by a further 200 mm, thereby enabling the direct heading of canola.

Vertical knives can also be fitted to aid in direct heading. The fitting process only takes a couple of minutes, eliminating costly delays during harvest.

"Canola has the highest grain price tag on it so you owe it to yourself to get it off on time," Ian says. "If you windrow too early, the canola doesn't have the chance to mature completely.

"With direct heading, you can allow the crop to mature and then have a wider window for desiccating.

"We are yet to find out, but we think direct heading will improve yields by up to 20 per cent simply through better maturity, not to mention being able to harvest and spread stubble in one operation (see panel article).

"In a wet summer, we also expect to see higher yield and quality through better test weights and less shot and sprung grain compared to canola that has been sitting in wet windrows.

"Against this, we will be harvesting canola later than usual, which may interfere with our wheat harvesting program, so we'll see." ■

BIG STUBBLE, NO TROUBLE

The ability to handle vast amounts of stubble is a must when selecting farm machinery for use in the Trevethan family's min-till cropping program.

"We've been direct drilling for 20 years and stubble management remains our biggest hurdle," Ian Trevethan says.

"We have tried everything – grazing, spreaders, mulchers and wider row spacings – but we are still having to burn occasionally to keep on top of stubble.

"In a perfect world, we want to cut the crop nice and short – say less than 30 cm – smash the stubble, spread it around evenly and have it broken down as much as possible by the time we go to plant next autumn.

"That was one of the key reasons why we decided to go with the Lexion, which does a fantastic job at chopping and spreading."

The combine harvester will also be fitted with auto-steering to complement the much-anticipated adoption of inter-row sowing using a nine metre Seed Hawk cultivation bar and trailed Horwood Bagshaw airseeder.

"We have progressively introduced GPS guidance systems into our spraying and sowing operations and next year we hope to sow into this season's standing stubble," Ian says.

"We believe inter-row sowing will allow us to cope with the extra stubble load by reducing tine blockages and reducing disease pressure."

The Canadian-designed Seed Hawk toolbar is purpose-built for min-till farming systems, enabling high speed, precision seeding even in uneven terrain or heavy stubble conditions.

It features patented hydraulically-modulated 'openers' that independently follow the contours of the ground.

Once the trip pressure has been reached, the opener gently glides up and over any obstacle before re-engaging the soil.

The 'break out' pressure of each opener can be adjusted from inside the cabin to suit conditions on the move.

The laid back design of the openers is similar to the working of a parallelogram except that the seed and fertiliser are placed independently via separate knives.

Depth control and soil consolidation is achieved via a 45 cm press wheel on each assembly.

The fixed-height heavy steel frame and generous clearance between each row allows the Seed Hawk to handle stubble and trash with ease.

Seed Hawk's patented openers enable fast and precise seeding, even in high stubble or uneven conditions.

Make tracks today

WIN an iPad2*
Register at www.lexion2012.com.au

New Lexion 700 + Terra Trac

Satisfied customers worldwide

WORLD DEMAND for the new Lexion 700 series combine harvester with Terra Trac is peaking and internationally supplies for harvest 2012 are limited.

With award-winning, hydro-pneumatic suspension for faster, smoother and more powerful operation and reduced soil compaction, the CLAAS Lexion 700 series has set the new global benchmark for harvest productivity and operator comfort.

Your nearest CLAAS Harvest Centre has a Lexion Early Action Program (LEAP) deal that can be tailor-made for your enterprise for next year.

Find out more and register for your chance to win an iPad 2 at www.lexion2012.com.au or call us on 1800 425 227.

1800 425 227
www.lexion2012.com.au

CLAAS

* Terms and conditions available online at www.lexion2012.com.au

IMC LPA 2428 AG

BIOLOGICAL BATTLE WAGED AGAINST SNAILS

'AS slow as a snail' is an expression which fails to ring true for a Charles Sturt University (CSU) research team seeking an effective and environmentally-friendly means of eradicating a major pest of the Australian grains industry – the land snail.

The very small exotic conical and round snails are classified into four species – *Cochlicella barbara, Theba pisana, Cochicilla acuta* and *Cernuella virgata*. All are regarded as a serious pest as they infest wheat crops, pulses, vineyards and pastures in southern Australia, clogging up machinery and threatening vital grain export markets like Japan.

Preferring cool, wet weather to breed, the snails appeared in western Victoria in late 2009 after moving interstate from South Australia in grain consignments. Their resistance to the hot weather also ensures their survival and large numbers, particularly in the dry areas of the Yorke Peninsula.

Funded by the GRDC, the four-year research project, headed by Professor Gavin Ash, is focused on finding a biological control for the pest in the miniscule native nematode.

Professor Gavin Ash, is focused on finding biological controls for snails and other pests of Australian grain production.

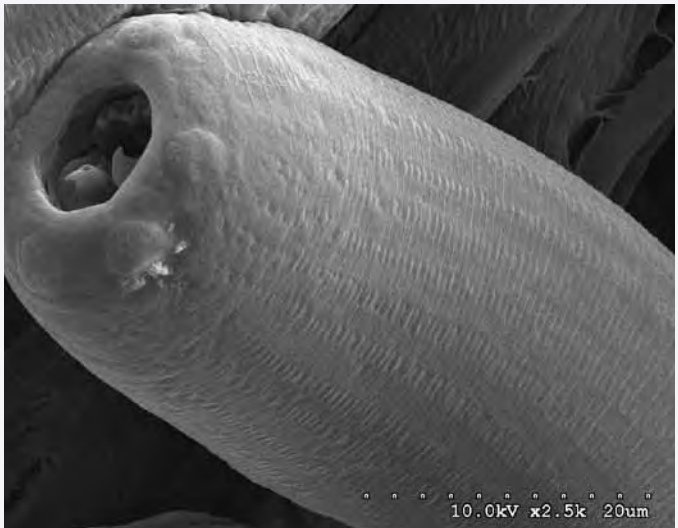
"Methods to control the snails to date have been less than successful," said Gavin, a plant pathologist from the School of Agricultural and Wine Sciences at CSU in Wagga Wagga. "They included stubble burn-offs, snail bait and even a parasitic fly imported from France. But the bait posed a danger to birds and was not particularly effective. Similarly the attempts to use the fly failed to control the snails about five years ago.

"The idea of the nematode as a biological control agent was born when we placed the native nematodes, found in soil, with the snails in a container in the laboratory. To our excitement we found dead snails. In fact mortality rates of up to 90 per cent have been recorded in about a week of the nematodes being placed with adult conical and round snails.

Gavin research team collected many soil samples from different habitats around NSW, VIC, SA and QLD. Using the wax moth larvae or *C. virgata* as baiting materials, they obtained more than 300 nematode isolates from these soil samples. All these nematode isolates were bioassayed for their pathogenicities against pest snails. A total of four nematode isolates, one from the group of Rhabditida and the remaining from the group of Diplogasterida, proved to be effective in killing these pest snails under laboratory conditions.

Promising nematode isolates

It is well known that the bacteria play a crucial role in forming the pathogenicity of nematodes against insects, slugs and other organisms. To clarify if a similar mechanism has been applied by these snails – parasitic nematodes – his research team isolated approximately 30 bacteria species from the bodies of four promising nematode isolates. By testing the efficiency of different nematode/bacterial combinations against different pest snails with different sizes, the research team has now successfully locked in two bacteria species with effect in



Using Scanning Electron Microscopy (SEM) nematodes can be identified as possible biocontrol agents.

assisting the growth of nematodes in artificial medium and increasing the pathogenicity of nematodes against pest snails.

"Under the microscope, you can see the nematode swim into the gut of a snail and burrow into it and release bacteria. The snail gets 'blood poisoning' and dies. A similar process happens with nematodes and slugs," Gavin said.

His research team's final target is to develop these nematodes as useful bioagents against pest snails in Australia. To achieve this goal, they conducted a series of LC50 trials in order to screen the most suitable densities of nematodes against pest snails. In addition, they have been developing techniques to mass culture and formulate these nematodes for the purpose of field trials.

His research team from the EH Graham Centre for Agricultural Innovation – a collaborative alliance between CSU and the NSW Department of Primary Industries – began their research in 2008. They remain optimistic about the potential of the nematodes as a biological control agent.

"We ultimately hope to work with the commercial sector to develop a nematode-based 'biological bait' for the snails by 2012. This will involve working with a commercial partner in the project."

But before then, the CSU researchers will see if they can truly slow down the snail and ultimately halt its progress. During field trials in South Australia in 2011, the researchers tested if the high mortality rates found in the laboratory can be repeated in the paddock.

Professor Gavin Ash is a lecturer in plant pathology, genetics and microbiology in the School of Agricultural and Wine Sciences at Charles Sturt University, Wagga Wagga. ■

TRANS TASMAN SEARCH FOR NEMATODE CONTROL

A new trans-Tasman research program will aim to develop a commercial biopesticide for the control of root lesion nematode, a serious pest of Australian cereal crops, particularly wheat.

Microbial product experts from New Zealand will join forces with plant pathologists from CSU – headed up by Gavin Ash, and nematologists from the Department of Agriculture and Food, Western Australia – to form a research group with strong industry support and extensive knowledge of commercial biopesticide development.

The project has three initial research targets:

- The identification and evaluation of existing commercial biopesticides with potential suitability for this crop/pathogen system;
- The development of a Trichoderma-based bionematicide for cereal root lesion nematodes; and,
- The identification of indigenous strains of selected microbe groups that may have potential as bionematicides.

The four year, $1.9 million research project, including a PhD stipend (2012–15) on indigenous biocontrol agents for nematodes, is funded by the GRDC and began in July 2011.

INTERNATIONAL COLLABORATIONS UNDERWAY AT CSU... NATURALLY

- Biological control of snails using native nematodes – funded by GRDC. We are collaborating with a German company to investigate mass production of the nematodes.
- Biopesticides for sucking insect pests of grain – funded by GRDC and CSU. We are collaborating with USDA (Montpellier France). We are also conducting whole genome sequencing to understand the basis of host selectivity in a fungus (*Metarhizium anisopliae*) for the management of aphids in Australia. This is the first time that this research has been undertaken in Australia.
- Reducing the impact of parasitic root lesion nematodes on cereals crops using biopesticides. This is GRDC funded and conducted in collaboration with Bioprotection Research Centre (NZ) and DAFWA.

Biological control of weeds

- Genome sequencing of fungi involved in biological control of weeds is underway in conjunction with Agri-Food Canada's Dr Karen Bailey. The target weed in this case is Californian thistle.
- Investigation is also underway on phytotoxins produced by Phomopsis spp. – funded by CSU. In an effort to develop a bioherbicide a number of isolates of Phomopsis have been identified as natural pathogens of saffron thistle in Australia. Most of these isolates also were found to be pathogenic to a number of other members of family Asteraceae. A genetic diversity and phylogenetic analysis has been undertaken and it has been determined that the fungus causing the disease in saffron thistle is a unique species in Australia.
  In glasshouse studies, the fungus has been shown to cause death of the target plants very rapidly, which indicates that phytotoxins may be produced by the fungus. The phytotoxins produced by this fungus are being isolated and characterised in collaboration with Professor Antonio Evidente from the University of Naples, Italy.

Rose grain aphid infected with *Metarhizium anisopliae*.

Coming to a paddock near you: Taped insect cadavers

By Jan Suszkiw and Sharon Durham, Agricultural Research Service, USDA

THE wormlike nematodes from the genera *Heterorhabditis* and *Steinernema* are less than one millimetre long. But don't let their small size fool you: Both can bring down prey many times their size. People, plants, and pets aren't on the menu, though – only the larval stages of Japanese beetles, vine weevils, root borers, fungus gnats, and other insect crop pests.

Heterorhabditis and *Steinernema* species belong to a small but elite group of entomopathogenic (insect-killing) nematodes whose host-specificity has made them appealing biological alternatives to synthetic pesticides. Liquid formulations, wettable powders, and clay carriers are among products used to apply the nematodes and keep them safe during storage. But about 10 years ago, an ARS team found that the nematodes perform best when applied to soils while still ensconced in the dead bodies of the insect hosts used to mass-produce them.

ARS entomologist David Shapiro-Ilan did that research with colleagues from ARS and the Virginia Polytechnic Institute and State University in Blacksburg, Virginia, and elsewhere. David is with the Southeastern Fruit and Tree Nut Research Laboratory in Byron, Georgia.

Their approach uses the insect cadavers as a kind of staging ground from which nematodes can venture out when conditions are optimal – or at the prompting of specific chemical cues from their dead host.

Upon locating and penetrating their prey, usually via natural body cavities, the nematodes release symbiotic bacteria. They, in turn, liquefy the insect's innards, killing it in 24–48 hours. The nematodes feed on the 'bacteria-seasoned' remains until all that's left is an empty shell. Within a week or two, a new generation of juvenile nematodes emerges, ready to start the cycle over again.

An idea takes shape

A technical hurdle that's kept the insect-cadaver approach from gaining widespread commercial acceptance is the tendency of some commonly used host insects – notably the soft-bodied greater wax moth larvae – to rupture or stick together during storage, transport, and application.

To address this issue, David teamed with Louis Tedders of Southeastern Insectaries, Inc., in Perry, Georgia, and entomologists Juan Morales-Ramos and Guadalupe Rojas – both with ARS's Biological Control of Pests Research Unit in Stoneville, Mississippi.

The result of that collaboration was an automated system that – in 'Dr Seuss-like fashion', as David describes it – plucks nematode-infected insect cadavers from a container and deftly sandwiches them between two strands of masking tape. Eventually, an entire roll is formed, allowing for easy storage, transport, and application to pest-infested soils – whether in crop fields, orchards, greenhouses, or gardens.

Customised insect-cadaver taping

Louis, who had been collaborating with the ARS scientists under a cooperative research and development agreement,

Entomologist Juan Morales-Ramos (left) and insect production worker Matthew McDaniel use a scaled-down prototype of a separator they designed to sort mealworms by size. (Photo: Stephen Ausmus)

Inside this plump wax moth cadaver are thousands of wiggly nematodes ready to serve as biocontrols against soil-dwelling crop pests. Wax moth larvae cadavers proved too fragile for the new carcass-taping method, so mealworms are used instead. (Photo: Peggy Greb)

originally came up with the cadaver-taping idea. He also devised a prototype machine to automate the process, which Juan and Guadalupe later refined to reduce labour and to standardise the final product. A patent application was filed in 2010.

Choosing the best insect species to use proved a critical early decision. Wax moth larvae had long been the nematode host of choice among insectaries and biopesticide companies, but the cadavers proved unsuitable for taping. "They become fragile and leaky; they're difficult to handle," says Juan. Instead, the team chose mealworms, whose harder shells can withstand the rigours of carcass taping.

Using off-the-shelf parts purchased from the food-service industry, the Stoneville researchers built a prototype separation device that has blowers and customised screens to mechanically sort the mealworms by size. Previously, this had been done using hand-held screens, which was time-consuming. "Mealworms develop at different rates," says Juan. "The biggest are chosen for nematode infection. Medium-size ones are sold for other purposes. Smaller sizes are returned to the colony to continue growing."

The mealworms are then placed in shallow plates teeming with hungry nematodes. After a few days, during which the nematodes infect and kill their hosts, a mechanical arm reaches in and places the carcasses between two strips of masking tape at the rate of one insect every two seconds. Future versions of the machine could speed the process by placing multiple cadavers simultaneously.

Testing proves tape formulation's worth

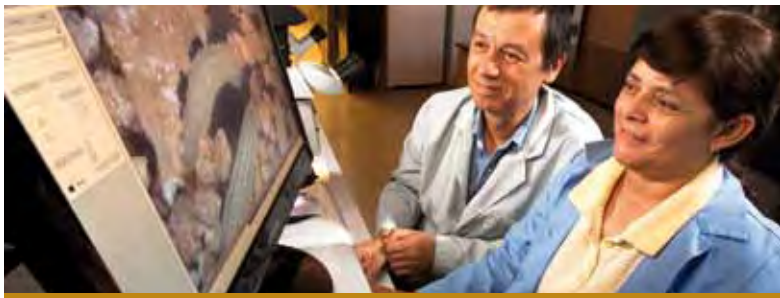
The next step was to test the tape-delivery system's ability to protect the cadavers from mechanical damage as well as its nematode yield and pest-control efficacy. "We found that infective juvenile nematode yield was not negatively affected by the tape formulation," says David.

In laboratory experiments, the group measured survival of two insect pests, the root weevil or the small hive beetle, after the application of two nematode-infected hosts with or without tape in soil-filled 15 cm pots.

A greenhouse experiment was conducted in a similar manner to measure survival of the root weevil. "In all experiments, both the tape and no-tape treatments caused significant reductions in pest-insect survival relative to the control, and no differences were detected between the nematode treatments," says David.

"Fifteen days after application, the infected-host treatments caused up to 78 per cent control of small hive beetle in the lab, 91 per cent control of root weevil in the lab, and 75 per cent control of root weevil in the greenhouse. These results indicate potential for using the tape-formulation approach for applying nematode-infected hosts."

To reach scientists featured in this article, contact Jan Suszkiw, USDA-ARS Information Staff, 5601 Sunnyside Ave., Beltsville, MD 20705-5129; PH: +1 (301) 504-1630 [Suszkiw], +1 (301) 504-1611 [Durham], sharon.durham@ars.usda.gov. ■



Entomologists Juan Morales-Ramos and Maria Guadalupe Rojas view first-instar larvae through a microscope and evaluate the fertility of the mealworms to determine the effectiveness of diet formulations. (Photo: Stephen Ausmus)

Tractors and politics of the 1940s

By Ian M. Johnston

THE 1940s

During the Second World War, new tractor availability came to a more-or-less full stop. Australian farmers were obliged to patch up old tractors that in normal times would have been scrapped. To add to the problem, spare parts were in a critical short supply, and worn out pneumatic tractor tyres had to be replaced with hitherto abandoned spudded steel wheels. Often horse teams, having been replaced by tractors and now enjoying their retirement in the back paddock, were once again harnessed to the plough.

Following the end of hostilities, the shortage of farm tractors continued. The diminutive indigenous Australian tractor manufacturing industry, which included A. H. McDonald and Co, Howard Auto Cultivators Ltd, Ronaldson Bros. & Tippett Ltd, and Jelbart Bros, had either switched to war related production or gone out of business.

In 1944, the directors of the Melbourne based firm of Kelly and Lewis, had commenced talks with the Commonwealth Government regarding the urgency of producing a local tractor for Australian farmers. These discussions related to licences being granted to KL for the purchase of scarce steel and an inducement for the firm to build a new foundry. It was decided that the company would build a copy of the German Lanz Bulldog, for which KL had been agents prior to the war. It would be known as the KL Bulldog.

Owing to a farcical series of bureaucratic government inter-departmental procrastinations, coupled to funding restriction imposed upon the project by the KL accountants (resulting in a walk-out by a totally frustrated Alios Murr, the chief project engineer), the tractor was not released until 1949, two years behind schedule! The predicted production target was to be 1000 tractors per year. In fact, only 900 of the big single cylinder KL Bulldogs were produced during its five year production life!

In the meantime, the Western Australia state government had been involved in negotiations with Bob Chamberlain and a group of financiers, who wished to establish a tractor manufacturing plant at Welshpool, an outer Perth suburb. Unlike the dilatory performance of their Commonwealth counterparts, the WA government officials eagerly and efficiently facilitated the proposal and agreed to certain generous funding as an incentive to getting the factory established and in business. Chamberlain tractors went on to become one of Australia's top selling tractors until eventually being taken-over by Deere and Co. in 1970.

The US owned International Harvester Company had established an Australian subsidiary back in 1912 and a farm machinery manufacturing plant was opened in 1937 at Corio Bay, near Geelong, Victoria. But it was not until 1948 that new extended premises were opened, enabling the production of tractors to commence.

A limited number of British imported tractors arrived towards the end of the 1940s. Included were the Fordson Major, Ferguson, Field Marshall, David Brown and the Scottish built Massey Harris 744D, each enjoying the tariff advantages of The Empire Trade Preference Agreement. A scheme designed to give preferential tariff benefits to British manufactured goods.

Also a trickle of North American tractors, including John Deere, Massey Harris, Case and so on, began once again to be imported, but without the price advantage extended to British manufacturers.

Due to an inexplicable and obviously wrong decision made in 1948 by the Prime Minister, The Rt. Hon. Ben Chifley, Australia missed out in having one of the world's largest tractor producers establish a tractor manufacturing plant in either New South Wales or Victoria.

A 1949 KL Bulldog, restored by the author. The 45 hp tractor featured a valveless single cylinder two stroke engine, fuelled by low volatile crude oil. The engine had to be pre-heated with a blow lamp prior to starting. (Photo: IMJ)

Pictured is the rare County half track version of the Fordson Major, restored by the author. (Photo: IMJ)

The popularity of Ferguson tractors rapidly increased, following their arrival in Australia in 1947. This fine example has been restored by Alan Latimore. (Photo: IMJ)

The David Brown Cropmaster was yet another British import that benefited from the Empire Trade Preference Agreement. (See text). Restored by the author. (Photo: IMJ)

ENTER OLIVER

Today's younger farmers will likely have little or no recollection of the name of Oliver, in relation to farm machinery and tractors. This is not surprising really as the Oliver Corporation was acquired by The White Motor Corporation of Oak Brook, Illinios, US in 1960, and the name of Oliver relegated into history.

Accordingly, a preamble into the Oliver background will add significance and emphasis to the extraordinary resolution made by Ben Chifley in 1948, particularly considering the desperate shortage of tractors in Australia at that time.

James Oliver was born in Roxburghshire, Scotland, the son of a shepherd, in 1823. The family emigrated to the USA in 1835 and in 1855 James Oliver commenced manufacturing ploughs in premises he acquired at South Bend, Indiana. He could not at that time have envisaged the amazing fortunes that were to follow.

Joseph Oliver eventually took over control of the business, following his father's death, and by 1912 The Oliver Chilled Plow Works embraced an area of 60 acres, most of which was under roof! In 1929 Joseph was successful in achieving a remarkable amalgamation with several other thriving farm machinery

Very few Oliver 88 tractors arrived in Australia. Most of those that did were petrol/kero powered. The example pictured is a rare six cylinder diesel version restored by the author. It was a truly outstanding smooth running machine, well ahead in technology of most of its competitors. (Photo: IMJ)

The Oliver Super 55 was a brilliant tractor, but only a handful came to Australia on account of the high tariff placed on North American tractors. Accordingly its price was nearly double that of British made competitors. This example was restored by the author. (Photo: IMJ)

manufacturers including Hart-Parr Tractor Co. and Nichols and Shepard, both long established producers of tractors. The new conglomerate was to be known as The Oliver Corporation. In 1944 it acquired The Cleveland Tractor Company, manufacturers of an extensive line of Cletrac crawler tractors.

The Oliver Corporation was now one of the world's largest producers of farm machinery and tractors. Significant numbers of Oliver, Hart-Parr and Cletrac tractors had been sold into Australia since before the 1920s, earning a reputation for reliability and longevity.

Which brings us now to the Australian political involvement.

THE MISSED OPPORTUNITY OR 'YES PRIME MINISTER'

On June 30, 1948, Prime Minister Chifley received a letter from a Mr Leslie Dyke, who gave as his address 8a Castlereagh Street, Sydney. Mr. Dyke was a representative of The Oliver Corporation and had recently returned from discussions with the Oliver executives, the subject of which could have far reaching beneficial implications for Australia.

This 1923 Cletrak Model W, was produced by The Cleveland Tractor Company, later absorbed into the Oliver conglomerate. This unit has been restored by The Booleroo Steam and Traction Preservation Society Inc of South Australia. (Photo: IMJ))

Mr Dyke requested a meeting with the Prime Minister for the purpose of outlining his company's aspirations to establish a tractor manufacturing and assembly plant in Australia. There was no suggestion of a request for federal funding or favours to assist with the project. But Mr Dyke did suggest it could be helpful if the Minister for Customs, Senator Courtice, could also be in attendance.

A reply was forthcoming on July 7 from the Acting Prime Minister, H. V. Evatt, who stated that the matter had been passed on to the Comptroller-General of Trade and Customs. There was no other comment.

As no further contact from the government was received by Mr Dyke, he again wrote to Prime Minister Chifley on September 7. Obviously the Oliver executives were anxious to obtain some response to their offer to invest millions in Australia and by so doing contribute considerably to the easing of the critical tractor shortage. The writer offered to meet with the Prime Minister either in Canberra or Sydney at a time convenient to the Prime Minister.

A letter dated September 20 was forwarded from a Mr W. T. Turner of the Dept of Trade, Canberra, to a Mr J Garrett, Private Secretary to Prime Minister Chifley, advising that the matter of the Oliver proposal had been passed on to the Administrative Officer of the Central Import Licensing Branch.

Around 10 weeks elapsed from the date of his original letter, before Mr Dyke finally received a blunt note from the Prime Minister on September 21, stating that the Department of Trade and Customs was awaiting further information which had been requested from him. In fact, Mr Dyke had not been approached for further information! Nor was there any suggestion in the note of enthusiasm or appreciation for the Oliver proposal.

On January 25, 1949, the Prime Minister wrote to Mr. Dyke stating that a Mr Meere, the chairman of the Inter Dollar Committee, was of the opinion that the Oliver proposal should be further considered. The letter went on (and I quote):

In view of these developments I do not think anything would be gained by having a discussion with me. Your proposals will receive detailed consideration by the appropriate Commonwealth

authorities when the further information requested has been furnished.

From there the matter seemed to simply run out of steam.

REFLECTIONS

Several thoughts come to mind relative to the foregoing.

Firstly, I cannot envisage a more classic example of bureaucratic paper shuffling!

One would think that in 1948 the Commonwealth Government would have extended the welcome mat to a large corporation wishing to establish a tractor plant in Australia, particularly with regard to the acute shortage of tractors. The cold shoulder bureaucratic treatment I feel was astonishing – but probably typical of the impersonal treatment dished out by some bureaucrats.

The Oliver team must have been perplexed and possibly disenchanted by the Australian Government's apparent lack of interest in the proposal.

It should be remembered that the Oliver offer did not involve the acquisition of any Australian company or a request for government subsidies.

Would a similar situation be different today? Let's hope so – but I wonder if politics have really changed that much from the 1940s?

For the record, in the unlikely event I am challenged about the accuracy of the Oliver saga, it so happens that the documents are carefully preserved in my archives. ■

IAN'S MYSTERY TRACTOR QUIZ

Question: What on earth am I doing with this tractor? Can you identify the tractor?

Clue: No – I am not drilling a hole and it is one of the tractors mentioned above.

Degree of difficulty: Easy to identify the tractor – but perplexing to know what I am up to.

Answer: See page 48.

Windows opens the door to speedy science

CSIRO'S graphics processing unit (GPU) supercomputer maintains a strong position on this year's Top500 list announced in November at the SC11 conference in Seattle, USA. Coming in at number 212, CSIRO's GPU supercomputer is one of the first GPU-based clusters to run Windows and is now ranked as the second fastest supercomputer running Windows in the world.

It's also expected to hold on to its title as Australia's greenest supercomputer and maintain a high position on the Green500 list with a perfomance of 710.67 MegaFlops/Watt, due to its use of energy efficient NVIDIA graphics processing units.

CSIRO eResearch Director Dr John Taylor said rankings for the Top500 list are determined using the Linpack benchmark test which measures, under certain conditions, the number of calculations a supercomputer can do per second.

"We've been building a strong collaboration with Microsoft over the past few months to optimise the Windows HPC operating system on our CSIRO GPU supercomputer and perform the Linpack test," John said.

"We are thrilled with the result. We now have a performance of 75.3 Teraflops in double precision on Windows HPC," said John.

CSIRO's GPU supercomputer runs dual Linux and Windows applications to cater for the needs of scientists who use these different operating systems for running software code and analysing data from experiments.

"We recognised that most CSIRO scientists are working on Windows workstations now so we wanted to make supercomputing more accessible from the desktop and allow them to speed up their research, giving them a competitive advantage in science internationally," he said.

CSIRO research leader Dr Tim Gureyev and his team have been running their Computed Tomography (CT) reconstruction software using Windows HPC on the CSIRO GPU supercomputer for the past two years and are delighted with the latest performance gains.

CSIRO's GPU supercomputer now runs at 75.17 Teraflops running Windows HPC. CSIRO Director of eResearch, Dr John Taylor. (Photo: Carl Davies, CSIRO)

The GPU supercomputer's 3D reconstruction of a sample showing sand grains with oil, water and gas within the pore structures. These types of images now take less than five minutes to reconstruct. (Photo: CSIRO)

"We have reconstructed a large number of 3D images, from a variety of scientific domains, such as biology, medical research, geosciences, material sciences, plant and insect phenomics," said Tim. "Each sample contains up to 64 billion or more voxels, like a pixel for 3D images, and usually takes up to 24 hours to reconstruct on a desktop PC. We can now do that reconstruction in less than five minutes.

"The availability of the Windows HPC system on the CSIRO GPU cluster allows us to run programs we used to run on desktop PCs with only slight modifications. The familiar interface also reduces the barrier to adoption for researchers."

Tim Buntel, Windows Azure Product Manager at Microsoft Australia says this result shows Windows HPC can play a significant role in high performance computing.

"We look forward to supporting CSIRO's strategy of integrating the Microsoft Azure Cloud with CSIRO's HPC infrastructure."

"This will give CSIRO even greater access to supercomputing facilities without the huge costs that come with building and maintaining large supercomputers," said Tim.

John Taylor says the first step is integrating CSIRO's Windows desktops and existing high performance computing facilities and linking them to the Azure Cloud to deliver even greater benefits for scientists.

"We're also aiming to use the cloud to explore exciting new opportunities in science such as virtual laboratories," said John.

CSIRO's GPU supercomputer was installed in Canberra in November 2009 by Xenon Systems of Melbourne. It combines 256 Intel central processing units (CPUs) with 64 NVIDIA Tesla S2050 which contain 256 graphics processing units (GPUs). ■

NORTHERN FOCUS
COVERING NORTHERN NSW AND QUEENSLAND

THE RESEARCH VIEW

Building better soils for better crops

By Dr Ann McNeill, University of Adelaide

THE main options for building organic matter in Australian soils are no-till, retaining stubbles, crop rotations with pastures, green or brown manuring, fertiliser inputs and additions of biosolids or manures.

Soil texture does influence the capacity for build up of organic matter – clay can protect organic matter from rapid decomposition so tends to build it up more and have slower breakdown of residues.

Residue breakdown works faster in sandy soil but because of

TAKE HOME MESSAGES…

- The chance to significantly increase organic matter in soil doesn't come along that often – especially in low rainfall farming systems – so use it wisely;
- Practices to build organic matter require investment in the short term – the payback is an increase in a farm's natural soil capital, higher capacity for soil to supply nutrients and suppress disease, increased yield and profit in the long term; and,
- Burning stubbles should be considered as a 'last resort' and may not be an option in the future – it is good forward planning to start looking into alternatives.

Dr Ann McNeill, University of Adelaide.

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.

The chance to increase organic matter in soil doesn't come around too often.

the smaller organic matter storage capacity, sands can run out of fuel (carbon) for nutrient production.

Nutrients like nitrogen may 'temporarily' tie up in microbes when a large amount of organic matter such as stubble is added, especially in clays, so extra fertiliser may be needed to ensure enough for crop needs. So, an important part of a seasonal program is pre-sowing N and P testing, especially if there are heavy stubbles.

What happens to the carbon in crop residues?

There is no denying the fact that it is much easier to lose soil carbon than gain it.

TABLE 1: Proportion (%) of carbon from plant residues lost via respiration one week and four months after addition to two soil types kept at different moisture contents

		Dry soil		Wet soil	
		1 week	4 months	1 week	4 months
Sand	Lupin shoot	34	47	32	56
	Lupin root	29	41	30	43
	Clover shoot	38	49	39	55
Clay	Lupin shoot	19	34	27	48
	Lupin root	21	31	26	53
	Clover shoot	30	47	43	58

Moisture contents : Sand- dry 4 per cent w/w; wet 10 per cent w/w; Clay- dry 13 per cent w/w; Wet 24 per cent w/w

TABLE 2: Proportion (%) of the N from lupin stubble and clover pasture residues accumulated in microbes and as plant available N

		Wet sand		Wet clay	
		Microbe N	Nitrate N	Microbe N	Nitrate N
Lupin	1 week	16	0	3	0
	2 months	16	12	9.5	0
	4 months	19	20	20	22
Clover	1 week	22	4	17	2
	2 months	18	30	5	25
	4 months	22	34	46	28

Results from a study on two agricultural soils to work out how much of the carbon added in mature legume residues was lost via respiration (Table 1), show that 19–43 per cent is lost within a week of addition to soil depending on soil type and moisture conditions.

After that time, although the rate of loss slows down, a further 10–27 per cent is lost over a subsequent four month period. The carbon that remains is not so easily degraded and is very important in the long term for many soil functions including structure, water holding and chemical buffering.

In this laboratory-based experiment the soils were 'disturbed' when the experiment was set up and the residues 'incorporated' – this simulates to an extent the effects of a system with some tillage so losses may be slower if disturbance is reduced.

But the key point here is that as much as 58 per cent of the C in crop residues added to soil 'burns' off as respired carbon dioxide within a year – so to build less degradable carbon in soil you clearly will need to add as much as possible.

The figures given here are for legume residues but similar or slightly lower values have been measured by other researchers around Australia for cereal stubbles.

Why is a lot of the carbon from crop residue inputs respired?

A lot of the carbon in organic matter is fuel for soil processes and increases its capacity to supply nutrients. This labile carbon from organic matter powers soil microbes, allowing them to grow and convert the residues into nutrients, such as N, for crop uptake. This is not the same outcome as putting a match to crop stubbles – where all the fuel and nutrients go up in smoke!

Further results from the study mentioned before (Table 2) show that, especially in the sandy soil, the microbes incorporated about 20 per cent of the N from the plant residues within a week after addition and after about two months started to release that as plant available nitrate-N.

TABLE 3: Effect of row spacing and stubble on grain yield (t/ha) at Minnipa SA

Row spacing (cm)	Stubble retained	Stubble burnt
18	1.03a	0.95b
23	1.00a	0.92b
30	0.91b	0.93b
LSD (P=0.05)	0.05	

Source: EPFS Research Summary 2008. Mean of 2005-2008 data. Yields followed by different letters are statistically significantly different.

By the end of four months 39–64 per cent of the N had been utilised from the residues, with around 20 per cent of N from lupin stubble and 30 per cent from the clover residue present in a form directly available for plants. This N benefit would have been lost if the residues had been burnt.

Wheat stubbles

Extrapolating from these numbers a rough calculation can be done for wheat stubbles. Assuming that on average they are 0.4 per cent N then five tonnes of wheat stubble would contain about 20 kg organic matter N and if one fifth of this becomes released as available N over four months that would give four kg N – plus there would be another four kg N ready to be released from microbes in the short term.

Therefore, about 8–10 kg of N is available over a growing season – enough to support half a tonne of grain production.

Legumes can make a bigger contribution to available N as they have higher N contents – the lupin stubble in the experiment was 0.6 per cent N and the clover residue 1.8 per cent N.

Of course here we are talking only about release of N from last season's residue; it does not account for available N coming from breakdown of older organic matter in the soil which in this study was actually similar to that from the freshly added residues. Amounts were larger from the clay than the sand which was lower in organic matter content.

The more organic matter you have in your soil the greater will be the supply of available N provided you have enough fuel (carbon) to run the nutrient production process.

Burning stubbles doesn't necessarily lead to better yields

Results from a trial undertaken from 2005–08 at Minnipa Agricultural Centre on Eyre Peninsula in SA demonstrated that there was no benefit to yield from burning stubbles in that environment compared with retaining them.

In fact a summary of the results (Table 3) shows that at narrower row spacing (18 and 23 cm) there was a slight yield advantage from retaining stubbles. Other benefits were a higher soil organic carbon where stubbles had been retained (1.02 per cent compared to 0.88 per cent where stubbles had been burnt) and a reduction in rhizoctonia patch.

When this study was carried out there was a run of average to dry seasons with annual yield ranging from 0.8–1.5 tonnes per hectare. So, cereal stubble loads also varied and were clearly not as high as in the next couple of seasons where yields were up around three to four tonnes per hectare.

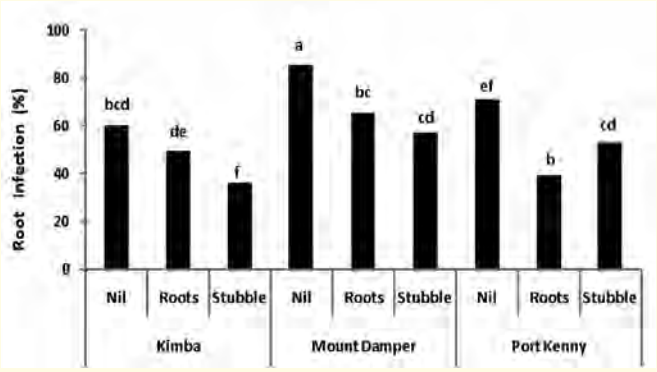
Years with higher stubble loads represent a great opportunity to add organic matter into the soil if issues such as mice can be controlled. In low rainfall areas these opportunities might only come along once or twice in a decade.

The reduction in rhizoctonia patch associated with retained stubbles noticed in the Minnipa study is likely to be partially caused by increased microbial activity encouraged by the carbon inputs from the retained stubble. This enables more 'good guy' microbes to flourish which can suppress the activity of the rhizo 'bad guys'.

Work on Eyre Peninsula has shown that carbon inputs in the

The decision on whether to accumulate organic matter or to burn it up rests with each individual farm business and it is similar to the kids' inheritance – Annie McNeill.

FIGURE 1: Rhizoctonia infection (%) for roots of young wheat plants grown in three Eyre Peninsula soils without carbon input (nil) or after addition of carbon as roots or stubble



Source: EPFS Research summary 2009. Bars within each soil with different letters above them indicate significant difference.

form of cereal stubbles in particular do increase certain microbes (in this case Pantoea) and increase the disease suppressive capacity in soils (Figure 1).

Cost and benefits of building organic matter in paddocks

There is no denying that there are time and dollar costs associated with building organic matter in paddocks. It takes time for any paddock to reach its potential for both yield and natural capital as ecological processes come into balance. Growers need time (a scarce commodity for most) to investigate and consider alternative approaches to practices such as tillage and stubble removal that 'burn off' soil organic matter.

Investment is required for many agronomic inputs – fertilisers to overcome temporary tie-up of nutrients as organic matter is increased, weed control in low or no-till systems, baiting for mice, machinery modifications or purchase of new equipment.

There might also be a need for buying in expertise or for gaining knowledge through technical courses and Grower Updates etc. Nevertheless, there are at least as many benefits as there are costs and in this changing world, public recognition of the importance of soil and organic matter is increasing.

Major benefits to the business are that the nutrient supplying capacity of soil is increased, long term profits will be up, and natural soil capital accumulates which may in future be linked to land values. Growers will be ahead of the game in responding to likely carbon policies and more resilient in the face of adverse climatic conditions.

The bottom line is that the decision on whether to accumulate organic matter or to burn it up rests with each individual farm business and it is similar to the kids' inheritance – are you going to burn it up on a trip around Australia when you retire or invest it for the future?

The contributions of many colleagues in Perth (CLIMA and University of WA) and South Australia (University of Adelaide and SARDI Minnipa Ag Centre) to the work reported in this article is acknowledged.

Ann McNeill, The University of Adelaide, Waite Campus, Glen Osmond SA, Email: ann.mcneill@adelaide.edu.au ■

THE CONSULTANT'S VIEW

BUILDING BETTER SOILS FOR BETTER CROPS

■ **By Bill Long, Ag Consulting Co[1]**


Bill Long.

Agricultural consultants and their grain growing clients well recognise the importance and value of retaining and building organic matter in our cropping soils.

The benefits of practices that lead to enrichment of soil are numerous, and as we strive to adapt to and manage the risks associated with climate variability and change, those advantages will continue to be underlined.

The long-term sustainability of the land we sow to crops is an industry-wide priority. The farming community is supportive of research into the effectiveness of various practices to build soil organic matter.

That research is particularly critical for those more marginal areas where the base levels of soil organic matter are generally low.

It goes without saying that any measures to boost organic composition of our soils – increasing the potential for improved yields and returns – can only be encouraged.

Stubble retention and no-till are practices influential in building organic matter, along with incorporating a range of materials and inputs and cropping and pasture systems.

When seasonal, economic and other circumstances allow for such measures to be undertaken, growers are advised to do what they can to improve their soils.

As a consultant and farmer, my view is that a flexible approach to any soil-improvement regime should be adopted.

This is particularly so when it comes to stubble management as there are years (such as 2010–11) when excessive stubble loads are not conducive to a rigid system of retention.

Retaining high stubble loads in these circumstances can in fact lead to significant issues relating to crop establishment and herbicide efficacy.

The benefits of having retained stubbles in prior years can be lost from the soil if subsequent crops are poorly established, full of weeds or have increased disease and pest levels as a consequence of excessive stubble. In these seasons, removal of some stubble is the preferred option.

While burning stubbles is advocated as a last resort on most occasions – soil organic carbon will decline faster than in retained stubbles – it is a practice that should not be ruled out completely as a means of dealing with heavy stubbles which pose a serious threat to productivity in the following season providing drift or erosion of precious topsoil is unlikely. A burn, just prior to the seeding operation, will reduce this risk significantly.

In conclusion, building soil organic matter should be an over-arching objective, but a 'horses for courses' policy in relation to stubble retention is an advisable approach.

[1]Bill Long is managing director of Ag Consulting Co, based at Ardrossan on SA's Yorke Peninsula where he also farms. He is a new member of the GRDC's Southern Regional Panel.

Whole-grain flour power

■ By Marcia Wood, Agricultural Research Service, USDA

FOR some of us, the fun of year-end holiday gatherings isn't only the pleasure of being with friends and family – it's also the food. If Agricultural Research Service wheat quality researchers have their way, more recipes for crackers, cookies, and other baked goodies will call for a greater proportion of flour made from whole-grain wheat, in relation to the amount of familiar, highly refined white flour that's used today.

"Most consumers in developed countries don't eat enough whole grains and don't get enough dietary fibre," says wheat expert Edward J. Souza. From Edward's perspective, putting more whole-grain wheat flour into foods that people will buy and enjoy may be one way to help us get the whole grains and fibre we need.

Consumption of whole grains has, in some studies, been associated with reduced risk of cardiovascular disease, the number-one killer in many developed countries.

A former research leader and plant geneticist with ARS's Soft Wheat Quality Laboratory in Wooster, Ohio, Edward now directs wheat breeding for an international plant science company.

The wheat kernel's three key components

A wheat kernel contains three key structural components:

- The outer, or bran, layer;
- The tiny wheat seed, also referred to as the 'germ' or 'embryo'; and,
- The endosperm, which takes up most of the inside of a plump, ready-to-harvest kernel.

When the miller or baker wants all the grain components for a flour, the entire kernel is used. Flour that contains whole-grain components provides more fibre than traditionally milled white flours and also provides more magnesium – from the bran – which may be important for controlling diabetes and heart disease.

The bran contributes some additional minerals, including selenium, and B vitamins. The germ provides B vitamins too, along with vitamin E, small amounts of vitamins A and K, and healthful fats. The endosperm yields carbohydrates and protein.

At Wooster, Edward's research focused on soft wheat – the kind that's used for making crackers, cakes, cookies, breakfast bars, pancakes, waffles, flour tortillas, some kinds of snack chips, and more. That's in contrast to, for instance, hard wheats, which bakers choose for making loaves of raised breads, or durum flours, which chefs worldwide use for pasta.

The Wooster team's studies are filling in some of the gaps in our knowledge about whole-grain flours made from soft wheat. In recent research, for example, Edward and colleagues tackled the question of how much dietary fibre is really in today's whole-grain soft-wheat flours. In other investigations, the researchers confirmed the value of two readily available laboratory tests that can help wheat breeders predict, early on, what kinds of promising new soft-wheat plants are the most likely to yield superior whole-grain flours for cookie doughs.

Dietary fibre: New estimates for bakers, shoppers, and nutrition researchers

Precisely how much dietary fibre is in soft-wheat whole-grain flour isn't well known, according to Edward. "When we first began looking at information about the dietary fibre content of these flours," he says, "we found very few measurements. Some were based on surprisingly small numbers of samples. Others were based on hard wheats, not soft. And others were derived from old, outdated analytical procedures."

To help clarify this somewhat muddled picture, Edward and colleagues Mary J. Guttieri, a research specialist, and Clay H. Sneller, an associate professor, conducted what is perhaps the most comprehensive analysis to date of dietary fibre levels in a nationally representative sample of soft-wheat whole-grain flours.

Clay is with Ohio State University's Ohio Agricultural Research and Development Center in Wooster, and Mary was formerly with the centre.

The team used a relatively new analytical method, variously known as the 'McCleary method', the 'all-in-one test', and the 'CODEX fibre method'. They tested an impressive assortment of soft wheats from fields and flour mills across North America.

For example, they acquired kernels from 13 different wheat-growing regions – from Virginia and South Carolina to Utah and

At the Soft Wheat Quality Laboratory in Wooster, Ohio, ARS technician Amy Bugaj (left) and research specialist Mary Guttieri, formerly with Ohio State University, grind wheat bran that will be used to prepare whole-grain wheat flour for testing. (Photo: Peggy Greb)

Oregon – and then tested the dietary fibre levels of the whole-grain flours made from those kernels.

Approaching the sampling from another perspective, they studied five different kinds of commercial whole-grain soft-wheat flours, including some from mills in Utah and in Ontario, Canada, and from a natural foods store in Ohio.

To discover more about year-to-year variations, they compared flours from each of two different commercial wheats grown at each of two sites in Ohio during three consecutive years. "We wanted to take as many key factors into account as possible," notes Edward.

The scientists determined that soft-wheat whole-grain flours have, on average, about 14.8 grams of dietary fibre in each 100 grams of flour. Though that's only slightly higher than the most widely referred to US estimate, it should nonetheless be of interest because of the scope of the study and the precision and accuracy of the analytical method used.

Dietitians and nutrition researchers might also use the data when estimating how much dietary fibre we are (or aren't) eating in developed countries. Their analyses might, in turn, be used – along with other data from other sources – to shape future updates of the dietary guidelines.

Kraft Foods North America, General Mills, Inc., and Kellogg Co. funded the research, in addition to ARS.

Souza, Guttieri, and Sneller published their findings earlier this year in a peer-reviewed article in *Crop Science*.

To reach the scientists featured in this article, contact Marcia Wood, USDA-ARS Information Staff, 5601 Sunnyside Ave., Beltsville, MD 20705-5129; PH: +1 (301) 504-1662. ■

search assistant Sharon Croskey (left) of Ohio State iversity cuts whole-grain wheat flour cookie dough for king-quality tests as ARS technician Amy Bugaj sets baked okies on a cooling rack. (Photo: Peggy Greb)

Innovative use of alternative flours

BRINGING together speakers with international and local experience across the baking supply chain was a recipe for success at a recent industry seminar in Brisbane.

The Department of Employment, Economic Development and Innovation (DEEDI)-led 'Innovative use of alternative flours in the baking industry' seminar explored using alternative flours (sorghum and soya) in the baking industry.

More than 45 people attended the October seminar, with a target audience across the grain value added chain, including sorghum farmers, grain traders, millers, and bakery owner/managers. Topics covered included the uses of sorghum and soya flour in bread and snacks, the healthy foods markets, new trends in packaging in the baking industry, research capability, financial support programs and services available to the industry.

The keynote speaker was Dr Lloyd Rooney from the Cereal Quality Laboratory at Texas A&M University, US. Dr Rooney is regarded as the pre-eminent world expert in the processing and utilisation of sorghum flour in the baking and health food industries.

The seminar was part of a targeted three-day program, which included a bus tour of Brisbane and Gold Coast flour milling and baking industry sites. ■

Dr Lloyd Rooney (left) Texas A&M University and Paul McDonald (National Baking Industry Association Aust.) discuss alternative flour uses at the Brisbane baking seminar.

Grain pests: Their natural habitat and their natural enemies

PESTS responsible for yield loss in Australian grain crops are being monitored and tracked as part of new Grains Research and Development Corporation (GRDC)-supported research. Dr Nancy Schellhorn, CSIRO senior research scientist says the project aims to link integrated pest management (IPM) and natural resource management (NRM).

"The project aims to identify 'pest suppressive' landscapes and the first step was to collect data from three regions in Australia," Nancy said. "We are examining the abundance of grain pests and key natural enemy groups in different habitat types, the movement of pests and natural enemies between habitat types, and the timing of crop colonisation of grain pests and their natural enemies."

She said research across Australia showed native remnant vegetation in grain landscapes contained higher predator densities and lower pest densities than crops.

"There is an indication of 'spill-over' of predators from native vegetation into crops close to native vegetation," Nancy said.

"In Queensland there is a tendency for higher pest densities in crops far from native vegetation, in NSW there is no difference, and in WA there is a tendency for higher pest mites in crops near native vegetation in April and May.

"This is probably due to weeds and volunteer crop plants in the area between crops and native vegetation. However, the possible explanations will be clearer as we complete the final year of data collection and analyses."

National data collection

Using the field data collected by the national team, researchers will generate models to simulate dynamics of pests and their natural enemies for a range of landscapes, not just those examined in the trials.

"These models will allow us to devise rules of thumb about the amount of native vegetation on-farm to capture these services," Nancy said.

She said the project would result in guidelines for IPM practices that considered the landscape context.

"This will allow grain growers to consider management options to better capture the ecosystem service of pest control, and move towards sustainable management of natural resources."

The initial GIS mapping of six landscapes was finalised in 2010 with subsequent layers added, including regional ecosystem information, invertebrate and plant information from collected field data.

Nancy said researchers would update maps as seasonal and temporal changes in crop rotation progressed through 2011 and 2012.

The first year's field work included field sampling and malaise trap catches and the project had progressed to processing of samples and initial analyses.

"The GRDC funding has allowed us to develop prototype models that explore and simulate the features and scenarios that result in pest suppressive landscapes and the effectiveness of field, farm and landscape scale IPM options," Nancy said.

"This includes farm crop diversity, crop configuration and the proportion of native vegetation at different spatial scales."

She says results so far show that the landscape context matters, so landscape composition matters.

"Perennial habitat is important for capturing pest control services and field-based and on-farm management of pests is only part of pest management – growers must think beyond the crop boundary.

"The work also shows scope for managing and revegetating with native vegetation, and that it might be an important part of IPM."

The research is a national GRDC project lead by CSIRO Sustainable Agriculture flagship and in partnership with DEEDI, University of QLD, and DAFWA. ■

New GRDC-supported research is tracking the movement of grain pests.

Empower farmers to feed the world

THE United Nations has estimated that as of October 2011, the world's population passed seven billion. This population benchmark should be the cause for a genuine recommitment by government to actively support Australia's agricultural sector so that it can do even more in contributing to global food security.

Chief Executive Officer of CropLife Australia, Matthew Cossey, said, "It is time for a renewed and coordinated effort by government at every level to ensure that Australia's farming sector and associated agri-industries are supported in meeting the genuine and serious challenges in supplying global food requirements. Key to this is ensuring the growth and continued innovation of the plant science industry, which delivers the technologies to meet the challenges of food security.

"In the past decade, the world has grown by nearly a billion people and since 1940 the population has more than tripled. To meet the challenge of feeding this exponentially growing world, the plant science industry has created innovative technologies that provide farmers with the means to boost yields, increase farm income and protect natural resources. But for these tools to meet the challenge of feeding the next billion people, all nations must ensure farmers have access to these sustainable, science-based technologies," Matthew said.

Declaration for Farmer Choice

"To support this effort, CropLife International, the plant science industry's global federation, of which CropLife Australia is a member, has launched the Declaration for Farmer Choice. This is a new framework built on five principles that can empower farmers with the knowledge and freedom to determine what they need in order to grow crops successfully and sustainability.

"Today, our world stands at a crossroads – we have surpassed seven billion inhabitants and will surpass eight billion in the next 15 years. To feed this population we must empower farmers to continue to improve their productivity by providing access to new agricultural technologies," explained Matthew.

"As the international community prepares for the June 2012 RIO+20 Earth Summit, the Declaration for Farmer Choice will provide a basis for discussion on how to foster sustainable farming practices."

The Declaration for Farmer Choice calls for:

- Sustainable, productive and environmentally-responsible technologies;
- Enhanced access to agricultural technologies;
- Science-based regulatory schemes;
- Increased agriculture investment; and,
- Improved agricultural knowledge.

Under the Declaration, farmers are recognised as the best and most knowledgeable stewards of their unique plot of land, and environmentally sensitive farming is comprised of a mosaic of sustainable agricultural solutions and practices that farmers can choose from.

To learn more about the Declaration for Farmer Choice visit www.ActionforAg.org/get-involved ■

The world's population passed seven billion this year.

Coal seam gas debate flawed

CURRENT controversies over coal seam gas point to deeper problems in how Australia plans the use of natural resources, according to two peak university bodies.

The Council of Environmental Deans and Directors (ACEDD) and the Australian Council of Deans of Agriculture (ACDA) met in Canberra recently, and discussed ways to improve policy making affecting Australia's natural resources and environment. The two bodies between them represent departments at 36 universities.

They claim that Australia needs to make decisions in much more sophisticated and forward thinking ways.

"Coal seam gas is the current argument, but the underlying issue is short-term, fragmented approaches to decision making, lacking a sufficient scientific basis and not engaging the public in balanced, informed debates," said Professor Rick Roush, President of ACDA.

"Undertaking assessment and approvals processes in less than transparent ways, one project at a time, without strong and shared data on benefits and impacts, can only lead to divisive, unconstructive debates."

Both Councils agreed that these problems are not confined to the CSG debate, but to other major national policy issues including coastal development, urban and peri-urban growth and non-urban land use planning.

Notably, CSG involves a rapidly proliferating class of developments with trade-offs between food security, waste disposal, water resources, biodiversity, employment and social well-being, and demand lengthy and comprehensive planning processes.

The Councils called for an improved approach to planning and approvals processes that take a wider and longer view of major development sectors.

The essential elements of such an approach need to be a strategic view that takes account of the cumulative impacts of many developments, and the integration of environmental, social and economic aspects.

A precautionary and evidence-based approach is also needed, with sufficient quality scientific understanding built up before single major developments are approved, or multiple smaller developments that together can have major social and environmental impacts. Policy needs to be mindful of closing off options for future generations of Australians.

"The problems we now face are the result of unplanned, multiple decisions and actions in the past – we are now capable of doing better than that, through existing strategic assessment powers," said Rick. ■

SOUTHERN AUSTRALIA FOCUS

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

THE RESEARCH VIEW

Building better soils for better crops

By Dr Ann McNeill, University of Adelaide

THE main options for building organic matter in Australian soils are no-till, retaining stubbles, crop rotations with pastures, green or brown manuring, fertiliser inputs and additions of biosolids or manures.

Soil texture does influence the capacity for build up of organic matter – clay can protect organic matter from rapid

TAKE HOME MESSAGES…

- The chance to significantly increase organic matter in soil doesn't come along that often – especially in low rainfall farming systems – so use it wisely;
- Practices to build organic matter require investment in the short term – the payback is an increase in a farm's natural soil capital, higher capacity for soil to supply nutrients and suppress disease, increased yield and profit in the long term; and,
- Burning stubbles should be considered as a 'last resort' and may not be an option in the future – it is good forward planning to start looking into alternatives.

Dr Ann McNeill, University of Adelaide.

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.

decomposition so tends to build it up more and have slower breakdown of residues.

Residue breakdown works faster in sandy soil but because of the smaller organic matter storage capacity, sands can run out of fuel (carbon) for nutrient production.

Nutrients like nitrogen may 'temporarily' tie up in microbes when a large amount of organic matter such as stubble is added, especially in clays, so extra fertiliser may be needed to ensure enough for crop needs. So, an important part of a seasonal program is pre-sowing N and P testing, especially if there are heavy stubbles.

What happens to the carbon in crop residues?

There is no denying the fact that it is much easier to lose soil carbon than gain it.

Results from a study on two agricultural soils to work out how much of the carbon added in mature legume residues was lost via respiration (Table 1), show that 19–43 per cent is lost within a week of addition to soil depending on soil type and moisture conditions.

After that time, although the rate of loss slows down, a further 10–27 per cent is lost over a subsequent four month period. The carbon that remains is not so easily degraded and is very important in the long term for many soil functions including structure, water holding and chemical buffering.

In this laboratory-based experiment the soils were 'disturbed' when the experiment was set up and the residues 'incorporated' – this simulates to an extent the effects of a system with some tillage so losses may be slower if disturbance is reduced.

But the key point here is that as much as 58 per cent of the C in crop residues added to soil 'burns' off as respired carbon dioxide within a year – so to build less degradable carbon in soil you clearly will need to add as much as possible.

TABLE 1: Proportion (%) of carbon from plant residues lost via respiration one week and four months after addition to two soil types kept at different moisture contents

		Dry soil		Wet soil	
		1 week	4 months	1 week	4 months
Sand	Lupin shoot	34	47	32	56
	Lupin root	29	41	30	43
	Clover shoot	38	49	39	55
Clay	Lupin shoot	19	34	27	48
	Lupin root	21	31	26	53
	Clover shoot	30	47	43	58

Moisture contents : Sand- dry 4 per cent w/w; wet 10 per cent w/w; Clay- dry 13 per cent w/w; Wet 24 per cent w/w

TABLE 2: Proportion (%) of the N from lupin stubble and clover pasture residues accumulated in microbes and as plant available N

		Wet sand		Wet clay	
		Microbe N	Nitrate N	Microbe N	Nitrate N
Lupin	1 week	16	0	3	0
	2 months	16	12	9.5	0
	4 months	19	20	20	22
Clover	1 week	22	4	17	2
	2 months	18	30	5	25
	4 months	22	34	46	28

The figures given here are for legume residues but similar or slightly lower values have been measured by other researchers around Australia for cereal stubbles.

Why is a lot of the carbon from crop residue inputs respired?

A lot of the carbon in organic matter is fuel for soil processes and increases its capacity to supply nutrients. This labile carbon from organic matter powers soil microbes, allowing them to grow and convert the residues into nutrients, such as N, for crop uptake. This is not the same outcome as putting a match to crop stubbles – where all the fuel and nutrients go up in smoke!

Further results from the study mentioned before (Table 2) show that, especially in the sandy soil, the microbes incorporated about 20 per cent of the N from the plant residues within a week after addition and after about two months started to release that as plant available nitrate-N.

By the end of four months 39–64 per cent of the N had been utilised from the residues, with around 20 per cent of N from lupin stubble and 30 per cent from the clover residue present in a form directly available for plants. This N benefit would have been lost if the residues had been burnt.

Wheat stubbles

Extrapolating from these numbers a rough calculation can be done for wheat stubbles. Assuming that on average they are 0.4 per cent N then five tonnes of wheat stubble would contain about 20 kg organic matter N and if one fifth of this becomes released as available N over four months that would give four kg

THE ROLL OUT PROCESS…

As part of the national GRDC Soil Biology Initiative, soilquality.org.au is rolling out to South Australia with an expected launch in early 2012. This monitoring program and associated website will give growers access to regionally specific data on soil biological, chemical and physical constraints to grain production. In particular, growers are able to benchmark their sample sites against local and regional values as well as against expert opinion. This information will help growers to determine if they are heading in the right direction with their systems and management practices.

As part of the roll out process, a meeting of an expert group for South Australia was convened in September this year by Dr Ann McNeill, who is leading the dissemination aspects of the project in South Australia as the 'soil quality champion'.

The aim of the meeting was to introduce the website and the agreed national indicators and to review the current data interpretation approaches used in the website, which were established with expert groups in Western Australia, to determine whether the critical values, ranges and targets used for each of the indicators is appropriate for use in South Australia.

The workshop was attended by representatives from Commonwealth and State Government agencies in SA as well as the University of Adelaide and key personnel from Western Australia. Private consultants were invited but unable to attend so will be invited to the next workshop to be held late in 2011.

Recommendations from the workshop are currently being acted upon with a view to ensuring the website will be relevant and useful for all SA growers. Workshops for agribusiness and growers are planned for 2012.

The chance to increase organic matter in soil doesn't come around too often.

N – plus there would be another four kg N ready to be released from microbes in the short term.

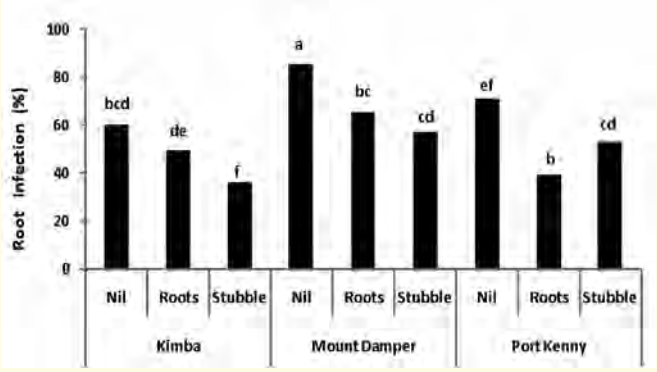
Therefore, about 8–10 kg of N is available over a growing season – enough to support half a tonne of grain production.

Legumes can make a bigger contribution to available N as they have higher N contents – the lupin stubble in the experiment was 0.6 per cent N and the clover residue 1.8 per cent N.

Of course here we are talking only about release of N from last season's residue; it does not account for available N coming from breakdown of older organic matter in the soil which in this study was actually similar to that from the freshly added residues. Amounts were larger from the clay than the sand which was lower in organic matter content.

The more organic matter you have in your soil the greater will be the supply of available N provided you have enough fuel (carbon) to run the nutrient production process.

FIGURE 1: Rhizoctonia infection (%) for roots of young wheat plants grown in three Eyre Peninsula soils without carbon input (nil) or after addition of carbon as roots or stubble



Source: EPFS Research summary 2009. Bars within each soil with different letters above them indicate significant difference.

Burning stubbles doesn't necessarily lead to better yields

Results from a trial undertaken from 2005–08 at Minnipa Agricultural Centre on Eyre Peninsula in SA demonstrated that there was no benefit to yield from burning stubbles in that environment compared with retaining them.

In fact a summary of the results (Table 3) shows that at narrower row spacing (18 and 23 cm) there was a slight yield advantage from retaining stubbles. Other benefits were a higher

TABLE 3: Effect of row spacing and stubble on grain yield (t/ha) at Minnipa SA

Row spacing (cm)	Stubble retained	Stubble burnt
18	1.03a	0.95b
23	1.00a	0.92b
30	0.91b	0.93b
LSD (P=0.05)	0.05	

Source: EPFS Research Summary 2008. Mean of 2005-2008 data. Yields followed by different letters are statistically significantly different.

The decision on whether to accumulate organic matter or to burn it up rests with each individual farm business and it is similar to the kids' inheritance – Annie McNeill.

soil organic carbon where stubbles had been retained (1.02 per cent compared to 0.88 per cent where stubbles had been burnt) and a reduction in rhizoctonia patch.

When this study was carried out there was a run of average to dry seasons with annual yield ranging from 0.8–1.5 tonnes per hectare. So, cereal stubble loads also varied and were clearly not as high as in the next couple of seasons where yields were up around three to four tonnes per hectare.

Years with higher stubble loads represent a great opportunity to add organic matter into the soil if issues such as mice can be controlled. In low rainfall areas these opportunities might only come along once or twice in a decade.

The reduction in rhizoctonia patch associated with retained stubbles noticed in the Minnipa study is likely to be partially caused by increased microbial activity encouraged by the carbon inputs from the retained stubble. This enables more 'good guy' microbes to flourish which can suppress the activity of the rhizo 'bad guys'.

Work on Eyre Peninsula has shown that carbon inputs in the form of cereal stubbles in particular do increase certain microbes (in this case Pantoea) and increase the disease suppressive capacity in soils (Figure 1).

Cost and benefits of building organic matter in paddocks

There is no denying that there are time and dollar costs associated with building organic matter in paddocks. It takes time for any paddock to reach its potential for both yield and natural capital as ecological processes come into balance. Growers need time (a scarce commodity for most) to investigate and consider alternative approaches to practices such as tillage and stubble removal that 'burn off' soil organic matter.

Investment is required for many agronomic inputs – fertilisers to overcome temporary tie-up of nutrients as organic matter is increased, weed control in low or no-till systems, baiting for mice, machinery modifications or purchase of new equipment.

There might also be a need for buying in expertise or for gaining knowledge through technical courses and Grower Updates etc. Nevertheless, there are at least as many benefits as there are costs and in this changing world, public recognition of the importance of soil and organic matter is increasing.

Major benefits to the business are that the nutrient supplying capacity of soil is increased, long term profits will be up, and natural soil capital accumulates which may in future be linked to land values. Growers will be ahead of the game in responding to likely carbon policies and more resilient in the face of adverse climatic conditions.

The bottom line is that the decision on whether to accumulate organic matter or to burn it up rests with each individual farm business and it is similar to the kids' inheritance – are you going to burn it up on a trip around Australia when you retire or invest it for the future?

The contributions of many colleagues in Perth (CLIMA and University of WA) and South Australia (University of Adelaide and SARDI Minnipa Ag Centre) to the work reported in this article is acknowledged.

Ann McNeill, The University of Adelaide, Waite Campus, Glen Osmond SA, Email: ann.mcneill@adelaide.edu.au ■

THE CONSULTANT'S VIEW

BUILDING BETTER SOILS FOR BETTER CROPS

■ **By Bill Long, Ag Consulting Co[1]**

Bill Long.

Agricultural consultants and their grain growing clients well recognise the importance and value of retaining and building organic matter in our cropping soils.

The benefits of practices that lead to enrichment of soil are numerous, and as we strive to adapt to and manage the risks associated with climate variability and change, those advantages will continue to be underlined.

The long-term sustainability of the land we sow to crops is an industry-wide priority. The farming community is supportive of research into the effectiveness of various practices to build soil organic matter.

That research is particularly critical for those more marginal areas where the base levels of soil organic matter are generally low.

It goes without saying that any measures to boost organic composition of our soils – increasing the potential for improved yields and returns – can only be encouraged.

Stubble retention and no-till are practices influential in building organic matter, along with incorporating a range of materials and inputs and cropping and pasture systems.

When seasonal, economic and other circumstances allow for such measures to be undertaken, growers are advised to do what they can to improve their soils.

As a consultant and farmer, my view is that a flexible approach to any soil-improvement regime should be adopted.

This is particularly so when it comes to stubble management as there are years (such as 2010–11) when excessive stubble loads are not conducive to a rigid system of retention.

Retaining high stubble loads in these circumstances can in fact lead to significant issues relating to crop establishment and herbicide efficacy.

The benefits of having retained stubbles in prior years can be lost from the soil if subsequent crops are poorly established, full of weeds or have increased disease and pest levels as a consequence of excessive stubble. In these seasons, removal of some stubble is the preferred option.

While burning stubbles is advocated as a last resort on most occasions – soil organic carbon will decline faster than in retained stubbles – it is a practice that should not be ruled out completely as a means of dealing with heavy stubbles which pose a serious threat to productivity in the following season providing drift or erosion of precious topsoil is unlikely. A burn, just prior to the seeding operation, will reduce this risk significantly.

In conclusion, building soil organic matter should be an over-arching objective, but a 'horses for courses' policy in relation to stubble retention is an advisable approach.

[1]Bill Long is managing director of Ag Consulting Co, based at Ardrossan on SA's Yorke Peninsula where he also farms. He is a new member of the GRDC's Southern Regional Panel.

New faba bean: A class of its own

A UNIQUE and superior new faba bean variety developed for production in southern Australia is expected to appeal to the major Egyptian market due to its large size and quality characteristics.

Developed by the Pulse Breeding Australia (PBA) faba bean breeding program, led by the University of Adelaide, PBA Rana represents a new grain quality category for Australian faba bean production. The seed of PBA Rana is larger than current faba bean varieties and no other major faba bean exporter is producing a bean of comparable size and quality.

Already, feedback from the market in Egypt for this larger type of faba bean has been very positive, according to Australian authorities.

PBA Rana will be available through Viterra for the 2012 growing season and its development is supported by PBA and its partner agencies, Australian faba bean growers and the Australian Government through the Grains Research and Development Corporation (GRDC).

Faba bean breeder Dr Jeff Paull, from the University of Adelaide's School of Agriculture, Food and Wine, says PBA Rana is a relatively late flowering variety and trials have shown it produces the highest yields in high rainfall and long season faba bean production regions.

Jeff says areas of best adaptation are in south Western Victoria and South Australia's Lower South-East, Central Hills, Fleurieu Peninsula and the high rainfall sites in the Lower Mid North.

PBA Rana yields more than broad bean varieties in most districts, the main exception being the Millicent/Conmurra district in SA where broad beans produce higher yields.

Improved disease resistance

"This new faba bean presents growers with other significant advantages over existing varieties," Jeff said. "The overall disease resistance profile of PBA Rana is superior to current Australian faba bean varieties.

"It has a greater level of Ascochyta blight resistance, increasing the reliability of production in higher disease risk regions. This improved resistance should reduce the risk of seed staining due to this disease.

"Its resistance to chocolate spot is higher than current varieties and is comparable to the broad bean varieties, and preliminary results indicate that PBA Rana develops a lower level of seed staining caused by Pea Seed borne Mosaic Virus (PSbMV) than other faba bean varieties."

GRDC manager breeding programs, Brondwen MacLean, says the release of PBA Rana is an important development for the Australian pulse industry and its international markets.

"This new faba bean is the product of a world-class, collaborative breeding program that continues to provide Australian growers with improved pulse varieties that have better disease resistance, are higher-yielding and are adapted to Australian conditions," Brondwen said.

PBA Rana was launched at the MacKillop Farm Management Group (MFMG) field day at Conmurra in SA. ■

VARIETY BROCHURE

A variety brochure is now available for PBA Rana. This package is a compilation of extensive agronomic and disease management projects undertaken by pulse agronomy and pathology research projects which are funded by GRDC in conjunction with the PBA partner agencies, combined with yield data from variety trials conducted by both PBA and National Variety Trials (NVT).

Pulse Australia has been integral in compiling and producing these documents which are available on the PBA website: www.grdc.com.au/pba.

PBA is an unincorporated joint venture between GRDC; Department of Primary Industries, Victoria (DPI Vic); South Australian Research and Development Institute (SARDI); Queensland Primary Industries and Fisheries (QPI&F) as part the Department of Employment, Economic Development and Innovation (DEEDI); New South Wales Department of Primary Industries (NSW DPI); Department of Agriculture and Food Western Australia (DAFWA); University of Adelaide; and Pulse Australia.

At the launch of PBA Rana at the MacKillop Farm Management Group field day at Conmurra in SA are Pulse Australia Industry Development Manager (South-Central) Wayne Hawthorne (left); SA Research and Development Institute plant pathologist Rohan Kimber; Viterra regional sales manager Bernard Seal; and, faba bean breeder Jeff Paull, University of Adelaide.

Seed destructor set for test debut in the south this harvest

GRAIN growers throughout Victoria, South Australia and New South Wales are about get their first glimpse of the Harrington Seed Destructor in action on their own turf.

The grain industry's latest weapon in weed control, the HSD is to be evaluated in south-eastern Australia during November and December.

The HSD has been developed by Western Australian grower and inventor Ray Harrington, with assistance from the Australian Herbicide Resistance Initiative (previously the Western Australian Herbicide Resistance Initiative), the University of South Australia and the Grains Research and Development Corporation (GRDC).

Towed behind a harvester like a chaff cart, the HSD has been designed around a cage mill crushing unit originally developed for use in the mining industry.

The unit, complete with its own power supply, incorporates chaff and straw delivery systems. During harvest, chaff collected from the top sieves of the harvester is delivered into the cage mill where it is processed sufficiently to destroy weed seeds.

GRDC New Farm Products and Services program manager, Paul Meibusch, says the upcoming HSD trials in south-eastern Australia will give grain growers and advisers the opportunity to observe and learn more about the machine's potential use and impact.

Speaking at recent GRDC research Updates in the southern cropping region, Paul said it was hoped that the HSD would become commercially available in 2012, following completion of trials of the latest prototype and any required refinements. The GRDC is managing the commercial development of the HSD.

The trials over the next couple of months are being conducted as part of a new Rural Industries Research and Development Corporation (RIRDC) funded project focussing on harvest weed seed management systems and follow the release of results from trials conducted in WA.

These results confirmed the efficacy of the unit in reducing annual ryegrass emergence, paving the way for its introduction into Australian farming systems.

Those involved in development of the HSD stress that it is not a 'silver bullet in weed management' but is in fact one more string in the bow of overall integrated weed management.

Based at the University of WA, AHRI researcher Dr Michael Walsh said avoiding herbicide resistance through targeting weed seed production was critical, as was the overall need to manage herbicide resistance in annual ryegrass.

Resistance continues to escalate

Michael said the frequency and distribution of herbicide resistant weed populations continued to escalate across all Australian dryland grain production regions, coinciding with the adoption of conservation cropping systems heavily reliant on selective herbicidal weed control.

He said results from 2010 AHRI harvest trials across 12 locations in the WA grainbelt had shown that the HSD was equally as effective as two other harvest weed seed management systems – chaff carts and windrow burning – in reducing ryegrass emergence.

"But unlike chaff carts and windrow burning systems, the HSD has the advantage of conserving all crop residues and does not require any post-harvest management activities," Michael said.

Michael said that while the trials focussed on ryegrass because it was the most problematic weed in Australian cropping, the HSD was also equally effective in controlling other weed seeds including wild radish, wild oat and brome grass.

The trials in south-eastern Australia, from November 21 to December 24, will be conducted in the following locations:

- **SA – Minnipa, Cummins, Bute, Maitland, Yorketown, Hart, Mintaro, Pinnaroo;**
- **Victoria – Underbool, Dimboola, Skipton, Dookie; and,**
- **NSW – Buraja, Balldale, Temora, Wagga Wagga, Dubbo, Nyngan.** ■

The grain industry's latest weapon in weed management – the Harrington Seed Destructor – is about to be evaluated across various locations in south-eastern Australia.

Spray expert says simple changes can increase yield

GLOBAL spray expert Tom Robinson says there are lots of factors involved in effective spray application – and by adopting a few simple changes, growers could dramatically increase yields.

UK-based Tom is a Syngenta Fellow and the company's Application Technology Manager. He was in Australia recently to conduct a series of spray application master classes with growers and agronomists.

"Aussie farmers are the same as farmers everywhere in the world, in that they want the best result from their crop protection products," Tom said. "My job is to look at ways to get the best results, because ultimately the farmer is not just buying a product, they are buying weed control or disease control. How well they achieve this depends on the product they use and the way they apply it."

Following the basics

Tom says that farmers can easily increase their yields just by following some basic tips.

"The reason some growers are not following the basics is not that they're expensive or difficult, it's just a matter of not knowing about them. The workshops I have been running focus on the physics of spraying and showing how various techniques actually make a difference. In our trial sites, we use a tracer dye so we can see exactly how much product gets on a plant and we do a lot of trials just comparing one approach to another to see what the impacts are."

Tom says boom height is extremely important and that many growers at his sessions have been surprised to learn their boom is set too high.

"Farmers set the boom high to lessen the chance of it banging into the ground. But as soon as a drop is released from the boom, it starts to slow down. The further it has to travel from the boom to the crop, the slower it gets. If the boom is set too high, the product sometimes only reaches the top part of the crop – it doesn't have the drive to get to the bottom. If the weed or disease problem is at the base of the crop, this is a real issue because the droplet just doesn't get to it."

Tom says the optimum boom height is half a metre above the crop. "There are a couple of things farmers can do to help make this achievable. First of all, make sure the tyre pressure on the boom is right. Lots of farmers don't really pay attention to this, but tyre pressure is the first shock absorber and getting it right can help smooth the ride. A half-metre length cable tie on the end of the boom can also help by making it really easy for the operator to see whether they're close to the height target."

L–R: Craig Farlow (Syngenta Vic), Tom Robinson, Paul Chatfield (Syngenta WA) and Richard Lillingstone (Syngenta Vic).

While half a metre is always going to be the ideal height, Tom acknowledges that with a wide boom and undulating land, it's hard to maintain. He says specialist nozzles, including those he helped develop, are useful, as they are not so height sensitive and they help ensure full coverage.

"Many farmers think that if they use a standard fan jet nozzle, they get good, even coverage, but it's not the case. Because the boom is moving forward, a fan jet nozzle will mean the front of the crop gets more product.

"We pioneered angled nozzles to help ensure full coverage. By setting them up alternatively – one inclined forward, one back and so on – you'll get proper coverage that doesn't miss spots. Older nozzles might still function well if they've been looked after, but new nozzles are designed for less drift and improved yields."

For more information go to www.syngenta.com ■

The spray boom pictured has been fitted with different nozzles to demonstrate how nozzle choice impacts on spray drift.

Domestic grain market outlook

Barley

In relative terms, feed barley continues to perform this season, in the South Australian, Newcastle and Brisbane markets, with the discount off malting barley being well under the $40 per tonne average. In Pt Kembla, Geelong and Kwinana zones, feed barley is priced close to average compared to prevailing malting barley prices in those markets. Given that malting barley is evenly priced around the country at the moment, it does show those markets as having weaker feed barley prices compared to the other regions.

Relative to ASW wheat, feed barley is also doing well. It is rare for feed barley to match ASW wheat prices. Over the period from 1996 to 2011 feed barley has averaged a discount of $32 per tonne to ASW in the export dominant South Australian market, and has only been priced equal to ASW in late winter this year and briefly in 2002.

F1 barley is currently priced above ASW wheat in the key export states of Western Australia and South Australia, is equal in the northern Australian market, and is under in the key domestic markets of the Pt Kembla and Geelong zones.

Wheat

High protein wheats

The premiums for high protein wheat are high again this harvest. At this stage, they are above the average for the 2010 harvest in most port zones. Newcastle is an exception.

Last year the premiums spiked up around the rainfall event in early December, and then fell away into late January. They then held their ground until August when they slipped away. In the Newcastle zone for example, the premium ranged from $80–$100 per tonne for most of the period from early February to the end of July, and then slipped back to $40 per tonne.

Last year the high protein premiums in Australia were driven by shorts in our market. This year the higher prices for APH and AH1 wheats are being driven by high prices for high protein wheats in international markets. For example, the spread between nearby Minneapolis Grain Exchange (MGE) and Chicago Board of Trade (CBOT) wheat futures is currently at 305.4 USc/bu. This has only been exceeded for a brief two month period in early 2008 when there were severe shorts in the US spring wheat market at that time.

In A$ terms the spread between MGE and CBOT futures is A$110 per tonne, against $40 per tonne at this time last year. The long term average is closer to $20 per tonne.

The current prices for high protein wheat are at risk of declining both in the international market, and here in Australia.

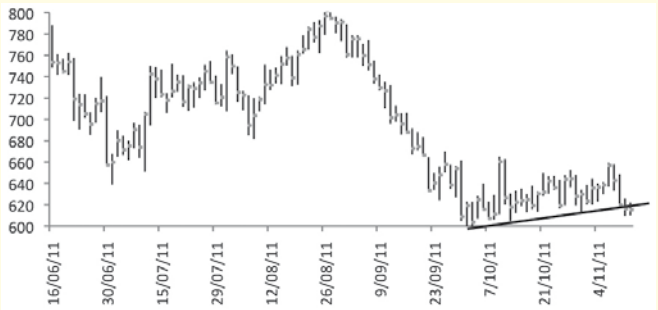
- If CBOT wheat prices remain under pressure MGE wheat may well follow if the market accepts that current protein premiums are high enough.
- As the next northern hemisphere crop becomes established, it may put pressure on Minneapolis wheat prices relative to Chicago prices.
- If corn underpins CBOT wheat, we could see CBOT prices rise relative to MGE prices.
- If supplies from this harvest in Australia are sufficient to cover reasonable export sales, and certainly any committed sales, exporters may stop chasing high protein grades. ie as volumes available diminish the market will shut down regardless of where prices might be.

Wheat takes dangerous turn

The US wheat futures market has entered a dangerous phase, breaking below a gentle uptrend in prices.

In Australian dollar terms December futures are back to $221.59 per tonne this week. The low so far has been $218.61 per tonne. While this is lower than we would like, against last year's swap expiry of $248.55 per tonne, it is not a bad level given the increase in global wheat stocks over the last 12 months. The bigger concern should be whether the US market has the ability to strengthen in early 2012. If it does not, then waiting until the early post harvest period to sell wheat may end up being the wrong move, because we will be relying solely on a lift in basis levels to generate better prices.

FIGURE 1: CBOT wheat has breached a weak upward price trend



Canola

Basis levels have collapsed

Last week we were able to say that canola basis levels were strong. A week later and basis levels are no longer as good. Despite the drop in Winnipeg futures over the last week, (-CAN$7.50 per tonne) in A$ terms there has actually been an increase of A$7.74 per tonne thanks to moves in currencies. At the same time our cash prices have fallen by $14 to $22 per tonne. A fall in cash prices against a lift in the A$ value of January futures represents a significant drop in basis.

Current basis levels in NSW and Victoria look to be consistent with basis levels seen in normal years where oil contents are good (ie about A$10 per tonne above January futures). South Australian basis levels still seem to be carrying a premium, presumably from the European market or from markets that require non GM deliveries.

Canola prices should have got a boost on Tuesday this

Supplied November 16 by *ProFarmer* Australia. Information available at www.profarmer.com.au or call 1300 302 143

FIGURE 2: Canola price as percentage of APW

week, with an overnight rally of A$16.58 per tonne on futures markets. This was on the back of a drop in the value of the Australian dollar against both the US and Canadian dollars, and a CAN$6.40 per tonne lift in futures prices.

But cash prices did not follow at all, and in fact eased, pushing basis levels down sharply. It is hard to understand completely what is happening, except that:

- We have harvest in full swing and growers are making sales. Harvest pressure on prices?
- Oil levels are coming in high (anecdotal evidence at this stage). To compensate, the trade lowers their price base.
- The sovereign debt crisis is starting to ripple through the banking system, constraining credit limits being offered by the banks.
- A$ prices into Europe did not move overnight Monday, removing the potential for a price increase in Australia despite the strength coming from North America.

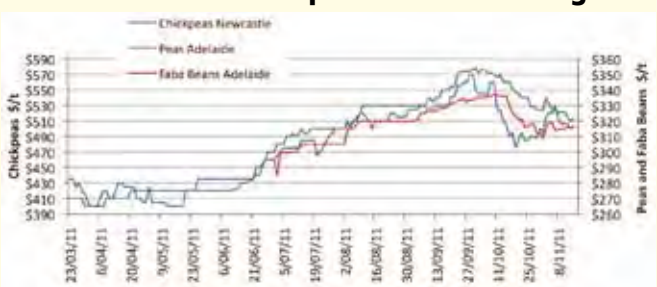
Pulses

The latest news out of India is that their current pulse planting program is progressing rapidly, with pulse plantings running 22 per cent ahead of this time last year according to *Stat Publishing* this week. This should indicate a lift in pulse acreage because the area planted to other crops, like oilseeds, is very similar to the same time last year. There are also reports of adequate water supplies in reservoirs.

This might have big implications for chickpea growers. In one key state the area planted to kabuli chickpeas has jumped 77 per cent, with farmers responding to minimum support payments and other initiatives put in place to try and boost pulse production. The lift in Kabuli chickpea output in India will flow over to desi chickpeas and to field peas. Desi output is also expected to be higher, and that will dampen demand for field peas as well.

Imports into India are expected to remain strong against current low global stocks, but as the new crops come in it will allow resistance to current high prices, which are in place to ration available supplies until new northern hemisphere crops come in. ■

FIGURE 3: New season pulses consolidating



Global update

Australian canola crop bigger

The latest Australian Oilseed Federation Report released this week has increased the size of the Australian canola crop again. Another 85,000 tonnes has been added to the national estimates, largely on the back of a 55,000 tonnes increase in the estimate for NSW. We are now expecting a record crop of 2.63 million tonnes, exceeding the previous 2.5 mt record from 1999–2000.

CANOLA ESTIMATES STILL RISING (million tonnes)

	October estimate	November estimate	Change
NSW	0.575	0.630	0.055
Vic	0.570	0.590	0.020
SA	0.355	0.365	0.010
WA	1.040	1.040	0.000
Total	2.540	2.625	0.085

Source: AOF November 2011

Brazilian soybeans

Profarmer in the US report that planting of the Brazilian soybean crop is progressing at a rapid pace with 57 per cent of the crop now in the ground.

This is well ahead of average and ahead of last year's 40 per cent at this time of the year.

The early soybean crop may allow more acres to roll straight into corn later in 2012. It also leaves Brazil on target to produce a 75 mt crop according to latest USDA estimates. A crop of that size will be just 0.5 mt smaller than last year's crop.

Ukraine crop

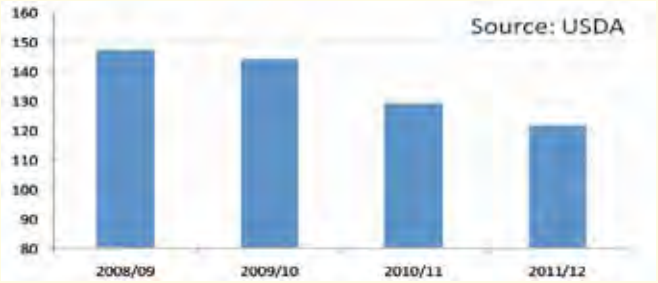
Grain stocks in Ukraine were pegged at 25 mt as of November 1 this year. This is a 63 per cent increase from October 1. The harvested crop so far in Ukraine is totalling 29.7 mt this year compared to 12.2 mt in 2010.

Looking forward to next year, the USDA are saying that as much as 30 per cent of this newly planted winter wheat crop may be lost to drought. This has been one of the supporting factors for the wheat market, but will probably have most influence on prices early in 2012, if the drought conditions persist or have actually pulled back this year's crop.

USDA report: Corn

Last week's USDA Report was not a major market mover, although most grains did lose ground in the wake of the report on the back of macro economic factors that pushed the US dollar up, and commodity prices in general down. ■

World corn stocks falling (million tonnes)



Markets overshadowed by uncertainty

By Rabobank Agri Commodity Markets Research

MACROECONOMIC uncertainty remains the key driver of agricultural markets despite fundamental adjustments from the USDA in their latest World Agricultural Supply and Demand Estimates. There were few surprises in the USDA's November WASDE report, with prices expected to ease in the face of a stronger US dollar and flight to safety. Corn yield was a major focus heading into the report, as the industry expectations were widely diverged, with the USDA lowering their yield estimate by almost a bushel per acre more than the pre-report expectations.

But any bullish impetus from the lower yield is likely to be tempered if not offset by weaker feed and residual which resulted in only a minor contraction in corn ending stocks.

In comparison to the volatility and uncertainty which continues to define major macro markets, the impact of the WASDE report's fundamental news on agri commodity markets will likely be minimal. Market focus will quickly shift back to the bigger issues at play as the crisis in the Euro zone escalates. A stronger US dollar and weaker global equity markets have produced significant selling in the commodities complex.

Under the circumstances, fundamental readjustments will quickly be moved to the back burner. Even markets such as corn – which received supportive data in the WASDE report – will likely be caught up in a flight to safety.

Corn

The USDA reduced its US corn yield estimate to 146.7 bushels per acre from 148.1 bushels per acre in October. This is below the average pre-report trade estimate of 147.8 million bushels. The USDA projects ending US stocks of 843 mb, which is above the average trade estimate of 800 mb but reduced from 866 mb in October. Rabobank forecasts that 2011–12 US corn ending stocks will be 592 mb – lower than the USDA's new estimate. Beyond immediate price movements, Rabobank sees short-term upside for CBOT corn prices.

Global 2011–12 corn production was revised down by 1.1 million tonnes from the October estimate to 859 mt, with ending stocks reduced by 1.62 mt to 121.57 mt. The reduction in US production figures and the 3.5 million tonne reduction in Mexican production amount to a 6.6 million tonne reduction in global production, which is offset by production increases in South America. There was a 1.5 million tonne increase in Argentine production to 29 mt from 27.5 mt in October. Brazilian production was unchanged at 61 mt.

The USDA lifted their 2011–12 Chinese corn production estimate by 2.5 mt to 184.5 mt and have now increased their estimate by 6.5 mt since September. Despite the increase in domestic production, estimated 2011–12 imports for China were raised by one to three million tonnes as feed and industrial demand strengthened by 2.5 mt to 189 mt. Rabobank continues to expect the final import number for China to be four mt for 2011–12.

Soybean

The November WASDE added to the mounting downward pressure on CBOT soybean prices as stock levels in the US and globally were revised higher. A modest downward revision to US soybean production (-14 mb) was more than offset by the USDA's 50 million bushel cut to their export forecast. This resulted in a 22 per cent increase in their ending stocks forecast from the October WASDE. The USDA now forecasts ending US stocks of 195 mb – 15 mb higher than what the trade was expecting. South American production and Chinese import demand will play a more prominent role in the coming months.

Globally, the USDA's forecast for ending stocks was revised

FIGURE 1: US corn yields now forecast to be significantly below trend and the lowest since 2003

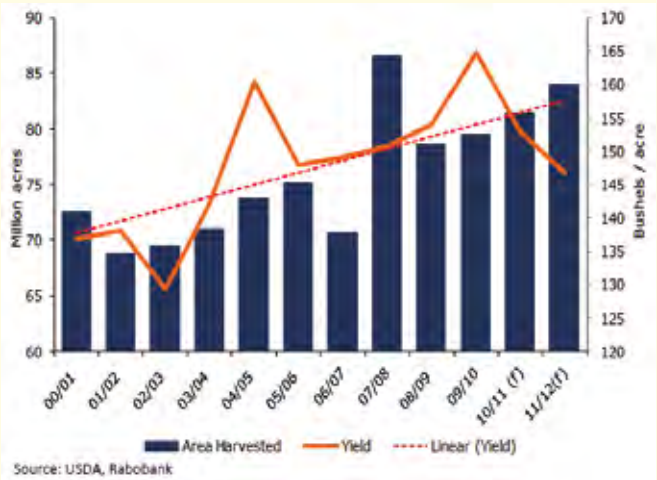
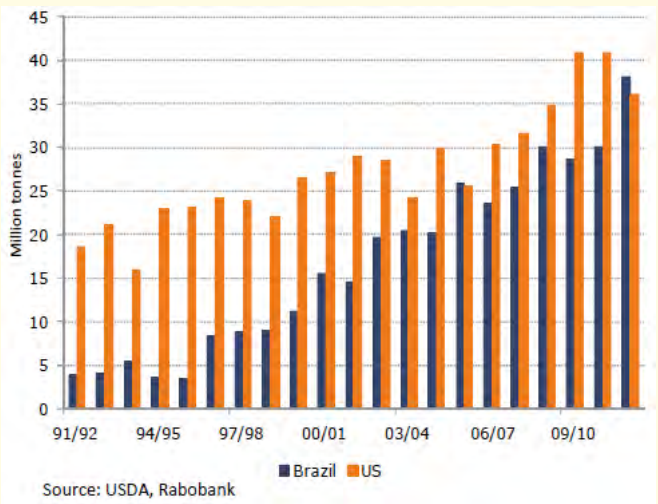


FIGURE 2: Brazil set to displace the US as the world's largest soybean exporter in 2011–12



higher from the prior month due to increased production in Brazil and lower demand. The USDA raised their forecast for Brazilian soybean production to 75 mt (from 73.5 mt in October). The USDA's forecast of 75 mt would be the third consecutive year of record large soybean harvests in Brazil and has prompted the USDA to raise their expectations for Brazil's soybean exports 1.5 mt to 38 mt – displacing the US as the world's largest soybean exporter for only the second time in history.

Although fundamentals are increasingly bearish for the soybean complex, we expect prices will continue to follow CBOT corn movement as the price ratio hovers near record lows. This price relationship will, in our view, partially offset the underlying fundamentals as we view the November report as less bearish to corn.

Corn plantings have taken area from soybeans in most growing regions, which is forecast to cause global production to decline two per cent year-on-year in 2011–12.

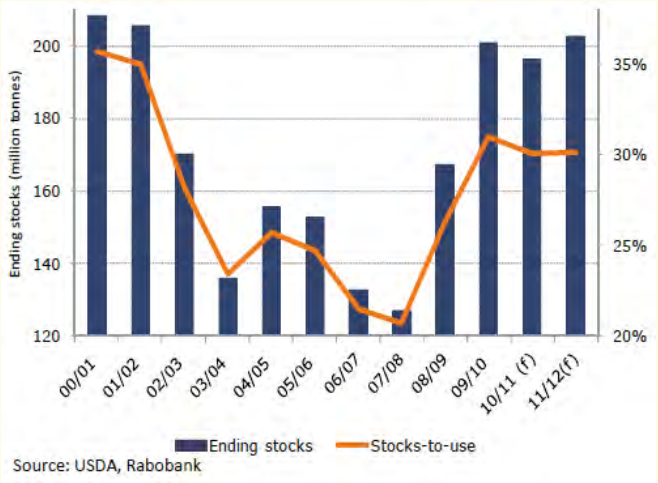
Wheat

The November WASDE was neutral for wheat, with only minimal changes to the US and global wheat balance sheets. US all wheat production was lowered nine mb from the October estimate based on re-surveyed states and now stands at 1999 mb. US all wheat ending stocks were cut to reflect the lower production, with exports and domestic feed and food usage left unchanged.

Global wheat production was raised 2.6 mt from October to 683 mt, with global ending stocks left almost unchanged at 202.6 mt due to increased feed usage. Production estimates were again raised for the EU and Kazakhstan.

Global wheat fundamentals remain very comfortable given the recovery in world production this season, and we would suggest that, without support from the corn market, wheat is overvalued at current price levels.

FIGURE 3: Global wheat ending stocks and stock-to-use are forecast to remain comfortable in 2011–12



Source: USDA, Rabobank

Cotton

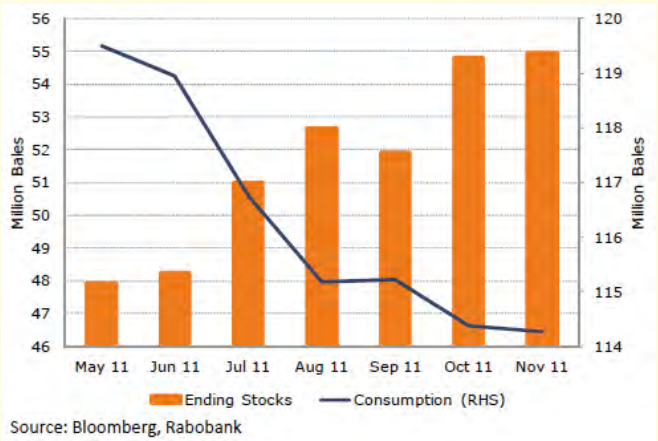
The November WASDE was largely neutral for cotton as the USDA failed to surprise with only small changes to the numbers reported in October. The yield number in the US was reduced from 809 lbs per acre to 794 lbs per acre, which resulted in a small reduction in US ending stocks of 0.1 million bales to 3.8 million bales.

The market outlook had already suggested expectations of a downward revision for the US crop given the severe drought conditions currently affecting the southern US states.

Globally, cotton ending stocks for 2011–12 were revised upward by 0.13 million bales to 54.96 million bales. This was due to the higher beginning stocks, up 0.35 million bales to 45.22 million bales and slowing demand, down 0.1 million bales, which more than offset the contraction in production of 0.3 million bales.

With global demand also decreased, the 2011–12 outlook continues to be one of increased cotton supply and diminished consumption. ■

FIGURE 4: The USDA has lowered their forecast for 2011–12 global cotton demand in six of the seven last months



Source: Bloomberg, Rabobank

Food security, food reality and Australian agricultural opportunity

By Mick Keogh, Australian Farm Institute


Mick Keogh.

AS recently as five years ago, food security was a term used when discussing the food supply situation in drought stricken and impoverished developing nations But more recently, food security has emerged as a major policy issue in developed nations such as Australia. Unfortunately, much of the policy discussion is misinformed, and some of the proposed solutions are likely to make global food insecurity worse, rather than better.

While the issue represents a significant opportunity for Australian agriculture, policy-makers are currently infected with 'mining myopia' and have failed to grasp that the agriculture sector can make a major contribution to global food security and deliver sustained wealth for Australia.

Australia is one of the most food secure nations on Earth, and is in absolutely no danger of having insufficient food for its population. In fact, Australia ranks fourth in the world behind only Brazil, Argentina and the Netherlands as a net exporter of agricultural products. Depending on the year, Australia exports between 60 and 70 per cent of its total agricultural output, meaning the nation's farm businesses provide for the food needs of Australia's 22 million people, plus at least another 50–60 million overseas.

No doubt some will claim that Australia's current agricultural systems are unsustainable, but the facts confound this argument. For a wide range of agriculture sector indicators including water, fertiliser and energy use efficiency, and rates of adoption of technologies such as conservation tillage and precision agricultural systems, Australian agriculture either leads the world, or is included amongst the top one or two nations.

Australian farmers achieve this, despite farming in some of the world's most variable climates, and in the almost complete absence of government subsidies or payments for environmental services. Reinforcing this, the most recently published OECD review of world agricultural policies (OECD 2011) identified that Australia expends the lowest amount of public funding on agriculture as a percentage of GDP (0.12 per cent) of any nation globally.

Global food insecurity

But at a global level, the issue of food insecurity is one that has gained increasing attention from policy-makers, as fears emerge about the ability of the globe's human population to sustainably produce sufficient food in the future.

There are a range of reasons that the issue has become much more prominent, but perhaps the most important factor has been the change that has occurred in global agricultural commodity prices over the past decade. This change can be observed in global food price indicators. These indicators show that the period of a persistent downward trend in global agricultural prices that was experienced from the 1960s ended around 2000, and that since that time global agricultural and food prices have trended upwards and become more volatile.

Exactly what has triggered this trend change in global agricultural commodity prices is the subject of considerable debate.

The most frequently cited factor is global population growth, with current population estimates approaching 7 billion people, and a further billion increase anticipated over the next 15 years. It is not immediately apparent that population growth *per se* has triggered the price change, but an increasing global population constantly adds to demand pressure in agricultural markets.

Another commonly cited factor is the growth in global biofuel production that has occurred since 2000, which has diverted agricultural production that would otherwise have been used as food. Certainly there has been strong growth in biofuel production since 2000, with the EU, the US and Brazil all implementing policies to boost biofuels (although in Brazil's case these date back to the 1970s oil shocks). Irrespective of the crops involved, these policies divert land from food production, and therefore add to the upward pressure on global food prices by limiting supply.

A further factor commonly cited as a reason for the change is that the world has reached the limit of available agricultural land, and this has restricted the ability of nations to respond to increased demand for food. But there is no compelling evidence to confirm this. Global-scale assessments of available land identify large areas of South America and sub-Saharan Africa where additional land could be converted to agricultural production without environmental damage, and also a large area of highly productive agricultural land in Eastern Europe that is under-


Across the globe many people argue that farm commodity prices have risen on the back of population pressure, increased biofuel production and the increasing scarcity of prime agricultural land. But is this what is really happening?

Changes in political will and public policies would see more land become available for feed production.

utilised. Even China, the nation most frequently considered to have reached the limit of land utilisation, has recorded a 12.5 million hectare increase in crop area over the six years since 2004.

There are a range of logistical and political factors that are limiting the area of land utilised for agriculture in South America and Africa. Development costs are also limiting the productive utilisation of land in Eastern Europe, and deliberate government policies in both Western Europe and North America ('set asides') have reduced the amount of land used for crops. Most of these factors could be addressed, but they would require political changes or substantial public investment, and governments have not as yet been sufficiently motivated to take such action. In reality, the limits on agricultural land are economic and political, not agronomic.

Slowing global agricultural productivity growth is widely considered to be contributing to global food insecurity. The relatively high rates of productivity growth observed in the agriculture sectors of developed nations over the period from 1970 to 1990 appear to have slowed, as the benefits of the 'green revolution' have been exhausted. This slowdown in agricultural productivity growth rates has limited the ability of agricultural producers in developed nations to increase production in response to higher prices.

A further important factor contributing to higher global food prices is that in a number of large-population developing nations such as China, India and Indonesia, growing consumer wealth is resulting in a transition to more Westernised diets higher in animal protein, and this is creating sharply increased demand for feedgrains for livestock. There is certainly strong evidence of this trend in China, which has dramatically increased annual soybean (and more recently corn) imports since 2000.

These now amount to almost 50 million tonnes annually (more than twice Australia's annual volume of wheat production). Such trends are also becoming evident in other ASEAN nations, as per capita wealth increases with the current high rates of economic growth.

The significance of these changing dietary patterns arises from the sheer size of the populations in those nations that are experiencing the transition. Japan, South Korea and Taiwan went through a similar transition during the 1960s and 1970s and the result was major new markets for Australian agricultural products – but collectively these three nations represent just 2.8 per cent of world population.

In contrast, China, India and Indonesia together have a population of 2.8 billion people and account for 40 per cent of the world population. In theory, the impact of the economic transition of just these three nations on global agricultural demand over the next two decades will be 13 times as great as was the impact of the economic transition of Japan, South Korea and Taiwan.

A recent review of trends in global agricultural markets by Abbot *et al* of Purdue University concluded that two factors – the global growth in the use of crop products for biofuels, and the large increase in Chinese imports and utilisation of soybeans – are the key factors driving the fundamental changes that have been observed in global agricultural markets over the past decade.

What these researchers also noted is that both these are inelastic sources of demand, and they therefore contribute to increased price volatility.

The changes that are occurring in these and other developing nations means that there will be a sustained period of growth in demand for agricultural products over the next few decades and beyond. At the same time, it is apparent that there are a range of factors that currently limit the potential of global agriculture to respond to this increased demand. This suggests that global food insecurity will remain a focus for policy-makers over the next few decades, as relatively high food prices persist.

Some illogical responses to global food insecurity

The recent period of elevated food prices has led to renewed concern by policy-makers about food security, and has spawned an entire industry of international and national reviews, academic treatises and books about the issue, as well as renewed interest in the writings of Malthus, and the Club of Rome. It seems that there is an inherent human fascination with predictions of an imminent catastrophe – and no end of instant experts ready to take advantage of this fascination – even in highly food-secure nations like Australia.

Some of the suggestions that have been made to fix global food insecurity are 'interesting' to say the least. They include proposals for stopping global trade in agricultural products, banning factory farming, banning the use of genetic modification or agricultural chemicals, the development of urban agriculture, and the concept of food sovereignty, which involves the development of localised food production systems linking producers and consumers, without multinational corporations or government agencies being involved.

There are also serious proposals for the widespread adoption of organic and biodynamic farming as a means of solving global food supply shortfalls.

What many of these proposals seem to ignore is the difference between the desires and whims of a limited population of some of the most wealthy and food secure consumers in developed nations, and the future needs of a growing population of poor, food insecure people in some of the poorest nations of the world.

Responding to the desires and whims of the wealthiest and fussiest consumers in developed nations, especially at a national policy level, seems likely to result in an exacerbation of food insecurity for developing nations, rather than resolving the problem. The United Kingdom serves as a relevant current case-study. For a variety of reasons; including disease outbreaks, the requirements of the Common Agricultural Policy, the increased focus on organic production, and the imposition of a broad range of regulatory controls (DEFRA 2006); the UK has become progressively less self-sufficient in food since the 1980s.

While not likely to result in mass starvation, it is a sign that the

UK agriculture sector is becoming less productive. There is now a concerted program underway in the UK to remove many of the regulatory controls and to invest in agricultural research and development in an attempt to reverse this trend.

Banning so-called factory farming is frequently proposed as a means of addressing global food insecurity by environmental and some consumer groups. But there is no doubt that such farms have the potential to be much more efficient in terms of energy and water use per unit of output, especially in intensive production systems associated with pork, poultry and some horticulture commodities.

Larger, well-capitalised businesses can access modern technology and implement advanced production systems. They are also more likely to be able to implement food safety and animal welfare measures than smaller-scale farms. Larger farms are also more likely to achieve consistent production and quality. That is not to say there is no place for smaller, family-scale businesses, but there is no doubt these are often less competitive in producing undifferentiated bulk commodities utilising intensive production systems.

What is also overlooked in relation to large-scale corporate farming entities is that they often serve as a test-bed for new technologies and management systems that will, if successful, later be adopted by smaller scale farm enterprises. In this manner they can act as a catalyst for improved productivity across an entire commodity production sector.

'Urban farming'

The concept of 'urban farming' – where urban residents grow their own food – is also commonly proposed as a way of producing extra food for the world. While the notion of urban residents growing all their own food may have some philosophical appeal, the concept must be a source of great amusement for the teeming masses of recently urbanised citizens in developing nations, many of whom have experienced the sheer hard work and poverty of smallholder farming, and have been desperate to swap that existence for an urban wage-earning lifestyle which enables them to purchase, rather than produce their own food.

There are some urban residents in developed nations who take great delight and much satisfaction from the production of some of their own food. But this is a far cry from food self-sufficiency, especially given that the most limited resources for many urban residents is time and open space, both of which are essential elements of successful food production.

Organic and biodynamic farming systems are also spoken of in glowing terms as viable alternative production systems that could be adopted to alleviate world food insecurity. There are certainly many examples of the successful implementation of organic farming systems. But robust, long-term comparisons of the productivity of conventional and organic farming systems highlight that well-managed organic systems at best match the productivity of conventional farming systems, and in many situations are significantly less productive.

An exception to this may be minimal input organic production in low rainfall areas.

An issue often overlooked in relation to high-rainfall organic production systems is that there is a need to maintain fertility and soil nutrients, either by utilising imported organic wastes such as manure, or through rotations involving legumes. A significant expansion of organic production would quickly exhaust available manure supplies, creating greater reliance on crop/pasture rotations for organic farm systems. However as Pimentel and colleagues noted:

Depending on the crop, soil, and weather conditions, organically managed crop yields on a per hectare basis can equal those from conventional agriculture, but it is likely that organic cash crops cannot be grown as frequently over time because of the dependence on cultural practices to supply nutrients and control pests.

Less GM, more insecurity

Banning or discouraging the use of genetically modified crops is also certain to add to, rather than alleviate food insecurity. While genetically modified (GM) crop varieties may not necessarily result in better yields in trial situations (although they frequently do) their incorporation into farming systems greatly simplifies management for farmers, and therefore increases the probability that optimum yields will be obtained. This is confirmed in two ways:

- Broad measures of national agricultural productivity growth identify much stronger yield growth in commodities where GM varieties are available (maize, feedgrains and soybeans) than for commodities grown without the use of GM varieties (wheat and barley); and,
- In situations where GM crop varieties are available (canola in Canada, cotton in Australia) farmers very quickly choose to use those varieties rather than conventional varieties, confirming the advantages they provide.

The most irrational

The most irrational suggested solutions to global food insecurity are those that involve banning agricultural chemicals. Modern agricultural chemicals have contributed enormously to

farm productivity growth over recent decades, for both crop and livestock production. It is often overlooked that during this period, agricultural chemicals have also become much safer and specific to particular pests, and residue detections have declined dramatically.

A nation such as India has been transformed from a land of chronic food shortages during the 1960s, to being a net food exporter during the 2000s, largely through the use of agricultural chemicals. In the Australian context, the use of chemicals has enabled almost 90 per cent of Australian crop producers to adopt no-tillage cropping systems, resulting in major fuel savings while minimising soil erosion and maximising water use efficiency.

There are numerous other examples in almost all commodities of similar gains that have been made. It is inconceivable that even current levels of global food production could be sustained without the use of agricultural chemicals, let alone food production increased substantially in the future.

Securing global food security and opportunities for Australia

Australia is in the somewhat unique position of being a major net food exporter, and also being closely tied to Asian economies where most growth in food demand is anticipated in the future. Global food insecurity therefore represents a major opportunity for Australian agriculture.

Australian agricultural products will generally not be cost competitive in the agricultural markets of the poorest nations, but Australia is a cost-effective source of high quality food for the burgeoning Asian middle-classes. This will make an important future contribution to improved global food security, because in the absence of Australian agricultural imports, consumers in these markets would be outcompeting consumers from poorer nations for available food supplies.

Sustainably maintaining and improving Australian agricultural output in the future will require renewed and vigorous efforts to enhance agricultural productivity, utilising all the advantages that modern science and technology can bring. Australian governments will need to increase investment in agricultural R&D, and implement policies that incentivise private sector agricultural R&D investment in order to ensure future agriculture sector growth.

Associated with the above investment is the challenge of re-orienting the mindset of many urban consumers about agriculture and food production. There is clearly a need to assist consumers to better understand the realities of agricultural production and the benefits associated with modern production technologies – including genetic modification and the use of agricultural chemicals.

Asian demand for Australian agricultural products will still be there long after their demand for our coal and iron ore slows.

Wealthy consumers will continue to demand food with specific credence characteristics such as 'natural' or 'organic', and farmers should pursue those market opportunities. But care is needed to ensure that agricultural policies facilitate a diversity of production systems, without unnecessarily constraining any of these systems. The fact that some consumers prefer organic food should not become a justification for the banning of genetically modified crops.

Change in government policy

Aside from agricultural R&D investment, there are a broad range of other government and industry initiatives that will assist Australian agriculture to take advantage of the enormous opportunities that are emerging. These include taking an objective approach to the development of land and water resources in northern Australia, and abandoning the 'lock it up and leave it' mentality that seems to pervade current government decision-making.

There is also a need to re-evaluate the water resource policies of southern Australia, in the light of the higher long-term strategic value of agricultural production. This applies in particular to decisions about the best way to obtain extra water for the environment. While buy-backs might look best from a cost per megalitre perspective, any policy evaluation should include the multi-year economic value generated by productive water use, and therefore favour water infrastructure investments that generate water savings while retaining productive agriculture.

Transport and communications infrastructure servicing rural industries also needs to be considered in a new light, given the dramatic future potential of Australian agriculture. The current priority being given to mining infrastructure and transport needs is having a negative impact on some sub-sectors of agriculture, and reducing agricultural competitiveness.

'Mining myopia'

But perhaps the biggest challenge of all lies in re-orienting the thinking of policy-makers towards the future potential of agriculture. Much current policy-making at both the national and state levels is affected by 'mining myopia' – a very short-sighted focus on maximising wealth from minerals exports, without considering the longer-term implications of many of these policies – especially for a growth sector such as agriculture.

To put it very simply, Asian demand for iron ore and steel for building new cities and infrastructure will slow long before its demand for food slows.

The reality of mining myopia was brought into sharp focus recently, when the Australian Government made a major announcement about the development of a white paper on Australia's future engagement with Asia to be carried out by Former Treasury Secretary Ken Henry. In a speech announcing this initiative, Prime Minister Gillard referred to the potential of the mining industry at least six times, but did not mention agriculture once.

Hopefully, Ken Henry will adopt a broader perspective and the resulting white paper will help to cure the myopia that currently infests the vision of Australian policy-makers.

Originally published in Farm Institute Insights, Food security, food reality and Australian agricultural opportunity, Vol 8 Number 4, November 2011. This editorial and the rest of the Farm Policy Journal are available on www.farminstitute.org.au or by contacting the Institute on 02 96901388. ■

Education a key to tackling urban encroachment

LOSING the connection between city and country is one thing, but it's the loss of farmland itself to urban encroachment that is occupying the thoughts of Nuffield scholar Helen Thomas.

Helen, who farms near Manoora, South Australia, is using her Landmark-sponsored scholarship to investigate how to preserve prime agricultural ground and the surrounding reserves and ecosystems.

She says it's a serious problem which isn't getting the attention it deserves.

"We have lost 14 per cent of our farmland in Australia over the past decade, and as the world needs to feed a population of possibly nine billion by the year 2050, I think that every bit of farmland we can preserve is precious and every bit of open space and remnant vegetation also has its place."

Small acreage threat

Helen says while urban encroachment from cities is a factor in the loss of farmland, the bigger threat is from small acreages.

"They are actually creating far more damage to our farmland, not just in the straight acres they're using, but also the weeds they're introducing, the risk to fire control and biodiversity infringement."

Helen says while her land isn't directly affected by encroachment, the affect on her district as a whole is all too obvious.

"We're the valley between the Clare Valley and the Barossa Valley and they've been marked for expansion.

"I've seen in the 20 years I've been in the district how a lot of high rainfall good soils have disappeared and how the management of those areas is becoming more difficult and has gone out of the control of local people."

It's this last point about the disconnect between city and country which gives Helen food for thought as she looks to solve this huge problem for agriculture.

City/country disconnect

She believes while it is a massive job, making the public understand the value of preserving farmland would go some way to improving the situation.

"At the moment I'm not sure if there's a full connect there in the city as to the need to be able to grow food and the resources that that requires – and that the whole of Australia isn't necessarily suitable for growing vegetables or even crops or animal products people actually want to use.

"We have to delineate where urban stops and where rural starts and somehow we have to find a mix and get the community actually talking about it – as much as anything I'd like to just find ways of getting the debate to start."

While it may seem logical that people who have moved from the city onto hobby farms don't need to be sold on the benefits of preserving farmland – after all, understanding country life at some level was surely what pushes many to a 'tree-change' – Helen says that's not necessarily the case.

"Yes and no, sometimes people who have moved to the country want the view, but they actually consider the view as being a right, a bit like fresh air," Helen says.

"At the moment there's not a lot of thought as to who actually pays for the view – and that's a big question overseas. If you go to Europe a lot of governments there are basically paying for the view by providing public support for farmers to look after their set-aside areas and their hedgerows and all that kind of thing.

"I'm not sure that our farmers are actually prepared to take on public funding and I'm not sure that we actually would ever have the resources or the willpower to want to do it in Australia.

"But I think there's still got to be some debate there as to who controls that view and who controls the use of that land," Helen says.

"The hobby farmers – yes they want to be part of that scene – but quite often they don't have the expertise, the resources, the education to know how to manage that land."

Keep an eye on www.nuffield.com.au to see the full results of Helen's research and travels.

Nuffield Australia is an organisation which provides opportunities to Australian farmers between the ages of 28 and 40 to travel the globe investigating a research topic important to them and Australian agriculture. Follow us on Twitter! @nuffieldaust ■

Helen Thomas, 2010 Nuffield Scholar.

Farming in Foreign Fields...

a focus on the successful endeavours of innovative farmers around the world

Knowing the costs pays dividends

THE decision to put a 440 hp 12.9 litre tractor on the farm to keep costs down may seem surprising, but for UK *Farmers Weekly's* Arable Farmer of the Year, Andrew Ward (pictured above), the use of a Case IH STX440 Quadtrac in a mintill system makes sense and pays dividends. "The STX has transformed our farming operation since we bought it in 2004," says the Lincolnshire farmer, who hosted the Cereals event at Leadenham in 2004 and 2008. The Quadtrac has made such a difference to the farm that Andrew has traded up to a 597 hp STX535 model.

Andrew carefully monitors all the costs involved in using the big machine. In addition to fuel use, capital and operator costs, insurance, depreciation and maintenance are all factored in to establishment costs for each crop. It is this scientific approach that has lead Andrew to start a new business – Ward Cultivation Solutions – and ensure that such a purchase would make sound financial sense.

"In speaking with other farmers, I was surprised how few knew the exact costs per hour of running a machine like this, and therefore their establishment costs. Using a specialist cultivation cost model I've developed, I was able to determine the positive impact of purchasing the 535 and how the extra performance would make my operation more efficient. Ward Cultivation Solutions offers this costing methodology to others," explains Andrew. "By monitoring these costs against cereals prices, the profitability and viability of each crop can be measured."

A vocal supporter of minimum tillage, Andrew has expanded his all-arable operation from 360 hectares to 650 hectares thanks to a cultivation system based on a minimum number of passes.

"Capital costs are obviously important, but the continuing operator and fuels costs must also be carefully managed to ensure that establishment costs are understood and driven down," explains Andrew.

Although supported by other tractors for spraying and transport, the Quadtrac undertakes the lion's share of the drilling and all primary cultivation tasks.

"Our approach centres on a large, reliable tracked tractor able to draw a heavy multi-function trailed implement – the Simba Solo. The Simba has enabled us to reduce the number of passes for cultivations by an average of 60 per cent. I say that pto stands for 'profit totally obliterated' – we haven't used a power harrow since 2003."

One of the multiple uses of the Simba Solo is the incorporation of canola stubble.

Even in wet conditions the tracked STX has no trouble pulling the 'combi-press' set up.

Andrew has been using tracked tractors on the farm for more than 30 years. "The STX has plenty of power and the grip is superb, even in the wet, nothing will touch it. We can run it flat out all day long pulling our 'combi-press' for example – a combination of a 5.5 metre Simba culti-press and a 5.5 metre Simba double press – and at a good pace that is essential if the cultivation is to be done properly. Being able to do several operations in one pass means establishment efficiencies are high and we are able to cover many more hectares within the same time period."

The farm's combination of heavy soils, where canola and wheat is grown, and lighter soils growing sugar beet and spring malting barley produce varying fuel consumptions for the STX440, but Andrew records each meticulously.

"Fuel use ranges from 54 litres per hour on the lighter land using the Solo and press covering 2.0 to 2.5 hectares per hour, to 70 litres per hour for the Simba combi press yet covering three plus hectares per hour."

Litres per hectare the important number

Although Andrew expects the fuel consumption to increase with the new STX535, he also expects the work rate to increase in line. "The litres-per-hectare is the important number. We are staying with the 4.5 metre Solo and double press, which means the new 535 will be working well within its capability resulting in greater fuel efficiency even on heavy soil. We've added the full GPS, RTK auto-steering package which reduces overlaps and further improves efficiency."

Andrew expects establishment costs to drop slightly with the new machine. "Even with the cost of trading up I expect to make savings and of course reduce cultivation time. The STX440 has a lower fuel-per hectare figure than our previous 255 hp tractor with a 3.3 m Solo, and I hope the STX535 will go lower still. These efficiencies will give us the capacity to take on additional work."

Focussing on one machine with one operator keeps costs down but according to Andrew this does not rule out flexibility.

"The ability to keep going, and going well, means we can get jobs done quickly. And for a large machine, it's easy to use and very manoeuvrable. There's also a great view all round from the cab, which is quiet and comfortable. This all means that long hours are not difficult or tiring and that's important as we expect the STX to clock up between 750 and 1000 hours each year." ■

The Quadtrac and Simba Solo combination has reduced the number of passes by 60 per cent.

Closing the phosphorus efficiency gap

THE price for phosphorus is increasing steadily and has doubled over the past 10 years. Providing a national review of phosphorus use in grazing and cropping systems, Australian and international scientists found that Australia's pasture systems, on average, have low phosphorus–use efficiency (15–30 per cent) while most broadacre grain operations average around 50–60 per cent efficiency.

They say that the major avenue for addressing inefficiencies and increases in phosphorus fertiliser cost could be addressed through improving fertiliser technologies:

- Breeding plants that can more efficiently take up phosphorous from the soil or grow better in lower–phosphorus soils; and,
- Applying the right amounts of phosphorus fertilisers at the right times.

According to Dr Richard Simpson from CSIRO's Sustainable Agriculture Flagship, with a few exceptions, improvements in using phosphorus efficiently have been stalled for years.

"Ideally we would like to be applying only one kilogram of phosphorus as fertiliser to produce one kilogram of phosphorus in food and fibre products," Richard said.

"But for every kilogram of phosphorus that ends up in farm products, usually two to four kilograms of phosphorus has been added to the soil in fertiliser. This is because most Australian soils tend to hold on to phosphorus when they are fertilised and plants can't access it.

"We really can't afford to continue doing that. From a dollar point of view, improved efficiency will mean we can reduce costs for our farmers, but also, high-quality phosphorus reserves are a finite global resource – the more effectively we use phosphorus the better global citizens we will be," Richard said.

"This latest work is showing us how we may be able to achieve improved efficiency through improved practices and technologies."

Globally, phosphorus fertilisers are an important input for producing food. For most Australian farms, using phosphorus fertiliser (along with other inputs like nitrogen and water) ensures high production per hectare therefore helping to minimise overhead costs and support more efficient use of land and other resources. This helps Australian enterprises to maximise their returns on investment and maintain their global competitiveness.

"Unfortunately, the price of fertiliser has doubled over the past decade and some meat and wool producers are deciding to forego productivity gains as they need to reduce stocking rates," Richard said.

"In addition, the cost of energy needed to source and produce fertilisers is rising, so further steady increases in fertiliser costs are expected.

Optimising fertilisers and production

"The key thing for farmers to think about is whether they are optimising fertiliser application for their production goals. Applying phosphorus amounts that exceed the targets for optimal management simply cost more in fertiliser for no gain.

"If the inefficiency gap can be closed there are big opportunities to maintain high farm productivity with reduced food production costs and reduced phosphorus losses to the environment such as into waterways.

"While it's not going to be easy, there are immediate steps we can take and there are many improvements possible. Pasture systems particularly provide the biggest opportunity," he said.

CSIRO's Sustainable Agriculture Flagship is working with industry and farmers to more efficiently use resources such as nutrients, water, soil and labour to benefit both productivity and the environment.

This research was supported by Meat and Livestock Australia. ■

Dr Richard Simpson has been part of a team of CSIRO and other scientists researching the phosphorus efficiency of Australian agricultural soils. (PHOTO: Carl Davies, CSIRO)

Soil core samples taken for analysis. (PHOTO: Carl Davies, CSIRO)

Peak phosphorus – a real or perceived issue?

By Rob Norton, Regional Director (Australia and New Zealand), International Plant Nutrition Institute

A RELIABLE supply of high quality phosphorus (P) has been a cornerstone of agricultural development in Australia as well as across the globe. As most farmers know, P is an essential nutrient for plant growth that has no substitutes.

So, where P is lacking in the soil, large responses can be achieved by adding fertiliser P and ongoing production depends on at least replacing the P removed in produce. For example, a 2.5 tonnes per hectare wheat or barley crop will remove around 10 kg of P which is the equivalent of 45 kg of MAP.

P fertilisers such as MAP, DAP, triple super and superphosphate are made from phosphate rock that is mined mainly from ancient marine sediments as well as relatively new guano deposits and some igneous deposits. DAP and MAP represents around 70 per cent of the P used in Australia. These deposits are finite resources and there has been some questions raised about the amount of P remaining for use.

The major producers of phosphate rock have been the US and the former Soviet Union. Global production is again approaching the previous peak in the late 1980s of around 165 million tonnes of rock per year (Figure 1).

The demand for phosphorus is strongest in East Asia and South Asia which use around half of the global P fertiliser, and these regions are also growing quickly. Use of fertiliser in general is also rising in Latin America.

Australia uses around 945,000 tonnes of P2O5 fertiliser annually, some which is produced from local phosphate rock and some which is imported or produced from imported rock. Australia also trades phosphate fertiliser internationally.

A recent study estimated that about half the current P resource would be depleted by 2100. An earlier estimate suggested that P fertiliser supply would peak in 2033 after which production would steadily fall. Because there is no agronomic substitute for P – and much of the world's food supply hinges on its use – having a reliable estimate of reserves is important in assessing how immediate is the problem of P resource depletion.

Estimating our reserves

The size of the reserve of phosphate rock is an estimate of materials that can be economically produced at the present time using existing technology. The actual reserve base is the portion of the total reserve base (or resource) from which future reserves could be developed. Both terms are important as the reserve will

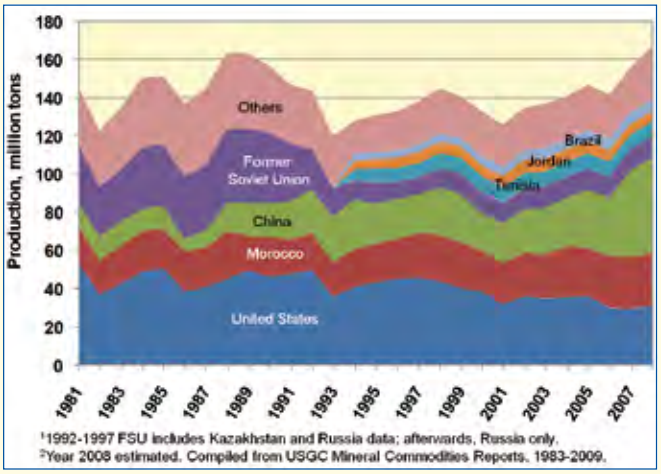
Phosphate rock in place. The phosphate is deposited in layers which are interspersed with the yellow layers of clay.

TABLE 1: World mine production and phosphate rock reserves (USGS 2011)

Country	2009 (mt)	2010 (mt)	Reserves (mt)
Algeria	1.80	2.00	2,200
Australia	2.80	2.80	82
Brazil	6.35	5.50	340
Canada	0.70	0.70	5
China	60.20	65.00	3,700
Egypt	5.00	5.00	100
Israel	2.70	3.00	180
Jordan	5.28	6.00	1,500
Morocco	23.00	26.00	50,000
Russia	10.00	10.00	1,300
Senegal	0.65	0.65	180
South Africa	2.24	2.30	1,500
Syria	2.47	2.80	1,800
Togo	0.85	0.80	60
Tunisia	7.40	7.60	100
United States	26.40	26.10	1,400
Other countries	8.62	9.50	620
World total	**166**	**176**	**65,000**

Dragline mining phosphate rock deposits.

FIGURE 1: World phosphate production



[1]1992-1997 FSU includes Kazakhstan and Russia data; afterwards, Russia only.
[2]Year 2008 estimated. Compiled from USGC Mineral Commodities Reports, 1983-2009.

change with technology and prices. As well, new deposits are discovered which adds to the resource base and reserve.

These values of phosphate rock are expressed in terms of P2O5 content with most rock being around 25 per cent to 35 per cent P2O5.

The most recent comprehensive assessment of phosphate rock reserve and reserve base was undertaken by the International Fertilizer Development Centre (IFDC). The IFDC estimate of global phosphate rock reserves is approximately 60 billion tonnes of concentrate which the US Geological Survey increased to 65 billion tonnes recently (USGS 2011).

Table 1 lists the annual production for 2009 and an estimate of 2010 production for the major producers and the size of the current phosphate rock reserves. The IFDC estimate of global resources is approximately 290 billion tonnes.

Australia has developed reserves of around 82 million tonnes of rock phosphate, which represents around 50 years' supply based on current domestic use. There are also several companies involved in exploring and proving phosphate rock reserves and details can be found at *http://www.australian-phosphate.com*.

Developing new mines

There is significant activity in developing the world resources. For example a new five million tonne per year phosphate rock mine began operation in Saudi Arabia late in 2010 and an associated fertiliser plant is due to open over the next few years.

World mine production capacity was projected to increase to 228 million tonnes by 2015 through mine expansion projects in Algeria, Brazil, China, Israel, Jordan, Syria, and Tunisia, and development of new mines in Australia, Kazakhstan, Namibia, and Russia.

Over the past few years, production has been around 160 to 170 million tonnes of rock, and demand rose by 2.1 per cent per year from 2007–08 until 2011–12 and is predicted to rise by around three per cent annually until at least 2015.

Assuming current rates of production, IFDC estimates that there are sufficient phosphate rock concentrate reserves to produce fertiliser for several centuries at current rates of production.

This does not mean growers and the fertiliser industry should be complacent. Phosphorus is a non-renewable resource and using fertiliser best management practices to ensure efficient use of P is a critical component of wise nutrient stewardship. This will also include investigating strategies to recycle P as well as ensuring as much soil P is retained on farm by reducing soil erosion. ■

It seems 'biochars ain't biochars'

■ By Ann Perry, Agricultural Research Service, USDA

WHEN fires burned freely across the North American prairies, they left behind charred material that helped form the region's dark, fertile soils. In South America, pre-Columbian Indians used slash-and-char practices to clear land for farming, which incorporated large amounts of char into the highly weathered soils of the Amazon. This char became a key building block in the development of the rich 'terra preta' – or black earth – that sustained agriculture in the Amazon for more than 1000 years.

Today, Agricultural Research Service scientists are learning more about 'biochar', the name for the charred biomass created from wood, plant material, and manure that has been used to improve soil fertility and remediate environmental contaminants.

The multi-location effort is still under way, but preliminary results suggest that adding biochar to agricultural soils could rebuild soil fertility levels and improve nutrient and water retention. Biochar can even 'sequester' carbon from plant materials by storing it underground, where it slowly decomposes and makes only a minimal contribution to the emission of the greenhouse gas carbon dioxide. So scientists are working diligently – and carefully – to understand how biochar interacts with soil and crops so that the potential benefits observed in the laboratory can become economically viable realities in the field.

First steps

Much of the ARS field work on biochar started at the National Laboratory for Agriculture and the Environment (NLAE) in Ames, Iowa. During November 2007, NLAE scientists began the first of six multi-year field studies at ARS locations around the country to assess how biochar affects crop productivity and soil quality.

Scientists amended 24 plots (three hectares) of corn with biochar made from hardwood biomass. Twelve plots had almost 8800 pounds of biochar per acre (9850 kg/ha), and 12 had almost 16,000 pounds per acre (18,000 kg/ha).

But no significant difference was observed in the three-year average grain yield from either treatment.

In New Orleans, technician Renee Bigner places poultry litter pellets into a furnace to make biochar via slow pyrolysis. (Photo: Stephen Ausmus)

Other small-scale ARS field and laboratory studies in Idaho, Kentucky, Minnesota, South Carolina, and Texas showed that hardwood biochar could improve soil structure and increase the ability of sandy soils to retain water.

But soil fertility response was more variable.

'Biochars ain't biochars'

These results underscore what ARS scientists already knew: Biochar characteristics vary widely, depending on the feedstock used to make it, the time spent in the pyrolyzer – a device that uses heat to break down the biomass in the absence of oxygen – the temperature used during pyrolysis, the feedstock's moisture content, and other factors. Because of structural differences, some biochars break down more quickly in soil than others.

iochars can also differ in particle size, porosity, surface area, pH, and biologically active and available compounds. So even though there's already a lot of public enthusiasm about using biochar in agricultural production, ARS scientists are much more cautious about the possibilities.

ARS soil scientist Doug Karlen, who is the research leader of the ARS Soil, Water, and Air Resources Research Unit at NLAE, has been involved with the biochar studies from the outset. "Now we're studying how crops respond to soils that have been amended with biochar made from corn stover," he says. "We didn't see a significant response when we amended an acre (0.4 hectares) with eight tons (8.9 tonnes) of biochar made from hardwood, so now we're amending fields with as much as 50 tons of corn stover biochar per acre (140 tonnes per hectare)."

Finding what works where

"We need to make sure that the biochar will actually improve the condition of the soil where it is being used," says soil scientist Jeff Novak, who coordinates the ARS multi-location effort to learn more about biochar dynamics under different real-world field conditions. "We want to ensure that the correct biochar is applied to the right soil so that we avoid decreasing soil quality."

Jeff, who works at the ARS Coastal Plains Soil, Water, and

Biochar pellets in Prosser, Washington, made from dairy cow manure and used to capture phosphorus from dairy lagoons. (Photo: Rebecca Cochran)

Plant Research Center in Florence, South Carolina, is working with other scientists to manufacture 'designer biochars' with properties tailored to remediate specific soil characteristics. He led a laboratory study to learn more about the characteristics of different biochars and to see which biochars could improve the sandy soils found on the Carolina coastal plain and the silt loam soils of the Pacific Northwest, which are derived from volcanic ash and windblown sediment known as 'loess'.

Several other Florence researchers, including soil scientist Warren Busscher, environmental engineer Kyoung Ro, agricultural engineer Keri Cantrell, and microbiologist Tom Ducey, participated in the study. Other ARS partners included chemist Isabel Lima, who works in the ARS Commodity Utilization Research Unit in New Orleans, Louisiana; soil scientist Jim Ippolito, with the Northwest Irrigation and Soils Research Laboratory in Kimberly, Idaho; and ecologist Harry Schomberg at the J. Phil Campbell Sr. Natural Resource Conservation Center in Watkinsville, Georgia.

The team made biochars from peanut hulls, pecan shells, poultry litter, switchgrass, and hardwood waste products. By pyrolyzing these materials at different temperatures, the researchers produced nine different types of designer biochars. Then the biochars were mixed into one type of sandy soil and two silt loam soils at the rate of about 20 tons per acre (45 tonnes per hectare). The test soils were leached with water every month.

After four months, the team found that biochars produced from switchgrass and hardwoods increased soil moisture storage in all three soils, but biochar made from the other biomass

Lettuce growing in Minnesota field plots amended with 20,000 pounds of macadamia nut shell biochar per acre (22,400 kg/ha). The study evaluated how the biochar affects crop yield, soil fertility, and greenhouse gas production from the field. (Photo: Amanda Bidwell)

At Wyndmoor, Pennsylvania, chemical engineer Akwasi Boateng (right) and mechanical engineer Neil Goldberg (center) adjust pyrolysis conditions while chemist Charles Mullen loads the reactor with bioenergy feedstock. (Photo: Peggy Greb)

sources did not. They saw the greatest moisture increase in soils amended with switchgrass biochar produced via high-temperature pyrolysis – almost three to six per cent higher than a control soil sample. Biochars produced at higher temperatures also decreased soil acidity, and biochar made from poultry litter greatly increased soil levels of available phosphorus and sodium.

Results also indicated that switchgrass biochar amendments could extend the window of soil water availability by 1.0 to 3.6 days for a soybean crop in Florence and could increase soil water availability for crops grown in Pacific Northwest silt loam soils by 0.4 to 2.5 days.

These results support hopes that agricultural producers might someday select feedstocks and pyrolysis processes to make designer biochars with characteristics that target deficiencies in specific soil types.

Karamat Sistani, research leader at the Animal Waste Management Research Unit in Bowling Green, Kentucky, is part of the ARS biochar team. "In 2010 we started a field study on combining biochar with poultry manure to see how microorganisms and nutrients in the manure affect biochar efficiency in improving soil quality and corn yield," Karamat says. "We also want to see if it has any efficacy in mitigating greenhouse gas emissions of nitrous oxide, methane, and carbon dioxide."

The Bowling Green researchers will also be determining whether biochar amendments can help improve the nutrient-holding capacity of Kentucky limestone karst soils, which develop large cracks that allow water and fertilisers to move quickly through the subsoil. In addition, Bowling Green hydrologist Carl Bolster and research associate Sergio Abit are conducting a lab study to see whether biochar affects the movement of pathogens like *Escherichia coli* in the soil.

The results aren't all in yet

In Kimberly, Idaho, Jim Ippolito and soil scientist Rick Lentz are studying how three different soil amendments – biochar, manure, or a biochar-manure combination – affect soil quality and crop response in the region's calcareous soils. During the first

study year, biochar-amended soils showed no real improvement in nutrient levels, aside from an increase in manganese, which is an essential plant nutrient, and a slight increase in total organic carbon. Soils amended with manure also had increased levels of manganese and of other plant nutrients.

"Both manure and biochar applied alone increased soil manganese, but their combined effect was synergistic," Rick says. "In plots where soil was amended with a biochar-manure mix, the total increase in manganese was greater than what we would have obtained from just adding the manganese increase from biochar to the manganese increase from manure."

But during 2010, fields amended with biochar had a 31 per cent crop yield decrease, along with a 33 per cent decrease in nitrogen uptake. Sulfur uptake in fields amended by biochar also decreased seven per cent.

"We think that the biochar is somehow inhibiting nitrogen and sulfur uptake, maybe by stabilising the soil organic matter. This would reduce the mineralisation rate of soil organic matter and decrease the availability of nitrogen and sulfur to the crop," Rick says. "After biochar is added to soil, its chemical and physical characteristics will change with time, so its effect on soils and crops may change accordingly."

The third year of the study will help determine whether the 2010 results bear further investigation or were just a fluke. But the findings already demonstrate that biochar amendments might not always work the way farmers want them to work.

Cleaning up with biochar

ARS scientists have also spent years investigating the use of biochar for environmental remediation. Retired ARS chemist Wayne Marshall, who worked at the ARS Southern Regional Research Center in New Orleans, Louisiana, started pursuing this line of research in the 1990s. He and Isabel Lima found that charred poultry litter is especially adept at removing hard-to-capture heavy metals like copper, cadmium, and zinc from wastewater. They produced pellets, granules, and powders made from the char for use in water tanks, columns, and other filtering structures.

The New Orleans scientists also developed a method for making carbons that have increased surface area for adsorption or chemical reactions. They did this by pelletising ground poultry litter and then heating the pellets at high temperatures via slow pyrolysis to produce steam-activated char. ARS was issued two patents on the process, which Isabel says could be used to replace traditional activated carbon adsorbents in air or liquid-waste cleanup applications.

Since 2006, chemical engineer Akwasi Boateng, who works at the ARS Sustainable Biofuels and Co-Products Research Unit in Wyndmoor, Pennsylvania, has helped lead ARS studies of biochar production via fast pyrolysis. Other Wyndmoor scientists contributing to these projects include research leader Kevin Hicks, chemist Charles Mullen, and mechanical engineer Neil Goldberg.

"We use fast pyrolysis when we produce bio-oil from biofeedstock to maximise fuel production, but this process produces a biochar byproduct that has a lower surface area," says Akwasi. "We'd like to improve the biofuel production process so that it also yields biochar that has a high surface area. This would make it more structurally suited to use as an activated charcoal and as a soil amendment. Identifying this kind of process could help make the biochar use in soils economical."

As part of this effort, Akwasi and Isabel worked with other scientists in Wyndmoor and New Orleans to see whether steam activation would increase the ability of fast-pyrolysis biochars to adsorb toxic metals. They found that biochars made from broiler litter and alfalfa stems had the highest pollutant-uptake levels.

In a test of carbon's ability to absorb metals from water, student technician Bonnie Dillon (left) and chemist Isabel Lima run a copper ion solution (blue liquid) through a column of broiler manure-based carbon. When the copper is removed, the solution becomes clear. (Photo: Stephen Ausmus)

ARS microbiologist Hal Collins, who works at the Vegetable and Forage Crop Research Unit in Prosser, Washington, is exploring similar territory by evaluating the production of bio-oil and biochar from waste materials like wheat straw, logging debris, and manure. "There are a lot of concentrated animal-production facilities in the Pacific Northwest, and there's not a lot of room available to store manure," says Hal. "Nutrient runoff from these sites can potentially pollute nearby water sources, so using the manure to produce bio-oil and biochar could be one mechanism for controlling nutrients at dairy facilities."

In one test, Hal made biochar from plant fibres remaining after processing dairy manure through an anaerobic digester used to capture methane from manure. He used that biochar to adsorb phosphorus present in the digester effluent. He found that the biochar removed 32 per cent of the phosphorus from the effluent, and when the biochar was used as fertiliser, 13 per cent of the adsorbed phosphorus was immediately available for plant uptake.

Given these results, Hal believes that bio-chars could help mitigate nutrient runoff but agrees that much more work is needed on the potential benefits and drawbacks. "Using this biochar to fertilise fields is not like using phosphorus fertiliser," he says. "We can add 200 pounds of fertiliser per acre (220 kg per hectare) to support plant growth, but we'd need to add two to three tonnes of the biochar (five to eight tonnes per hectare) to add the same amount of phosphorus to the soil."

To reach scientists mentioned in this story, contact Ann Perry, USDA-ARS Information Staff, 5601 Sunnyside Ave., Beltsville, MD 20705-5129; Ph: +1 (301) 504-1628.

■

"Almost all headers I ride in are harvesting a record crop for the paddock" – Peter Norris.

Western region

NORTH

Wet conditions continued over spring except for a hot week in early September. Rain has continued in almost all of the region allowing very good grain fill conditions. Sand soils in coastal areas are washed out due to too much rain and have lost some yield potential across all crops.

Harvest is now in full swing with some delays due to wet weather. There were some significant rainfall events in recent weeks and sprouting and falling numbers are a problem in some crops. Geraldton had 100 mm of rain in October which is decile 9 for our area. At this stage the amount of downgrading is probably around 10 per cent. Coastal areas are the worst affected and the more sprouting-susceptible varieties are going feed or GP due to low falling numbers.

Lupin crops jumped away early and had huge growth which resulted in lodging and twisting of the main stems. Very wet conditions resulted in disease buildup in these crops. Yields are still OK to very good but the worst lodged crops have the lowest yields. Grain price is the big challenge for lupin growers at the moment.

Canola is yielding fantastically well and GM and hybrid crops are leading the charge. Yield and oil have generally been at record levels. One GM hybrid paddock averaged 2.6 tonnes per hectare at 49 per cent oil which is the best I have heard in our region. (These results may not sound too high to some southern Australian growers, but latitudinally-speaking, this paddock is around 900 km north of Horsham!)

Wheat and barley also at record yield levels

Wheat and barley yields are equal to or at record yields across most of the region. Protein levels are on the low side due to the extreme yields but most growers are more than happy with what they have.

The extreme I have seen was one paddock of 'wheat on wheat' which has gone 5.0 tonnes per hectare this year – its previous best was 3.8 tonnes.

Sprouting-susceptible varieties and washed out sandy coastal paddocks are the only bad news in the landscape. Quality is mixed in coastal areas with up to four grades of wheat off

The dust settles while headers wait on a truck northeast of Yuna.

the same paddock and quality downgrading because of three different problems.

Grain marketers are slaughtering the malt barley industry in our area. Their indecision about preferred malt varieties has farmers avoiding this crop. In my opinion they should pick a malt variety for our region – my recommendation would be Buloke – and get all malt barley growers to run with it.

Late-season weeds are popping up through crops and, in many cases, the boom will follow the header.

"Legs 11" has been a fantastic year in our area. Almost all headers I ride in are harvesting a record crop for the paddock. I think we will smash the Geraldton Port zone production record if we can just get the crop off. The sky is blue today and we need it to stay that way until Christmas to get this big crop in the bin.

Peter Norris
Agronomy For Profit and Synergy Consulting, Geraldton
November 11, 2011

SOUTH COAST

Seasonal conditions on the South Coast over the past two months have seen a return to Spring rainfall – but for most this rainfall has been six to eight weeks too late! The dry period between the middle of August and the mid-September caused a big reduction in yield potential. But the late rain has been very useful for filling very good plump grain which should boost some yield potential.

Harvest has begun across the region with mostly canola and field peas to date. Yields are very mixed with some canola crops from the dry north eastern regions only yielding 300 kg per hectare whilst canola crops on the coast are harvesting in excess of two tonnes per hectare.

Field pea yields are also mixed – some yields are very disappointing at only 200 kg per hectare due to frost and drought, whilst other crops in areas that received reasonable growing season rainfall are still yielding in excess of 1.5 tonnes.

The last week of October and first week of November have seen some big rainfall events – some areas received over 100 mm overnight! Most areas have totalled between 50 to 150 mm in recent weeks which is causing a delay in harvest and some potential for grain quality downgrades. The chances of getting malt barley are becoming very remote due to fungal staining.

With these heavy thunderstorms, there has also been some widespread hail damage. The damage extends along a strip over 70 km in length – crop losses along this strip vary from 10–20 per cent through to a total wipeout.

One benefit of the rain is that most growers now have had sufficient run-off to fill dams. This will be very beneficial for the inevitable summer weed spraying – which has already begun for some.

Most growers on the South Coast are looking forward to finishing harvest and turning the calendar over to 2012 which will hopefully bring a more predictable season to our region.

Quenten Knight
Agronomist, Precision Agronomics Australia
November 5, 2011

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)	2011 rainfall to date (mm)	Summer		Autumn		Winter		Spring	
			25yr Annual Average (mm)	2011	25yr Annual Average (mm)	2011	25yr Annual Average (mm)	2011	25yr Annual Average (mm)	2011 to date
Emerald Qld	556	441	247	345	105	315	69	21	126	23
Toowoomba Qld	644	956	239	860	135	233	85	91	173	111
Roma Qld	576	570	226	357	120	339	78	38	143	70
Goondiwindi Qld	619	527	239	227	135	166	105	82	139	165
Narrabri NSW	654	428	229	286	128	107	134	68	157	144
Gunnedah NSW	677	380	223	325	131	110	128	44	178	130
Dubbo NSW	616	406	191	214	133	137	133	79	154	144
West Wyalong NSW	438	541	101	290	87	187	121	76	125	108
Wagga Wagga NSW	540	525	118	367	116	116	156	108	146	86
Swan Hill Vic	333	375	66	227	70	74	96	64	99	56
Bendigo Vic	540	698	99	434	115	105	178	147	145	117
Horsham Vic	384	481	77	286	79	62	136	101	113	71
Lake Bolac Vic	565	509	122	303	106	121	164	102	156	91
Murray Bridge SA	364	303	61	132	73	132	126	96	102	76
Kadina SA	340	354	53	114	73	148	120	102	92	61
Cummins SA	391	346	48	108	83	94	176	116	83	71
Esperance WA	613	583	75	79	144	117	254	230	138	175
Wagin WA	400	499	43	115	96	49	179	183	83	161
Northam WA	405	451	42	67	88	63	194	225	79	128
Mingenew WA	368	478	31	85	92	122	184	205	61	88
Moora WA	398	394	45	12	92	126	191	155	70	101
Mullewa WA	323	499	40	304	96	72	139	174	44	60

Last rainfall reading November 15, 2011.

Southern region

SOUTH AUSTRALIA

Weather

Maximum temperatures were average for September and slightly above average for October across the state.

Several frosts were recorded in inland areas during late September and early October.

September rainfall was generally below average across the state, except for the southern parts of the Lower Eyre Peninsula and Lower South East, which were average.

October rainfall was above average across the state.

Growing season rainfall (April to October) was well below average for most of the state with most centres recording decile 2 to 4 rainfall and several centres only receiving decile 1 rainfall. The exceptions being the southern part of the Upper North (Decile 6) and parts of Upper Eyre Peninsula (Decile 6 and 7).

Variable yields but above average

Despite the below average growing season rainfall across most of the state, crop yield potential is average to above average. The exceptions being the lower rainfall areas of the Upper North, Mid North and Northern Murray Mallee, which suffered severe moisture stress in mid to late September with some areas of below average yields.

Harvest of a few very early sown (March) barley crops commenced around Pt Germein in late September while the harvest of peas, barley and canola commenced in other early districts in mid to late October.

Yields of cereals have been above average, although quality has been disappointing.

Canola and pea crops in these early districts suffered from the dry September and yields are below average. Canola has been windrowed in all but the later districts of the state.

Lentil crops have good yield potential with low levels of disease.

Yields of early cut hay have been low and quality affected by rain. Later cut hay should be better.

Some disease and pest issues

Stripe rust was widespread throughout the state. Timely and effective fungicide applications limited crop damage.

Stem rust has caused only minimal damage to susceptible varieties where fungicides were applied early, with some crop damage noted when application was delayed.

Leaf rust was widespread in both wheat and barley crops throughout the state, but fungicide applications have kept damage to low levels.

Powdery mildew has infected pea crops and some cereals late in the season.

Frost caused severe damage to pea crops from Mallala to Crystal Brook and to a range of other crops in Central Eyre Peninsula, Southern Mallee, Lower Murray and Upper South East districts, with minor damage in other districts.

Widespread hail caused general minor damage to developing crops. Isolated pockets suffered severe hail damage.

Snails have increased in some districts and are causing harvesting problems.

Ryegrass and brome grass populations are higher than normal reducing yield potential in some crops.

Mice are still present in many districts at low numbers, but are only causing minimal crop damage.

Pastures

The dry conditions in September hastened maturity of pastures in many areas. Feed supplies should be adequate until stubbles become available.

Livestock are generally in good condition.

Michael Wurst
Farming Systems Consultant, Rural Solutions SA
November 7, 2011

VICTORIAN MALLEE

Canola windrowing came in earlier this year with windrows being made in the last week of October. Harvesting started on November 1 and progressed slowly due to the moisture levels hovering above the required eight per cent. Initially, yields have been below what was expected. This has been due to widespread frost occurring right across the Mallee.

Canola has also been threatened by mice, but with vigilant baiting, these crops have compensated very well to fill in gaps late in the spring. The windrows have shown more potential than the actual yields. Yields have varied widely from 0.5 tonnes per hectare to 1.5 tonnes but most have been just under a tonne to the hectare.

At the time of writing not much barley has come off, but all indications are that the yields are promising at around 2.5 to 3.0 tonnes per hectare. Protein is low due to abundant moisture and not being able to balance up the nitrogen requirement. Nitrogen levels generally began from a low base due to last year's big crops and leaching losses from the summer rain, particularly on the lighter soils.

The winter has been quite dry with below average growing season rainfall. This limited topdressing opportunities, but if we knew the spring was going to finish as well as it did, I'm sure another 50 kg of urea would have gone on many crops. Hindsight is a wonderful thing!

Some legumes have been harvested and results have been good. Crops podded up better than usual and the targeted yield of 1.0 tonne per hectare has been surpassed in most crops harvested to date. Frost has not impacted the legumes like it did in the canola.

The cool finish to the season has been most favourable. This is two cool springs in a row, which is quite rare in the Mallee.

A lot of the Mallee (and the state) copped a storm on November 9 which delivered 15–30 mm in many areas. This is not the kind of harvest weather we want. Some canola windrows were blown around also making it difficult to pick up.

The aim now is to get the harvest off as quickly as possible to avoid another scenario like last season where rain downgraded quality.

Wheat crops look to have very good potential and growers are eager to discover what yield benefits their crops have had from stored moisture.

Simon Severin
Dodgshun Medlin Ag Management, Swan Hill
November 10, 2011

MURRAY VALLEY RICE REPORT

It's been a 'mixed bag' as far as rice establishment has gone in the Murray Valley this season. Some crops have done remarkably well, others have struggled.

Growers wanting to take advantage of the early delivery bonus sowed in late September or early October. The weather's normally cold enough that time of year and this season it was below average – so many of those crops have struggled.

The weather warmed up considerably in mid and late October and crops tended to establish much better. Wind was present as it normally is this time of year, but was only of minor concern.

The big problems this season have been ducks and snails.

Some growers who are normally not troubled by ducks have encountered them this season, particularly if they sowed early. Many crops will have 'holes' or areas of low plant population due to duck damage. Some growers unfortunate enough to be in high duck pressure areas have suffered substantial losses and have re-sown much of their crop.

Crops sown into last season's rice stubble were hit hard with aquatic snails. The damage occurred while crops were still establishing, catching some growers by surprise. Control measures were mostly quite effective once they were implemented.

Blood worms have been present, but have not caused the same amount of damage as last season. Most fields had far less trash incorporated prior to sowing so insecticide efficacy was not unduly affected.

Wind (top) and duck damage (bottom) to early rice stands was much less prevalent in direct-drilled crops.

There have been a few more growers' trialling direct drilling crops this season. At the time of writing it is too early to say definitively how those crops have established, but early indications are positive. They are certainly not worried with wind, ducks or slime like the aerially sown crops.

Water allocations have now reached the 100 per cent level. Most growers expected this would occur and planted accordingly. But there was a general sigh of relief once the announcement was made.

The poor price outlook remains the main concern for growers. Many are hopeful that there will be some upward movement between now and when the crop is marketed.

John Fowler
Deniliquin District Agronomist
November 10, 2011

WESTERN MURRAY VALLEY

Winter cropping

After a promising start to 2011, with 250 mm of rainfall over the summer, we have on average only recorded an additional 150–180 mm of growing season rainfall. May and June rains were very poor totalling 35 mm (over 12 rainfall events!) consequently crop emergence was staggered and later than ideal. Most of the GSR rain fell from July into September with significant falls of 35 and 85 mm.

Canola windrowing has been very efficient this year opposed to 2010. Most crops – due to later emergence and improved black leg varietal choice – have stood up and not lodged.

As harvest has just begun it may be slightly early to generalise, but early reports on canola yields to date have ranged from 1.0 tonne per hectare where crops emerged late ,up to 1.8 tonnes per hectare on early established hybrid varieties. Oils are pleasing ranging from 42–45 per cent most likely due to the cooler spring. With current prices on-farm of $505–510 per tonne, canola will most likely be the highest grossing crop as wheat prices continue to remain around $165–$175 AH on-farm.

With irrigation up to 100 per cent in the Murray Irrigation Limited Scheme most winter crops have been watered at least once and pastures two to three times. This should put some security into wheat yields (four to six tonnes per hectare) and enabled most pasture growers to finish prime lambs successfully and cut hay as well.

Summer cropping

With a less desirable opening indicative price on rice at $230 per tonne, there has still been a substantial amount of rice planted.

The majority of the rice has been planted in October with the main variety, Reiziq, sown between October 1–15. Many rice growers have been disappointed with the much anticipated Sherpa variety's availability after its promising results last year. Those that have missed out on Shepra have swapped to another short season variety, Quest, which was sown in the last two weeks of October.

Early sown rice has had a hard time with very cool temperatures which has meant slow germination and growth. On top of this, every duck in Australia has decided to visit us and have a feed. This has resulted in many re-sowings. Growers who waited until warmer weather in mid October onwards, saw this rice germinate faster and have less duck and weed issues.

As temperatures have increased, slime growth has as well. This

has lead to many growers dropping water off blocks to allow rice to stand up and recover.

Bloodworm infestations are less intense than last year and many growers have been able to avoid the second control measure which is usually required. There has been some snail pressure in 'rice on rice' paddocks and old pasture paddocks.

A small amount of corn has been planted to utilise irrigation water that can't be carried over. A small amount of soybeans will be planted in mid November to also double crop following canola and utilise water that can't be carried over into the new year.

Fingers crossed for a dry harvest!

Laurence Pearce
Agronomist, IK Caldwell, Deniliquin NSW
November 11, 2011

GRIFFITH RICE REPORT

As of November 1, 2011, the General Security water allocation for Murrumbidgee Irrigators is 69 per cent. Murrumbidgee Irrigation has provided a five per cent enhancement to General Security customers on top of current allocations, taking GS allocations to a total of 74 per cent.

Rainfall figures for Griffith to November 9 are 451.2 mm compared to 371 mm for the long term average, with a relatively dry September (16.8 mm) and October (20.2 mm) period.

Rice

In what has been described as 'typical rice establishment conditions' the summer cropping season got off to a mild start. Whilst early October maximum temperatures were generally cooler than average, minimum temperatures were the opposite. Solar radiation and evapo-transpiration levels were also below average. This all changed once we reached mid October with above average conditions aiding establishment.

Establishment is always a trying time for growers and this season was no different with ducks, wind, weed control and the cool early start all having an impact. But despite all of this, crops are now generally progressing well.

Winter crops

Whilst rice establishment has been at the forefront of irrigator's minds, the focus now will be turned to the winter crop harvest. Although the winter cereal harvest is yet to get really underway on irrigation, recent weather has disrupted the canola harvest. With some canola crops already harvested and others windrowed awaiting harvest, yields and oils to date have generally been good.

The wet harvest last season remains fresh in grower's minds, and all are hoping not to see a repeat of those conditions in 2012.

Rachael Whitworth
Extension Agronomist, NSW DPI, Griffith
November 9, 2011

SOUTHERN NSW

Canola harvest is underway in the Lockhart area with current canola yields coming back in a range of 1.3 to 2.0 tonnes per hectare with oils at around 44–46 per cent. These results are encouraging particularly given that virtually no rain fell during October and the performance of our winter crops has relied heavily on stored soil moisture through our minimum tillage farming practices.

Increased levels of blackleg disease have again been observed in canola crops and this will continue to motivate us to look for suitable disease ratings in our varieties for next season.

I expect that the district's canola yield this season will average out at around 1.5 tonnes per hectare.

Much of the wheat crop is yet to dry down to harvest moisture – this maybe fortunate as heavy storms, delivering in the vicinity of 50 mm, have occurred recently. It is hoped that there's been little impact on grain quality and that harvest quickly resumes.

But the hot windy weather experienced in the third week of October did have a quality impact on crops and it is expected that some screenings may result. At this stage, there is still a lot of optimism for both grain quality and yield.

I expect that wheat will average out at around 3.0 tonnes per hectare.

Barley will be ready to harvest once canola is finished and it appears that yields of around 4.0 tonnes a hectare are quite achievable.

It looks like we may be in for a wet summer and so we must make the most of our opportunities and conserve this moisture for the 2012 winter cropping season.

Warwick Nightingale
Agronomist/Consultant, Delta Agribusiness Lockhart
November 10, 2011

Northern region

DARLING DOWNS

Winter crops

The winter crop harvest is underway, with over 50 per cent of the Western Downs crops off but under 10 per cent of the Eastern Downs crops harvested.

The cereal yields have varied. West of Dalby growers have found that yields have not been as good as expected at 2.5 to 3.5 tonnes per hectare, with protein back around 11 per cent. This is being put down to damage from crown rot, some yellow spot and late frost damage, as well as loss of nitrogen from the very wet conditions at times in 2011.

Most stripe rust susceptible varieties received at least one fungicide spray through the season, but the stop start rainfall and long dry spell during the growing season have caused some yield losses.

To the east of Dalby conditions have been better and yields have generally been between three and six tonnes per hectare (albeit with lower proteins at 11–12 per cent), with one paddock of barley yield tested at 7.8 tonnes per hectare. But it is still early days in the harvest and growers are watching the weather and looking to harvest as soon as possible to avoid losses such as last winter.

The chickpea harvest is about to start with some potentially good yields. There has been little disease, due to an increased

preventative strategy and the long dry spell this winter. But heliothis pressure has continued with many crops needing two control sprays as the crops persisted in setting flowers and pods.

Summer crops

There has been a strong plant of cotton and maize and a slightly reduced plant of sorghum so far. Sorghum establishment has been below expectations due to cold and dry conditions at planting, whilst the cotton planted later suffered from excess rainfalls of up to 100 mm along with cool conditions – so there has been some replanting. Maize and sorghum are now approaching the in-crop weed control stage, and there has been renewed interest in sunflowers this summer.

In December, further maize and sorghum planting is planned, along with mungbeans and soybeans. Growers are hoping to double crop a number of their winter crop paddocks – due to the good subsoil moisture conditions – so overall there will be a strong summer plant again this year. At this stage with a good soil moisture profile, the prospects are good.

Hugh Reardon-Smith
Agronomist, Landmark Pittsworth
November 8, 2011

CENTRAL QUEENSLAND

Rainfall and temperatures

Very little rain fell across Central Queensland grain growing districts during September 2011 except for parts of the Callide Valley. During October, areas north and south of Emerald received 50–70 mm with Clermont the wettest (70 mm) and Springsure and districts not as wet (50 mm). Emerald and Capella, in the middle, were drier (about 20 mm). Rainfall in the Dawson (Banana 28 mm) and Callide (Biloela 40 mm) was below average for October. November has been hot and dry with the promised La Niña and above average wet summer 'still to happen'.

Temperatures during September and October were generally cool, especially the nights with high summer temperatures only arriving now – almost the middle of November.

Wheat

Wheat harvest finished later then normal for most CQ farmers this year but fortunately without the wet weather dramas of last season. Cooler temperatures caused slower ripening and dry down which was frustrating for all and especially for header operators keen to move on.

Farmers were generally pleased with grain yields given that most paddocks received very little in-crop rain. The majority of the crop yielded in the 2–2.5 tonnes per hectare range with better paddocks and farms averaging 2.5–3 tonnes per hectare and a few reporting higher yields of 3.6 tonnes. Some Callide Valley farms lucky enough to get rain in early September averaged 3.7 tonnes per hectare and achieved paddock yields up to 4.5–5 tonnes per hectare.

Extraordinary low (especially for CQ) grain proteins have both devastated and confused farmers with much of the crop on the central highlands in the 8–10 per cent protein range – some even lower. Even scrub soil paddocks in the Dawson had protein levels of 10–12 per cent. Some depots could almost count on one hand the number of loads going Prime Hard.

An increase in the area planted to mungbeans in recent years may have helped some crops. The area planted to chickpea will certainly be higher next season.

Wheat prices have been even more disappointing with poor quality weather-damaged wheat selling for a higher price last season than better quality wheat this year. A lot of grain is currently stored on-farm or warehoused in the hope of better prices. Delivering to public storage has been a headache for many farmers who lack significant on-farm storage. Depot closures created major problems at harvest.

Local growers comparing wheat varieties at Norm Becker's property 'Paranui', near Theodore.

Winter crop harvest is finished in CQ for 2011. A clean wheat stubble paddock ready for next season at Ken Sullivan's property, 'Springton', in the Gindie district.

Chickpea harvest underway in the Clermont district.

Chickpeas

Chickpea harvest was generally later than wheat and yields of 1.7–2.2 tonnes per hectare were common.

Weeds

Wheat paddocks have generally finished fairly clean of weeds whereas many chickpea crops have a lot of broadleaf weeds present despite residual herbicides being applied at planting. While it is generally too dry to spray, some paddocks are being ploughed to control weeds and to level wheel tracks.

Summer crops

A small area of spring mungbeans and some sorghum has been planted in the Callide and Lower Dawson.

Maurie Conway
Principal Technical Officer
Grower Solutions for Central Queensland
Agri-Science, Emerald, Qld
November 11, 2011

ANSWER TO IAN'S MYSTERY TRACTOR QUIZ

Prior to starting a KL Bulldog, provision was made to pre-lubricate the main, gudgeon and big end bearings by manually winding the lubricating pump. This was brilliant as it meant, unlike other engines, there was no dry start period of wear, which accounts for most of the wear in an engine.

ADVERTISERS' DIRECTORY

Allied Grain Systems 21
Alloy & Stainless Products ..... Insert
Barcoo ..... ??
Bourgault Australia ..... S
Case IH ..... OBC
Charlton's Fishing 4
Claas 15
Dinner Plain 31
Excel Agriculture 7
Futari Grain Tech Services 23
Gessner ..... Rainfall chart
John Deere ..... IFC, 3, 9
K-Line Industries 19
Monsanto ..... Insert S
Neils Parts 13
Polytex 21
Study Tours ..... IBC
TACS Australia 5
Tractorman 23
Westfield Augers ..... N, S